

LEONARDO PARENTONI | RENATO CÉSAR CARDOSO (ORG.)

LAW, TECHNOLOGY AND INNOVATION

V. II: INSIGHTS ON ARTIFICIAL INTELLIGENCE AND THE LAW



EXPERT
EDITORA DIGITAL

This book is part of the collection sponsored by the Brazilian Research Center on Law, Technology and Innovation – DTIBR, a private nonprofit interdisciplinary membership association that works to bridge academia and business, as well as publishing papers and books focused on cutting edge technologies and their legal aspects.

The book assembles the best papers from the students, properly revised, in expanded and updated versions. Invited coauthors from other top-ranked universities in Brazil, as well as foreign scholars, also shared their thoughts, experience and impressions about that important subject.

In the following pages, the reader will find 13 texts about many aspects of AI technology, not only in the legal field but also from the perspective of other areas, such as ethics, philosophy, computer sciences, medicine, civil law, business law, privacy and personal data protection.

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“The widely accepted wisdom that ‘computers can only do what people program them to do’ no longer applies”.

(KAPLAN, Jerry. *Artificial Intelligence: What everyone needs to know*. Oxford: Oxford University Press, 2016. Preface, p. XII)

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COORDINATOR'S NOTE

This book is part of the collection sponsored by the Brazilian Research Center on Law, Technology and Innovation – DTIBR¹, a private nonprofit interdisciplinary membership association that works to bridge academia and business, as well as publishing papers and books focused on cutting edge technologies and their legal aspects. The first book of this collection, called “Direito, Tecnologia e Inovação – v. I: Law, Technology and Innovation” had been in development since 2015 and was published in 2018, with texts in Portuguese and in English². 65 coauthors, from more than 20 universities and research centers, both Brazilian and international, from scientific fields such as Law, Medicine, Economics, and Computer Sciences, took part in it. The scope of that first book was to provide the reader with an overview of the main legal issues related to new technologies, functioning as a glossary of this field, with more than a thousand pages. Each of the subsequent books was planned to be more concise, deepening on a specific technology and its legal implications.

This is the *second book of the collection*, the first *fully written in English*, dedicated to the study of *artificial intelligence* (AI). It was kickstarted during Professors Leonardo Parentoni and Renato Cardoso classes in the Ph.D. course at the Federal University of Minas Gerais – UFMG/Brazil, during the first semester of 2018. As far as we know, this was *the first comprehensive Ph.D. course about AI in a Brazilian Law School*. The book assembles the best papers from the students, properly revised, in expanded and updated versions. Invited coauthors from

1 More information about DTIBR can be found here: <<https://www.dtibr.com>>. Access: 19 Dec. 2020.

2 See the summary for free here: <https://www.researchgate.net/publication/327824339_Direito_Tecnologia_e_Inovacao_-_v_I_Law_Technology_and_Innovation>. Access: 19 Dec. 2020.

The book is available for purchase in the publisher's website, here: <<https://www.editoradplacido.com.br/direito-tecnologia-e-inovacao-vol1>>. Access: 19 Dec. 2020.

other top-ranked universities in Brazil, as well as foreign scholars, also shared their thoughts, experience and impressions about that important subject.

This book was originally expected to be published in the first quarter of 2020. It seemed to be the perfect timing since the second half of 2019 and the beginning of 2020 (pre-pandemics) were so far the most important season regarding AI regulation in Brazil. Tremendous achievements were made during that time. In the legislative field, the first and still most important bills about AI regulation were presented to the National Congress. The Federal Executive branch also played a major role by discussing a Brazilian Strategy for Artificial Intelligence with a public consultation to gather multiple opinions about that proposal. Outside the regulatory field, concrete measures to implement AI in the country were also put in place. For example, the initiative from the Ministry of Science, Technology and Innovation – MCTI, in collaboration with the São Paulo Research Foundation – FAPESP, to sponsor the installation of up to 08 Research Centers for Applied AI Technology in the country, investing around 1 million Reais³ of public grant plus another 1 million Reais coming from private partners. The scenario was very favorable and there was a widespread expectation, among both the legal/technical community and the government, that 2020 would mark the year in which Brazilian AI regulation would take off.

However, the COVID-19 pandemic took the country (and the whole world) by surprise and delayed these plans since public health became a top priority, for obvious reasons. All AI regulation initiatives were put on hold while the country was struggling with a massive

³ Real is the Brazilian fiat currency. 1 million correspond to around 200 thousand dollars.

public health issue aggravated by unemployment⁴ and economic crisis⁵.

Since December 2020, when a vaccine for COVID-19 was starting to be distributed around the world on a large scale, the new expectation is that in 2021 the discussions about AI regulation in Brazil will resume, hopefully evolving to a mature stage in which the first national law about that subject is finally approved in Congress or at least other regulatory initiatives become operational. It is in this context of hope and expectation that we present this book to the public.

In the following pages, the reader will find 13 texts about many aspects of AI technology, not only in the legal field but also from the perspective of other areas, such as ethics, philosophy, computer sciences, medicine, civil law, business law, privacy and personal data protection.

Antônio Martino opens the book with a historical introduction about logic, the development of informatics and AI regulation. Follows an article by Eduardo Magrani about the importance of ethics in AI. Right after, Lourenço Araújo and Yuri Santos study the concept of error in machine learning, from a computer science perspective. Then comes the text by Henry Colombi and Natália Chaves, discussing the pros and cons of attributing legal personhood to AI-based systems. Next, we have two studies relating AI to privacy and personal data protection, by Manuel Masseno and Bernardo Grossi. The former focus on the EU context, while the latter focus on Brazil. Then comes the article by David Hosni and Pedro Martins, dealing with the Brazilian General Data Protection Law provisions about automated decision-making and Júlia Ribeiro's study about possible impacts of EU

4 According to official data, the unemployment rate in Brazil raised 27,6% from May to August 2020: (AGÊNCIA BRASIL, 2020).

5 The International Monetary Fund worst prediction pointed out that the Brazilian gross domestic product could shrink up to 10% in 2020, the worst scenario in this century: (GERBELLI, 2020).

regulation of AI on technological innovation. Two following articles deal with civil and business law aspects, by Guilherme Martins, Thomaz Penna, Alexandre Alves and Lucas Silva, addressing the use of AI in commercial collaboration contracts and credit markets. The next paper is an interesting, bold and, as far as I know, *innovative* analysis of “solvable civil responsibility”, written by Wallace Freitas. Coming to an end, Eduardo Tomasevicius writes about AI-based systems in medicine, balancing their pros and cons, as well as the risks involved. Finally, Rômulo Valentini draws a critical analysis of the Brazilian electronic lawsuit systems and how it could lead to “machine-made judgments”.

The history of AI development has been far from a straight upward line. On the contrary, right after the first scholarly inquiries about this subject, in 1943⁶, and the first scientific use of the expression “artificial intelligence”, in 1956⁷, what followed was a period of nothing but rather modest developments, the reason why the following decades have been called “AI winter”⁸, in allusion to the fact that in some countries the vegetation does not grow or grows too slowly during the winter. Only in the first decades of the 21st century did the scenario change, with an impressive and fast development of AI technologies⁹.

Although due to different reasons, the COVID-19 pandemic also slowed down the AI development in some areas, especially outside medical care, since the world government and industry priorities radically shifted to fight the pandemic and its devastating social and

6 RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. 3rd ed. New Jersey: Prentice-Hall, 2010. p. 16.

7 KAPLAN, Jerry. *Artificial Intelligence: What everyone needs to know*. Oxford: Oxford University Press, 2016. p. 13.

8 RUSSELL, Stuart J.; NORVIG, Peter. Op. cit. p. 24.

9 MAYER-SCHÖNBERGER, Viktor; CUKIER, Kenneth. *Big Data*. 2. ed. Boston/New York: Eamon Dolan/Houghton Mifflin Harcourt, 2014. p. 09; CALO, Ryan. *Artificial Intelligence Policy: A Primer and Roadmap*. *University of Washington Research Paper*. p. 01-28. August 2017. p. 04.

economic consequences. However, just as what had happened after the AI winter, it is expected (and hoped for) that in the upcoming years the world will rapidly catch up with the pre-pandemics level of AI research and investments, experiencing an unprecedented development in this area, as predicted by the US Government in a press conference about the 2016 White House report called “Preparing for the Future of Artificial Intelligence”, when it was said that in a near-future AI could “*let a thousand flowers bloom*”¹⁰.

Belo Horizonte/MG - Brazil, December 2020.

Leonardo Parentoni

¹⁰ UNITED STATES OF AMÉRICA. Repor from the National Science and Technology Council Committee on Technology for the Executive Office of the President. *Preparing for the Future of Artificial Intelligence*, October 12th 2016

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Introduction

Logic, Informatics, Artificial Intelligence And Technology In Law: History And Challenges.

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There have been several lines that have been drawing the use of artificial intelligence in law, one of the most interesting born in Georg H. von Wright and passes through the Institute of Legal Documentation of the Italian CNR. Four years have passed and many things have changed and brought new challenges. There is already the electronic use of data and news both in the profession of lawyers and the judicial system and there are very advanced programs in the use of new technologies in law. Some doomsayers predict the dominion of machines over men. They forget something constant and that cannot change: man has weighting, machine does not.

1. Modern A.I. and Neural Networks

Neural networks can be presented as a simile (only a simile) of what happens in the brain of a newborn: it has brain cells but they are not connected at the moment. In the first years of life, the cells communicate through electrical impulses called synapses. The more synapses, the more developed a brain is. In the computer world, there has been a desire to make a simile, but it is simply “simile” and quite

far away because of the properties that a cell has compared to any set of bits and the fact that synapses are not natural but induced with rules and patterns.

So-called “artificial neurons” are sets of units in a system that connect to other neurons through links. These links vary by the weight of each knot and can be increased. Obviously, they receive information by link and emit information as output. The weight of the links can increase or inhibit the activation state of adjacent neurons. This is called the activation function. Similarly, at the output of the neuron, there may be a limiting or threshold function, which modifies the output value or imposes a limit that must be exceeded before it spreads to another neuron.

The network function of an artificial neuron is defined as a composition of other functions. It is represented as a network structure, with arrows representing the dependencies between variables. The important feature of the activation function is that it provides a smooth transition as change input values, i.e. a small change in input produces a small change in output.

The processing elements are arranged in linear arrays called layers. The layers can be of different kinds: input, output and hidden. Input layers receive signals from the outside, output layers send signals to the outside, and hidden layers do not interact with the outside environment, and their inputs and outputs occur within the system.

Neural systems can and do learn and form networks. To perform this automatic learning, a criterion is used to minimize the loss function that evaluates the network as a whole. The values of the weights of the neurons are updated to reduce the value of the loss function. To do this, a mechanism or function of backward propagation is used. Current neural networks usually contain from a few thousand to a few million neural units. Obviously, over time these units will increase and they will be able to function better.

In law, this means conceiving procedures as horizontal hierarchical structures, where each level corresponds to one of the chronologically consequential phases of the processing derived from the application of the law, the results of which determine the type of processing to be carried out in the successive phases

We lawyers work with texts but in a modern definition of “Text” is the fundamental communicative linguistic unit, a product of human verbal activity, which always has a social character; it is characterized by its semantic and communicative closure, as well as by its deep and superficial coherence, due to the (communicative) integration of the speaker to create a complete text, and to its structuring using two sets of rules: those of the textual level and those of the language system.

With a new version of the text, it is possible to analyze the recurrent semantic forms in a legal text and to create patterns with which to make elaborations with neural networks by putting a chain or function forward to obtain legal results given certain social elements that are being configured and chains backward to know what the legal foundations of some decision are.

It is possible to think of using a layered architecture to simulate the processes of a lawyer during legal qualification. Each of the layers would function as a lower-level structure specialized in the identification of a certain type of lower-level linguistic structure or textual portion, whose procedural results would be integrated by other higher-level layers and whose specialized functions would also be different

The final result would be the qualification(s) attributable to the full text, as a result of the integration of the textual portions found by means of the syntactic identifiers in the totality of the layers. Obviously, the final response (emergence) presupposes that between the different layers the inhibition relationships of certain processing units concerning others have been considered. In the case of complaints, not only do indicators denoting violations function as

inhibitors of other processing units, but they also correspond to types of authorities.

2. The Legal Reasoning

In a classic division of semiotics that starts from William Morris, it can be argued that the three levels of language are syntax, semantics and pragmatics.

For me, logic enters the field of syntax. While judicial reasoning enters into semantics and pragmatics. But all semantics and pragmatics sit on a logical loom.¹¹

The most classic enunciation of judicial reasoning, as in general of all legal reasoning is that it is summarized in a syllogism that contains the norms in the major premise, the facts in the minor premise and the consequence in the sentence.

The description is fascinating because of its simplicity and takes up much of what the judge actually does. Only that being so simple, it loses a lot of precision and ends up saying little about judicial reasoning.

To begin with, if it were only a syllogism, it would be simple logic and, according to my conviction, only syntax. We have developed with Carlos Alchourron a system of legal reasoning that we call SRL and then on my own a more sophisticated one, with Horacio Arlot Costa, called DEO.¹² These programs allow us to make purely logical legal reasoning: that is, they have a random logic and an ontic logic and can make deductions both from norms and from the adaptation

11 Carlos E. ALCHOURRON. Antonio A. MARTINO. *Logica sin verdad*. "THEORIA", Año III^o, Curso 1987/88; p. 7/43. IN PATTARO, Enrico (a cura di), *Logic Without Truth*, Ratio Juris, An International Journal of Jurisprudence and Philosophy of Law, vol. 3, n. 1, marzo 1990, Basil. Blackwell Oxford and New York.

12 Carlos E. ALCHOURRON. Stefano A. CERRI, Antonio A. MARTINO. *SRL: Sistema per il ragionamento legale*. IN MARTINO, Antonio Anselmo (a cura di) *Sistemi Esperti nel Diritto* Padova, CEDAM, 1989, p. 185 - 219.

of facts to norms. Moreover, not only do they have what is called a backward chain: this is the justification of a deduction from a set of norms and facts, but also the description of certain facts, they can obtain the legal consequences that will occur in a certain universe of norms: forward chain.

For example, we put the rules of the Italian Civil Code for marriage and SRL was able to both justify the presumption that the woman should bear the name of her husband (chain backward) and that if A and B were married, A is a spouse, B a spouse and both “spouses” and all the rights and obligations arising from that act distinguishing between direct obligations and bilateral obligations. Chain from now on.

But the legal reasoning is not only logical (which a machine can calmly do) there are other semantic and pragmatic elements that we will enumerate.

3.1. The Logic Of Legal Reasoning

Judicial reasoning - like all reasoning - has a syntactic part that is governed by logic. What logic? It depends. For each type of reasoning, some logics are more adequate than others. As long as logics - from the syntactic point of view are acceptable - that is, they follow a rule of abstract deduction, define their operators according to such rules, do not repeat useless operators and do not provoke contradictions among their consequences, their operability in a field depends on pragmatic reasons of use and this is an argument and not a logical proof.

In principle, all logics that follow the above principle serve as such. But there are logics with a strong tradition and great development and more modern logics that are still being tested. Undoubtedly, an aleatory logic is needed, both in its prepositional version and in its predicate version. Modal logics are needed to talk about the different

modes: possible, necessary, etc. A deontic logic is needed to be able to make calculations with the rules and between the rules. More sophisticated logics are needed for the tests, such as paraconsistent logics, which weaken the notion of negation and open the field to measurements or degrees. This last part seems to me important for tests, which indeed need degrees of credibility.

In general, I believe that for there to be judicial reasoning there has to be an application of standards and this requires a logic of ethics that could be identified as the hardcore of the common logic of Won Wright.

A rule has a fundamental structure consisting of a precept addressed to a class of target subjects and a sanction to which definitions and exceptions are added (or can be added).

The precept or imperative indicates a permitted, prohibited, obligatory or optional conduct. Imperatives are traditionally distinguished into absolutes and conditions, but in legal matters, there are no absolute imperatives.

Why does the doctrine persist in maintaining the distinction? For non-logical reasons:

a) The legislator uses the exception every time it is necessary to affirm a value of abstract anti-juridicity (e.g. to affirm the devaluation of a homicide even if it is justified or the devaluation of the non-payment of income tax even if it is less than 1 million).

b) Secondly, the choice of the exception allows the legislator to regulate the burden of proof and therefore to subordinate the lawfulness of the behavior to specific acts, even procedural ones of the subjects.

The exceptions constitute accidental elements of the rule, but they explain a fundamental importance of the law: the legislator, although he cannot foresee all the specific cases of action of a rule, is concerned with highlighting in general particular cases that exclude

in whole or in part the application of the rule, or particular cases that connect different consequences to the same rule.

Definitions are accidental parts of the legal order and it is necessary to distinguish between definitions of technical legal terms. The expression: *In claris non fit interpretatio* is false.

Logic can provide analytical elements to individualize contradictory or redundant statements or to bring out a gap in the ordering but it cannot enter into the critical appraisal of practical reasoning.

Practical argumentation in general and juridical in particular must necessarily be studied to try to reach the main purpose of logic, that is to say, to individualize a method of critical analysis of human reasoning, but it is necessary to take into account the strictly logical part and the linguistic, semantic and pragmatic aspects in which the argumentation is articulated.

3.2. The Legal Decision And Its Particular Problems (judicial Decision And Legislative Decision.)

We have already said that logic is purely syntactic and therefore that lack of semantics and pragmatics collaborates with fast and efficient calculations. In this lies also its similarity with computer programs that are symbolic and destined to make something to some machine. A logic can be judged by its accuracy, if it is not precise it will produce contradictions and these cannot be admitted. The simplicity (lack of redundancy), elegance and completeness of a logic can even be judged, but there are many logics for precisely another reason: their applicability. A random logic serves to verify statements of being, but not statements of duty to be that are more like those of time. And that is where Georg H. von Wright's research for deontological logic comes from. There is knowledge that requires a less emphatic negation than

alethic and thus paraconsistent logics are born that admit more than two states (0 1 and $\frac{1}{2}$, for example) .

Like logic, computer programs must meet syntactic qualities of formulation without which they are “bad programs” but it is when they are applied and results appear in a certain area that we say the program is adequate.

For knowledge in which it is necessary to have a more elastic version of denial and therefore of inconsistencies, paraconsistent logic has been a great achievement. Think for example that it could be applied to dialectics and therefore to Marxist theory. In 1874, Cantor created the theory of sets and quickly all logic and mathematics could be represented with it. But with the new century, paradoxes appeared in that theory. Russell’s paradox, Burali-Forti’s paradox and several others, which it is not appropriate to explain here because it would take a long time. These questions became a philosophically incredible problem: how were paradoxes possible in traditional mathematics and logic, until then the most perfect example of knowledge?

When the set theory was found to be inconsistent and contradictory, it was not supported. An attempt was made to resolve the question by maintaining classical logic and imagining what modifications we could make to set theory to overcome the paradoxes. The general theory of relativity and quantum mechanics are two of the most amazing theories that appeared in the history of culture until today because of their applications, because of the precision of the magnitudes, in short, because of everything. It’s crazy what they explain. For example, quantum mechanics explains the laser, the maser, the chemical structure. However, both theories, if you look closely, are logically incompatible. There’s only one way to bring them together, and physicists often do that, even if they don’t know how it happens logically. This paraconsistent logic consists of making negation less

rigid and allowing 0 to correspond to 1, but also 0.50 or similar things. In that (only in that) it is similar to quantum computing.¹³

3.3. The Argumentation

From a pragmatic point of view, language can be descriptive, emotional, prescriptive, argumentative, etc. Legislators use prescriptive language and therefore laws are orders to be obeyed. The language of judges and lawyers is argumentative because it is meant to convince (the judge, a higher court, a jury) that we are right in any dispute.

Oratory is the materialization of the persuasive capacity presented by rhetoric and is made concrete as a specific literary genre, for example, in speeches, conferences, accusations and judicial defenses. Dialectics means the “art of conversation” (from the Greek “*día*”, dialectic reciprocity, exchange, and “*logos*”, logos word, discourse, etc). Hegel, in dialectics, affirms that each thought, each idea and each situation in the world has an opposite and that the union with it forms a greater and more complex whole. In a process of thesis, antithesis and synthesis Hegel followed the tradition that comes from

¹³ All quantum physics has had a great theoretical development but little practical because quantum systems are unstable because of the heat they produce. I was lucky enough to talk to Carlos Bunge, Mario’s son and professor of quantum physics at Unam. If there are errors, they are due to my defective understanding. An article in the magazine *Nature*, one of the most prestigious scientific publications, gave an account of what could be a milestone in the field of quantum computing. The data said that Google’s quantum processor, called Sycamore, completed a calculation operation in 200 seconds, a run that would take the world’s fastest conventional computer about 10,000 years to complete. The result achieved with the experiment allowed the computer giant’s researchers to claim quantum supremacy, a concept coined by American physicist John Preskill in 2012. The notion holds that quantum supremacy will be achieved when a quantum system performs a computational task that exceeds those that can be performed by a classical computer. It is curious but now what is in danger is the process of block change because it rested on the tranquility that required a huge amount of time to calculate the steps that were made to give certainty of scribes to their calculations. With the quantum computer, goodbye certainty.

Heraclitus (around 500 BC), who saw everything as a product of a process from which the progress of history emerges. As no situation can continue indefinitely, and every situation contains elements that conflict.

The change is continuous. The process of change is the dialectic. In Marx, dialectics designates both the particular process by which society develops throughout its own history, and how it must think to adequately grasp that process.

Rhetoric is any orderly communicative process that has persuasion as its goal. Rhetoric is the capacity to defend one's own opinion through public discourse, thus trying to influence the way of thinking and acting of others, provoking an induced reflection in those who listen to us, and thus building in the head of others the edifice we want to carry out, so that they reach, in short, the conclusions we have previously foreseen.

Rhetorical discourse must be elaborated following the best rules of grammar, it can be on any subject, it must have a persuasive character and its construction must be suasive. The close relationship that rhetoric has with the law has been present since its birth and is found in its very origins. It should never be lost sight of the fact that ancient rhetoric is born of practical needs, especially those relating to the resolution of conflicts closely connected with law and politics

In other words, legal reasoning generally tends to convince, that is to say, it makes use of rhetoric, which is easily forgotten when artificial intelligence is applied to law.

A lot has happened in these ten years precisely because many more people are engaged in research and experimentation in this field and, as is fashionable, there is much more money available. Prepared people and money is what can turn a subject into something of enormous expectation. In this case, we must add that there is already enough experience to be able to tackle new and important issues, both from a theoretical and practical point of view.

In the theoretical part regarding systems that aims to use A.I. in legal reasoning: there is a lot on the table, but I want to point out the essential fields and notable works in those different areas:¹⁴

a) Criminal liability for acts committed by artificial intelligence systems: the context for the analysis of the common elements and the differences between the criminal activities of human beings and artificial systems. It is being handled by Giovanni Sartor, one of the best researchers in the field.

b) Electronic processes: Justice will be radically different all over the world. It is already beginning to be used in different judicial organizations around the world. It is enough that the notifications are electronic, as well as the demand and the answer that offer all the evidence in one single filmed hearing, which may last several days if the trial is very big and there is a lot of evidence, then the pleadings and the sentence help a lot that also other parts of the public function and even the relations between private people are already electronic, that is why we look very carefully at Estonia that has not only started to use this kind of system¹⁵ but has promised an “automatic judge”.

c) General legal reasoning software.: Notably, IBM Watson, who uses natural language and learns, and who, according to the American Barr Association, has already replaced the interns in the large law firms¹⁶. Also, ROSS Intelligence can listen to human language,

14 J:E:E:P. stands for “just enough essential pieces”. If we could use that when we write, talk or do things in life, we might be famous as the vehicle that revolutionized military transport in World War II and is still being sold.

15 In Italy, where the system has been in place for some years, causes that used to last 10 years now barely exceed 10 months. It is good to remember that we are human beings and that no instrument (and the A.I. is an instrument) is going to solve all our problems. The use of electronic systems in Justice creates other difficulties that must also be faced.

16 To the expert systems programs that we developed in the past years have entered new products extremely Watson is a computer system of artificial intelligence that is capable of answering questions formulated in natural language. Watson uses all the innovations in data analysis and management of, either by connecting to databases or encyclopedias stored on hard disks, or to the Internet, with the almost unlimited sources that this implies. Watson’s function is, precisely for this reason, to access, se-

track over 10 thousand pages per second and formulate a response much faster than any human lawyer.

Do not forget that technologies change very fast. In his book “Six memos for the next millennium”, Italo Calvino develops the six characteristics of this century: lightness, speed, accuracy, visibility, multiplicity, concreteness¹⁷. Without forgetting the others, notice today the speed for all changes.

4. Innovative Technologies Regarding A.i. And Legal Reasoning

In the past, the most advanced program for AI was Lisp, although Prolog was used a lot because it said in its propaganda that it had a rule of deduction. It is false 3 Prolog has a cut-off rule but no deduction rule and a cut-off rule has much less than what is needed to deduce.

Today the most widely used program in AI is Python, but it is wrong to say so because AI uses a lot of resources and not a programming language. Python is a multi-paradigm programming language, as it supports object-orientation, imperative programming and, to a lesser extent, functional programming. It is an interpreted language, uses dynamic typing and is multiplatform.

lect and process the most appropriate information to what the situation or interaction requires. IBM has put on the market Watson which is an A.I. system that works with natural language and can learn. We tried to use it for SRL but it was a failure. Until we met Alain Colmerauer, one of the creators, at a congress. We told him our discontent and laughingly he told us that he did not have a deduction rule but those who marketed the product put it that way and it could not be changed now. As he has the capacity to learn, it is possible to prepare Watson for any profession, for example as a lawyer or a judge, and in fact several American firms have - according to data from the Bar Association - already done so and have “electronic lawyers, nothing brilliant but who work 24 hours a day and don’t look at their cell phones.

17 Calvino, Italo, Six Memos for the Next Millennium, Harvard University Press, Cambridge MA, 1988.

For example, Deep Blue exploits in beating Kasparov at chess are well known, but now a new AlphaZero system has appeared, which did not learn from any chess player but dedicated itself to learning the rules and ways of playing on its own. The results show that a general-purpose, booster-learning algorithm can learn from scratch and achieve superhuman performance in several highly complex games.

Some sectors have developed more than others, in this field and from a commercial point of view of greater arrival are the insurance and banking. Philips, the Dutch giant, which operates in the health sector is the first example of a company that can create a new A.I.-based ecosystem business. Aon Benfield, the health sector think tank, has taken the programs to the next level and success is derived from the ability to give meaning to complex issues. Philips, the Dutch health colossus, is the first example of a global society able to create a new AI-based ecosystem business by connecting

Aon Benfield, the reinsurance company, has developed an AI platform in England that takes advantage of cloud technology to manage one of the most complex pension products with integrated financial guarantees: variable annuities.

But at the center of the field of interest of A.I. applied to legal reasoning is IBM Project Debater, the first artificial intelligence system that can debate complex issues.

Great public debates have fired our imagination since the days of ancient Greece. This intellectual tradition came to life at the IBM Think conference in San Francisco, when IBM Research and Intelligence Squared U.S. held a live public debate on Monday, February 11, between a human being and an AI.

Project Debater is the first artificial intelligence system that can discuss complex issues with humans, using a knowledge base that consists of about 10 billion sentences, taken from newspapers and magazines. Project Debater digests massive texts, constructs a well-structured discourse on a given topic, delivers it with clarity

and purpose, and refutes its opponent. Eventually, Project Debater will help people to reason by providing convincing, evidence-based arguments and limiting the influence of emotion, bias or ambiguity

To do this effectively, the system must gather relevant facts and opinions, form them into structured arguments, and then use precise language clearly and persuasively.

In development since 2012, Project Debater is IBM's next major AI milestone, following on from previous advances such as Deep Blue (1996/1997) and Watson on Jeopardy!

Great public debates have fired our imagination since the days of ancient Greece. This intellectual tradition came to life at the IBM Think conference in San Francisco, when IBM Research and Intelligence Squared U.S. held a live public debate on Monday, February 11, between a human being and an AI.

Harish Natarajan, Project Debater's opponent in Think 2019, is a 2016 World Debating Championship Grand Finalist and 2012 European Debating Champion. Harish was declared the winner of a debate on "We must subsidize preschool". Both sides delivered a four-minute opening statement, a four-minute rebuttal and a two-minute summary.

The winner of the event was determined by the ability of the debate to convince the audience of the persuasiveness of the arguments. The results were tabulated through a real-time online survey. Before the debate, 79 percent of the audience agreed that preschools should be subsidized, while 13 percent disagreed (8 percent were undecided). After the debate, 62 percent of the survey participants agreed that preschools should be subsidized, while 30 percent disagreed, meaning that Natarajan was declared the winner. Interestingly, 58 percent said Project Debater enriched their knowledge of the subject matter, compared to 20 percent for Harish.

In a live debate, Project Debater discusses a topic that has never been trained in a very short sentence describing the motion.

The first step is to construct a keynote speech to defend or oppose this motion. Project Debater looks for short pieces of text in mass bodies that can serve this purpose. This requires a deep understanding of human language and its infinite nuances and very precise position identification, something that is not always easy for humans and is certainly very for computers.

This process can result in a few hundred relevant text segments. To debate effectively, the system needs to build the strongest and most diverse arguments to support your case. Project Debater does this by eliminating redundant argumentative text, selecting the strongest remaining claims and evidence, and organizing them by topic, creating the basis of the narrative to support or challenge the motion.

It also uses a knowledge graph that allows it to find arguments to support the general human dilemmas that arise in the subject matter of the debate, for example, when it is right for the government to coerce its citizens by infringing on their freedom of choice.

Project Debater brings together all the selected arguments to create a persuasive discourse that lasts approximately four minutes. This process only takes a few minutes. Then, you are ready to deliver your keynote address.

The next step is to listen to your opponent's response, digest it and build your rebuttal. Generating a good rebuttal is the most challenging part of the debate for both humans and machines. Project Debater applies many techniques, including those for anticipating and identifying the opponent's arguments. It then aims to respond with claims and evidence that counter these arguments.

While the format and challenge of the debate has allowed us to shape Project Debater's capabilities, a future for technology beyond the podium is envisioned. It could be used, for example, to promote more civil debates in online commentary forums or by a lawyer preparing for a trial where he could review legal precedents and test

the strengths and weaknesses of a case using a mock legal debate. In the financial services industry, Debater could identify financial facts that support or undermine an investment strategy. Or it could be applied as a voice interaction layer to various complex customer experiences, or even to improve the critical thinking and critical writing skills of young people.

Debate is all about language. Mastering human language is one of the most ambitious goals of AI. Project Debater takes us one step closer on this journey. In the grand scheme, it reflects IBM Research's mission to develop a broad AI that learns across different disciplines to a human judgment intelligence. It absorbs large sets of information and perspectives in pursuit of a simple goal: to help us make better and more informed decisions.

5. New Projects: Research And Practice

There are many and very important ones but, for reasons of space, I will only deal with two: Mirel because it is the most ambitious international project financed by the European Union and Promethea because it is an Argentinean production, more modest, but destined for massive use.

Not only are there products in operation but research is being continued at the highest level. Of the many experiences, there are two: MIREL - MIning and REasoning with Legal texts, which is a European Union research The MIREL project will create an international and intersectoral network to define a formal framework and develop tools for MIning and REasoning with Legal texts, to translate these legal texts into formal representations that can be used for consultation of standards, verification of compliance and support for decision making. The development of the MIREL framework and tools will be guided by the needs of three industry partners and validated by industry case studies.

MIREL promotes mobility and exchange of personnel between SMEs and academia to create an intercontinental environment.

Interdisciplinary consortium in the areas of Law and Artificial Intelligence, including Natural Language Processing, Computer Ontologies, Argumentation, and Logic and Reasoning. It addresses both conceptual challenges, such as the role of legal interpretation in mining and reasoning, and computational challenges, such as the handling of large legal data, and the complexity of regulatory compliance. It bridges the gap between the community working on legal ontologies and NLP analysts and the community working on methods of reasoning and formal logic. It is also the first project of its kind to involve industry partners in the future development of innovative products and services in legal reasoning and market deployment.

Promethea is a multidisciplinary team from the Public Prosecutor's Office of the City of Buenos Aires (CABA) believes that it is. To achieve this, together with specialists in artificial intelligence they developed Promethea, a system designed to predict the solution of simple legal cases.

The team that created Promethea is led by two Buenos Aires justice officials: Juan Corvalán - deputy attorney general for administrative and tax matters in the Public Prosecutor's Office - and Luis Cevasco - deputy attorney general in charge of the General Prosecutor's Office.

The system was tested with 161 files on topics considered feasible to deal with this development. Among them, procedural issues, expiration, public employment and the right to housing, in which it showed a 98% efficiency. It is not the idea of this type of program to replace judicial officials and lawyers. It is essential that behind Promethea there is always a person of flesh and blood who, with his or her natural, and not artificial, intelligence, defines whether the system's proposal is adequate or not.

6. Some Comments About The Fear That Artificial Intelligence, Overcoming The Natural One, Dominates Our Actions.

Robot is a word that comes from *robota*, Czechoslovakian, name given to the servile workers in the Austro-Hungarian Empire. Robotics is just a singular field of A.I., but we're afraid of a robot running our lives.

The fears that accompany humanity created the Golem of Rabbi Levi, Frankenstein from an English writer, Mary Shelley. And other fantastic characters that scare us fear and love two sources of creation.

Instead of dealing with current issues such as health, work, environmental balance, education, politics and human coexistence, there are human attacks on A.I. systems to pollute data and confuse the algorithms that are at the base of the intelligent systems developed by the European Sherpa project

Obviously, we have to deal with ethical problems or they will come to us later. The preferable and the politically feasible, and therefore, ultimately, the legally enforceable, and what agents can or cannot do.

Life is the transmutation of light. It is matter and energy from the Sun converted into green fire from photosynthetic beings. It is the natural seduction of flowers. The green fire is transformed into red-orange, yellow and purple exaltation of the sexual fire of the flowering plants. The arrow of all these transformations must finally become a loop that includes the autopoietic demands of every living being. Intelligence uses the environment to transform it. Life on earth is a complex chemical system, based on photosynthesis and structured fractally in individuals at different levels of organization. We use myth and deception to survive and evolve. Gathered in electrified cities, we humans have begun to reshape and transform life on a planetary

scale. Nature does not end with us, but advances inexorably beyond animal societies: we have always used technology to transform the environment. Ortega: me and my circumstance

Our body is characterized by the synergies that have developed over billions of years, exploiting biological mechanisms that are currently not reproducible in robots the brain-body relationship, the human being has a system that has optimized itself in 3,280 billion years of evolution: a very long period in which the human being has developed an extraordinary capacity for adaptation and learning. The gap that technology has to fill to compete with the results of human evolution is still enormous: the human brain works in synergy with the body: the same group of neurons that controls sight also monitors manipulation; the group that controls language monitors speech understanding, and so on. Currently, it is impossible to transfer the implementation synergies of the mind - typical of humans - to machines, because electronic intelligence and mechatronic bodies work with mechanisms that are different from the biological

Let's see if we can discuss things that are important for human life, such as the fact that man has always used technology to modify the environment and make his life easier. No one ever thought about whether a wheel would be better or more important than a peasant using it. The human brain is a "ball" weighing about 1500 grams (a little less than 3.5 pounds), powered by the metabolism of sugars with a few dozen watts! Therefore, with today's technological standards, it is impossible to assume a self-moving system capable of thinking like humans, with the same mental and biomechanical abilities

We are also forgetting one important thing: machines can do calculations at extraordinary speeds, read a lot of information and store it, but what they cannot do is to weigh. Weighing is typical of human beings and their culture and therefore will be weighted differently according to time and place, but it is about using values and being able to distinguish what is most important and least important,

urgent and ordinary. Therefore, for now, we are confident that no machine will govern our lives beyond what we allow.

7. In Conclusion

The best way to catch the technology train is not to chase it, but to be at the next station. In other words, we need to anticipate and direct the ethical development of technological innovation. And we can do this by looking at what is feasible, privileging, within this, what is ambitious Then what is socially acceptable and then, ideally, choosing what is socially preferable compatible with the sustainability of the biosphere, so our current equation is incomplete.

We have shown that decision making is increasingly aided by digital programs and that they can often do so directly if there is sufficient control before, during and after the decision.

We saw that law was always close to formalized formulations from Roman epigraphs to the theory of argumentation to the profuse normalizing activity in law of the last forty years.

Logic was an extraordinary instrument in this legal passage to the formal and we believe we have demonstrated that logic is purely syntactic like computer programs and this explains the capacity and speed of legal decision making

We are living in an era of extraordinary growth in information and its dissemination. The expression Big Data has a specific meaning even if it is not transparent to everyone. And here appears the second characteristic of our time: just as after Plato and much more after Gutenberg, the great theme was to make the population literate, today we have a similar problem with the lack of knowledge of an important part of the population for the use of the computer media with which almost all jobs and social services are being transformed through e-government.

Curiously enough, we are living in a hinge time in which the three cultures coexist on Planet Earth: oral, written and cybernetic.

But the latter has a speed of development and a force of expansion that does not allow for the long times of literacy. This is a demanding world, now! And the law and many functions of the state cannot wait for “reasonable” times of knowledge. Those who are left behind will be the lumpen of the near future: not 2100, in 2050!

And, last but not least, this all comes together with ethical problems that we can't ignore.

Obviously, we have to deal with ethical problems, or they will come to us later. Let's stop arguing uselessly if the machines are going to govern man, a subject for unemployed philosophers, and let's deal with concrete and very close issues. Of course, any program, especially if it can learn and has concrete directives of its purpose will tend to achieve it more and more. But if it is a software or as the popular imagination wants a robot, the issue is that to achieve it has no other limits that we put it. Otherwise - since it cannot have an ethic because it is not conscious - it will get it anyway.

In the long term, people (as users, consumers, citizens, patients, etc.) are limited in what they can or cannot do by organizations, for example, companies, which are limited by law, but the latter is formed and limited by ethics, which is where people decide what kind of society they want to live in.

New Perspectives On Ethics And The Laws Of Artificial Intelligence

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Introduction¹⁸

With the growing dissemination of ‘Big Data’ and computing techniques, technological evolution spread rapidly and increasingly intelligent algorithms have become a great resource for innovation and business models.

This new context based on the concepts of Web 3.0, internet of things and artificial intelligence, depends on the continuous interaction between intelligent devices, sensors and people generating a huge amount of data being produced, stored and processed, changing, in various aspects, our daily life (Magrani, 2017).

The increasing connectivity and symbiotic interaction among these agents¹⁹, bring a significant challenge for the rule of law and contemporary ethics, demanding a deep reflection on morality, governance and regulation.

What role should intelligent things play in our society? Do machines have morality? What legal liability regime should we adopt for damages arising from increasingly advanced artificial

¹⁸ This article counted on the collaboration of Beatriz Laus in the translation.

¹⁹ Better understood by the expression “actant” on Latour’s theory.

intelligence (A.I.)? Which ethical guideline should we adopt to orient its development? In this paper, we will discuss the main normative and ethical challenges imposed by the advancement of artificial intelligence.

1. Technology Is Not Neutral: Agency And Morality Things

Peter-Paul Verbeek in his work “*Moralizing Technology: Understanding and Designing the Morality of Things*” aims to broaden the scope of ethics to better accommodate the technological age, and in doing so, reveals the inseparable nature of humanity and technology. Following Verbeek’s contributions, technologies can be considered “moral mediators” that shape the way we perceive and interact with the world and thus reveal and guide possible behaviors. Since every technology affects the way in which we perceive and interact with the world, and even the way we think, no technology is morally neutral – it mediates our lives (Verbeek, 2011).

Technical artifacts, as explained by the theorist Peter Kroes, can be understood as man-made *Things (objects)*, which have a *function* and a *plan of use*. They consist of products obtained through technological action, designating the attitudes we take daily to solve practical problems, including those related to our desires and our needs. Technical artifacts involve the need for rules of use to be observed, as well as for parameters to be created in relation to the roles of individuals and social institutions in relation to them and their use (Kroes, 2011).

Technical artifacts, as specific objects (Things) with their own characteristics. have a clear function and usage plan. Besides, they are subject to an evaluation analysis as to whether they are good or bad and whether they work or not. Thus, it is possible to observe the great importance that the *function* and the *plan of use* have in the characterization of a technical artifact. These two characteristics are

intimately connected with the goals that the individuals who created the object seek with it so that they do not stray from the intended purposes (Kroes, 2011).

Faced with this inseparability, the questioning of the morality of human objectives and actions extends to the morality of technical artifacts (Kroes, 2011). Technology can be used to change the world around us and individuals' have goals – be them private and/or social – that can be achieved with the help of these technical artifacts and technologies. Considering that the objectives sought by the humans when creating a technical artifact are not separated from the characteristics of the object itself, we can conclude that the technical artifacts have an intrinsically moral character.

Therefore, alongside the technical artifacts, which can represent the simplest objects, with little capacity for interaction/influence, to the more technologically complex ones, we have the sociotechnical systems, which consist of a network that connects humans and *things*, thus possessing greater capacity for interaction and unpredictability (Latour, 2001).

For a regulatory analysis, this concept is even more fundamental (Kroes, 2011). Precisely because of its complexity embodied in a conglomerate of 'actants' (in relation to Bruno Latour's conception of actor-network theory), causing sociotechnical systems to have even less predictable consequences than those generated by technical artifacts. In addition, they generate a greater difficulty to prevent unintended consequences, and to hold agents liable in case of harm, since the technological action, reflected in the socio-technical system, is a sum of actants' actions, entangled in the network in an intra-relation (Barad, 2003).

2. Technical Artifacts And Sociotechnical Systems: Entangled In Intra-relation

To illustrate the difference between the concepts of technical artifact and sociotechnical system, we can think of the former being represented by an airplane, and the second by the complex aviation system. The sociotechnical system is formed by the set of interrelated agents (human and non-human actants - *things*, institutions, etc.) that work together to achieve a given goal. The materiality and effects of a sociotechnical system depend on the sum of the agency of each actant. However, there are parameters of how the system should be used, which means that these systems have pre-defined operational processes and can be affected by regulatory laws and policies.

Thus, when a tragic accident involving an airplane occurs, it is necessary to analyze what was in the sphere of control and influence of each actor and technical artifact components of the sociotechnical network, but quite possibly we will observe a very complex and symbiotic relationship between the components that led to this fateful result (Saraiva, 2011). Moreover, this result is often unpredictable, due to the autonomy of the system based on a diffused and distributed agency among all components (actants).

These complex systems bring us to debate the liability and ethics concerning technical artifacts and sociotechnical systems. Issues such as the liability of developers and the existence of morality in non-human agents - with a focus here on technological objects - need a response or, at least, reflections that contribute to the debate in the public sphere²⁰.

Bruno Latour's theory offers progress in confronting and discarding the formal binary division between humans and non-humans, but it places objects with different complexities and values at the same level. Given this context, from a legal and regulatory

²⁰ In its Habermas definition.

point of view, assigning a different status to technical artifacts and sociotechnical systems, according to their capacity for agency and influence is justifiable and should be endowed with different moral statuses and levels of liability. It is necessary, then, to distinguish the influence and importance that each *thing* also has in the network and, above all, in the public sphere (Latour, 2001).

3. Hello World: Creating Unpredictable Machines

For this analysis, we will focus on specific things and technologies, aiming at advanced algorithms with *machine learning* or robots equipped with artificial intelligence (A.I.), considering that they are technical artifacts (Things) attached to sociotechnical systems with a greater potential for autonomy (based largely on the processing of ‘Big Data’) and unpredictability.

While technical artifacts, such as a chair or a glass, are artifacts “domesticated” by humans, i.e. more predictable in terms of their influence and agency power, it is possible to affirm that intelligent algorithms and robots are still non-domesticated technologies, since the time of interaction with man throughout history has not yet allowed us to foresee most of the risks in order to control them, or to cease them altogether.

Colin Allen and Wendell Wallach (Wallach and Allen, 2008) argue that as intelligent Things, like robots²¹, become more autonomous and assume more responsibility, they must be programmed with moral decision-making skills for our own safety.

Corroborating this thesis, Peter-Paul Verbeek, while dealing with the morality of Things understands that: as machines now operate more frequently in open social environments, such as connected

²¹ The 2005 UN Robotics Report defines a robot as a semi or fully autonomous re-programmable machine used for the well-being of human beings in manufacturing operations or services.

public spheres, it becomes increasingly important to design a type of functional morality that is sensitive to ethically relevant characteristics and applicable to intended situations (Verbeek, 2011).

A good example is Microsoft's robot Tay, which helps to illustrate the effects that a non-human element can have on society. In 2016, Microsoft launched an artificial intelligence program named Tay. Endowed with a *deep learning*²² ability, the robot shaped its worldview based on online interactions with other people and producing authentic expressions based on them. The experience, however, proved to be disastrous and the company had to deactivate the tool in less than 24 hours due to the production of worrying results.

The goal was to get Tay to interact with human users on Twitter, learning human patterns of conversation. It turns out that in less than a day, the *chatbot* was generating utterly inappropriate comments, including racist, sexist and anti-Semitic publications.

In 2015, a similar case occurred with "Google Photos". This was a program that also learned from users to tag photos automatically. However, their results were also outright discriminatory, and it was noticed, for example, that the bot was labeling colored people as gorillas.

The implementation of programs capable of learning and adapting to perform functions that relate to people creates new ethical and regulatory challenges, since it increases the possibility of obtaining results other than those intended, or even totally unexpected ones. In addition, these results can cause harm to other actors, such as the discriminatory offenses generated by Tay and Google Photos.

Particularly, the use of artificial intelligence tools that interact through social media requires reflection on the ethical requirements

²² "Deep learning is a subset of machine learning in which the tasks are broken down and distributed onto machine learning algorithms that are organized in consecutive layers. Each layer builds up on the output from the previous layer. Together the layers constitute an artificial neural network that mimics the distributed approach to problem-solving carried out by neurons in a human brain." Available at: http://webfoundation.org/docs/2017/07/AI_Report_WF.pdf.

that must accompany the development of this type of technology. This is because, as previously argued, these mechanisms also act as agents in society, and end up influencing the environment around them, even though they are non-human elements. It is not, therefore, a matter of thinking only about the “use” and “repair” of new technologies, but mainly about the proper ethical orientation for their development (Wolf et al., 2017).

Microsoft argued that Tay’s malfunctioning was the result of an attack by users who exploited a vulnerability in their program. However, for Wolf et al., this does not exempt them from the responsibility of considering the occurrence of possible harmful consequences with the use of this type of software. For the authors, the fact that the creators did not expect this outcome is part of the very unpredictable nature of this type of system (Wolf et al., 2017).

The attempt to make artificial intelligence systems increasingly adaptable and capable of acting in a human-like manner, makes them present less predictable behaviors. Thus, they begin to act not only as tools that perform pre-established functions in the various fields in which they are employed, but also to develop a proper way of acting. They impact the world in a way that is less determinable or controllable by human agents. It is worth emphasizing that algorithms can adjust to give rise to new algorithms and new ways to accomplish their tasks (Domingos, 2015), so that the way the result was achieved would be difficult to explain even to the programmers who created the algorithm (Doneda and Almeida, 2016).

Also, the more adaptable the artificial intelligence programs become, the more unpredictable are their actions, bringing new risks. This makes it necessary for developers of this type of program to be more aware of the ethical and legal responsibilities involved in this activity.

The Code of Ethics of the Association for Computing Machinery (Wolf et al., 2017) indicates that professionals in the field,

regardless of prior legal regulation, should develop “comprehensive and thorough assessments of computer systems and their impacts, including the analysis of possible risks”.

In addition, there is a need for dedicated monitoring to verify the actions taken by such a program, especially in the early stages of its implementation. In the Tay case, for instance, developers should have monitored the behavior of the bot intensely within the first 24 hours of its launch, which is not known to have occurred (Wolf et al., 2017). The logic should be to prevent possible damages and to monitor in advance, rather than the remediation of losses, especially when they may be unforeseeable.

To limit the possibilities of negative consequences, software developers must recognize those potentially dangerous and unpredictable programs and restrict their possibilities of interaction with the public until it is intensively tested in a controlled environment. After this stage, consumers should be informed about the vulnerabilities of a program that is essentially unpredictable, and the possible consequences of unexpected behavior (Wolf et al., 2017).

The use of technology, with an emphasis on artificial intelligence, can cause unpredictable and uncontrollable consequences, so that often the only solution is to deactivate the system. Therefore, the increase in autonomy and complexity of the technical artifacts is evident, given that they are endowed with an increased agency, and are capable of influencing others but also of being influenced in the sociotechnical system in a significant way, often composing even more autonomous and unpredictable networks.

Although there is no artificial intelligence system yet that is completely autonomous, with the pace of technological development, it is possible to create machines that will have the ability to make decisions in an increasingly autonomous way, which raises questions about who would be responsible for the result of its actions and eventual damages caused to others (Vladeck, 2014). According to the

report released at the World Economic Forum in 2017: *The greatest threat to humanity lies in delegating authority and decisions to machines that do not have the intelligence to make* (Cerka, 2015).

4. Application Of Norms: Mapping Legal Possibilities

The ability to amass experiences and learn from massive data processing, coupled with the ability to act independently and make choices autonomously can be considered preconditions for legal liability. However, since artificial intelligence is not recognized today as a subject of law, it cannot be held individually liable for the potential damage it may cause.

In this sense, according to Article 12 of the United Nations Convention on the Use of Electronic Communications in International Contracts, a person (natural or an entity) on behalf of whom a program was created must, ultimately, be liable for any action generated by the machine. This reasoning is based on the notion that a tool has no will of its own (Cerka, 2015).

On the other hand, in the case of damage caused by acts of an artifact with artificial intelligence, another type of responsibility is the one that makes an analogy with the responsibility attributed to the parents by the actions of their children or even the responsibility of animals' owners in case of damage. In this perspective, the responsibility for the acts of this artifact could fall not only on its producer or programmers, but also on the users that were responsible for their "training" (Cerka, 2015).

Another possibility is the model that focuses on the ability of programmers or users to predict the potential for these damages to occur. According to this model, the programmer or user can be held liable if they acted deceitfully or had been negligent considering a result that would be predictable (Hallevy, 2010).

George S. Cole refers to predetermined types regarding civil liability: (i) product liability, (ii) service liability, (iii) malpractice, and (iv) negligence. The basic elements for applicability of product liability would be: (i) the A.I. should be a “product”; (ii) the defendant must be an A.I. seller; (iii) the A.I. must reach the injured party without substantive change; (iv) the A.I. must be defective; and (v) the defect shall be the source of the damage. The author sustains that the standards, in this case, should be set by the professional community. Still, as the field develops, for Cole, the negligence model would be the most applicable. However, it can be difficult to implement, especially when some errors are unpredictable or even unavoidable (Cole, 1990).

To date, the courts worldwide have not formulated a clear definition of the responsibility involved in creating A.I.s which, if not undertaken, should lead to negligent liability. This model will depend on standards set by the professional community, but also clearer guidelines from the law side and jurisprudence.

The distinction between the use of negligence rule and strict liability rule may have different impacts on the treatment of the subject and especially on the level of precaution that is intended to be imposed in relation to the victim, or in relation to the one who develops the A.I.

In establishing strict liability, a significant incentive is created for the offender to act diligently in order to reduce the costs of anticipating harm. In fact, in the economic model of strict responsibility, the offender responds even if he adopts a high level of precaution. This does not mean that there is no interest in adopting cautious behavior. There is a level of precaution in which the offender, in the scope of the strict liability will remove the occurrence of damage. In this sense, if the adoption of the precautionary level is lower than the expected cost of damages, from an economic point of view, it is desirable to adopt the precautionary level (Shavell, 2004). But even if the offender adopts a diligent behavior, if the victim suffers damage,

it will be reimbursed, which favors, in this case, the position of the victim (Magrani, Viola, and Silva, 2019).

The negligence rule, however, brings a completely different picture. As the offender responds only if he acts guilty, if he takes diligent behavior, the burden of injury will necessarily fall on the victim, even if the damage is produced because of a potentially dangerous activity. Therefore, the incentive for victims to adopt precautionary levels is greater, because if they suffer any kind of loss, they will bear it (Magrani, Viola, and Silva, 2019).

Should an act of an artificial intelligence cause damages because of deceit or negligence, manufacturing defect or design failure as a result of blameworthy programming, existing liability rules would most often indicate the “fault” of its creators. However, it is often not easy to know how these programs come to their conclusion or even lead to unexpected and possibly unpleasant consequences. This harmful potential is especially dangerous in the use of artificial intelligence programs that rely on *machine learning* and especially *deep learning* mechanisms, in which the very nature of the *software* involves the intention of developing an action that is not predictable, and which will only be determined from the data processing of all the information with which the program had contact. Existing laws are not adequate to guarantee a fair regulation for the upcoming artificial intelligence context.

The structure contained in the table *below*, produced in a UNESCO study (Unesco, 2017), contains important parameters that help us think about these issues, at the same time trying to identify the different agencies involved.

Decision by robot	Human involvement	Technology	Responsibility	Regulation
Made out of finite set of options, according to preset strict criteria	Criteria implemented in a legal framework	Machine only: deterministic algorithms/ robots	Robot's producer	Legal (standards, national or international legislation)
Out of a range of options, with room for flexibility, according to a preset policy	Decision delegated to robot	Machine only: A.I. -based algorithms, cognitive robots	Designer, manufacturer, seller, user	Codes of practice both for engineers and for users; precautionary principle
Decisions made through human-machine interaction	Human controls robot's decisions	Ability for a human to take control over a robot in cases where robot's actions can cause serious harm of death	Human beings	Moral

Although the proposed structure is quite simple and gives us important insights, its implementation in terms of assigning responsibility and regulating usage is complex and challenging for scientists and engineers, policy-makers and ethicists, and eventually it will not be sufficient for applying a fair and adequate response.

5. How To Deal With Autonomous Robots: Insufficient Norms And The Problem Of 'Distributed Irresponsibility'

Scientists from different areas are concerned and deliberate that conferring this autonomous “thinking” ability to machines can necessarily give them the ability to act contrary to the rules

they are given (Pagallo, 2013). Hence the importance of taking into consideration and investigating the spheres of control and influence of designers and other agents during the creation and functional development of technical artifacts (Vladeck, 2014).²³

Often, during the design phase, the consequences are indeterminate because they depend partly on the actions of other agents and factors besides the designers. Also, since making a decision can be a complex process, it may be difficult for a human to even explain it. It may be difficult, further, to prove that the product containing the A.I. was defective, and especially that the defect already existed at the time of its production (Cerka, 2015).

As the behavior of an advanced A.I. is not totally predictable, and its behavior is the result of the interaction between several human and non-human agents that make up the sociotechnical system and even of *self-learning* processes, it can be difficult to determine the *causal nexus*²⁴ between the damage caused and the action of a human being or legal entity.²⁵

23 The engineers are responsible for thinking about the values that will go into the design of the artifacts, their function and their use manual. What escapes from the design and use manual does not depend on the control and influence of the engineer and can be unpredictable. That's why engineers must design value-sensitive technical artifacts. An artifact sensitive to constitutionally guaranteed values (deliberate in the public sphere) is a liable artifact. It also necessary to think about the concepts of "inclusive engineering and "explainable AI", to guarantee non-discrimination and transparency as basic principles for the development of these new technologies.

24 With this regard, to enhance the transparency and the possibility of accountability in this techno-regulated context, there is nowadays a growing movement in civil society demanding the development of "explainable artificial intelligences". Also, the debate around a "right to explanation" for algorithmic and autonomous decisions that took place on discussions around the General Data Protection Regulation (GDPR) is also a way to achieve the goals of transparency and accountability since algorithms are taking more critical decisions on our behalf and is increasingly hard to explain and understand its processes.

25 'Causal nexus' is the link between the agent's conduct and the result produced by it. "Examining the causal nexus determines what were the conducts, be them positive or negative, gave rise to the result provided by law. Thus, to say that someone has caused a certain fact, it is necessary to establish a connection between the conduct and the result generated, that is, to verify if the action or omission stemmed from the result

According to the legal framework we have today, this can lead to a situation of “distributed irresponsibility” (the name attributed in the present work to refer to the possible effect resulting from the lack of identification of the *causal nexus* between the agent’s conduct and the damage caused) among the different actors involved in the process. This will occur mainly when the damage transpires within a complex socio-technical system, in which the liability of the intelligent *thing* itself, or a natural or legal person, will not be obvious.²⁶

6. 'With a Little Help From My Friends': Designing Ethical Frameworks To Guide The Laws Of A.i.

When dealing with artificial intelligence, it is essential for the research community and academia to promote an extensive debate about the ethical guidelines that should guide the construction of these intelligent machines.

There is a strong growth of this segment of scientific research. The need to establish a *regulatory framework* for this type of technology has been highlighted by some initiatives as mentioned in this section.

The EU Commission published in April 2019 the document “Ethics guidelines for trustworthy A.I.” with guidelines on ethics in artificial intelligence. According to the guidelines, trustworthy A.I. should be: “(i) lawful - respecting all applicable laws and regulations; (ii) ethical - respecting ethical principles and values; and (iii) robust - from a technical perspective.”

The guidelines put forward a set of seven key requirements that A.I. systems should meet to be deemed trustworthy. According to the document, a specific assessment list (hereunder) aims to help verify the application of each of the key requirements:

caused.

²⁶ This legal phenomenon is also called by other authors as “problem of the many hands” or “accountability gap”.

“(i) Human agency and oversight: A.I. systems should empower human beings, allowing them to make informed decisions and fostering their fundamental rights. At the same time, proper oversight mechanisms need to be ensured, which can be achieved through human-in-the-loop, human-on-the-loop, and human-in-command approaches;

(ii) Technical robustness and safety: A.I. systems need to be resilient and secure. They need to be safe, ensuring a fallback plan in case something goes wrong, as well as being accurate, reliable and reproducible. That is the only way to ensure that also unintentional harm can be minimized and prevented;

(iii) Privacy and data governance: besides ensuring full respect for privacy and data protection, adequate data governance mechanisms must also be ensured, taking into account the quality and integrity of the data, and ensuring legitimized access to data;

(iv) Transparency: the data, system and A.I. business models should be transparent. Traceability mechanisms can help to achieve this. Moreover, A.I. systems and their decisions should be explained in a manner adapted to the stakeholder concerned. Humans need to be aware that they are interacting with an A.I. system, and must be informed of the system’s capabilities and limitations;

(v) Diversity, non-discrimination and fairness: unfair bias must be avoided, as it could have multiple negative implications, from the marginalization of vulnerable groups, to the exacerbation of prejudice and discrimination. Fostering diversity, A.I. systems should be accessible to all, regardless of any disability, and involve relevant stakeholders throughout their entire life circle;

(vi) Societal and environmental well-being: A.I. systems should benefit all human beings, including future generations. It must hence be ensured that they are sustainable and environmentally friendly. Moreover, they should take into account the environment,

including other living beings, and their social and societal impact should be carefully considered;

(vii) Accountability: mechanisms should be put in place to ensure responsibility and accountability for A.I. systems and their outcomes. Auditability, which enables the assessment of algorithms, data and design processes plays a key role therein, especially in critical applications. Moreover, adequate and accessible redress should be ensured.”

Similar to this well-grounded initiative, many countries, companies and professional communities are publishing guidelines for A.I., with analogous values and principles, intending to ensure the positive aspects and diminish the risks involved in A.I. development. In that sense, it is worth mentioning the recent and important initiatives coming from:

- (i) Future of Life Institute – Asilomar AI;
- (ii) Berkman Klein Center;
- (iii) Institute Electrical and Electronic Engineers IEEE;
- (iv) Centre for the study on existential risks;
- (v) K&L gates endowment for ethics;
- (vi) Center for human-compatible AI;
- (vii) Machine Intelligence Research Institute;
- (viii) USC center for AI in society;
- (ix) Leverhulme center for future of intelligence;
- (x) Partnership on AI;
- (xi) Future of Humanity Institute;
- (xii) AI Austin;
- (xiii) Open AI;
- (xiv) Foundation for Responsible Robotics;
- (xv) Data & Society (New York, US);
- (xvi) World Economic Forum’s Council on the Future of AI and Robotics;
- (xvii) AI Now Initiative;

(xviii) AI100.

Besides the great advancements on ethical guidelines designed by the initiatives hereinabove, containing analogous values and principles, one of the most complex discussions that pervades the various guidelines that are being elaborated, is related to the question of A.I.'s autonomy.

The different degrees of autonomy allotted to the machines must be thought of, determining what degree of autonomy is reasonable and where substantial human control should be maintained. The different levels of intelligence and autonomy that certain technical artifacts may have must directly influence the ethical and legal considerations about them.

7. Robot Rights: Autonomy And E-personhood

On 16 February 2017, the European Parliament issued a resolution with recommendations from the European Commission on *civil law* rules in robotics. The document the European Parliament issued (“Recommendations from the European Commission on civil law rules in robotics 2015/2103 – INL”) advocates for the creation of a European agency for robotics and artificial intelligence, to provide the necessary technical, ethical and regulatory expertise. The European Parliament also proposed the introduction of a specific legal status for smart robots as well as the creation of an insurance system and compensatory fund²⁷ with the aim of creating a protection system for the use of intelligent machines.

²⁷ The type of insurance that should be applied to the case of intelligent robots and which agents and institutions should bear this burden is still an open question. The European Union's recent report (2015/2103 (INL)) issued recommendations on the subject, proposing not only mandatory registration, but also the creation of insurance and funds. According to the European Parliament, insurance could be taken by both the consumer and the company in a similar model to those used by the car insurance. The fund could be either general (for all autonomous robots) or individual (for each category of robot), composed of fees paid at the time of placing the machine on the

Regarding the legal status that could be given to these agents, the resolution uses the expression “electronic person” or “*e-person*”. In addition, in view of the discrepancy between ethics and technology, the European proposition rightly states that dignity, in a deontological bias, must be at the centre of a new digital ethics.

The attribution of a legal status to intelligent robots, as designed in the resolution, it is intended to be one possible solution to the legal challenges that will arise with the gain of autonomy of intelligent Things. The European Parliament’s report defines “intelligent robots” as those whose autonomy is established by their interconnectivity with the environment and their ability to modify their actions according to changes.

With the purpose of building upon this discussion, the Israeli researcher Karni Chagal performs the analysis on robot autonomy to help us differentiate the potential of responsibility in each case. To Chagal, to resolve the liability issue, it is crucial to think on different levels of robot’s autonomy (Chagal, 2018). Nevertheless, she is aware that given the complexity of the artificial intelligence systems, the classification is difficult to implement, since the autonomy is not a binary classification.

Two possible metrics raised for assessing autonomy are the freedom of action of the machine for the human being and the capacity of the machine to replace human action. Such metrics are branched and complex with several possible sub-analyses and, according to Chagal, these tests should also consider the specific stage of the machine decision-making process (Chagal, 2018).

To illustrate, Chagal designed the following table (hereunder), with a metric showing the possibility for machines to substitute

market, and / or contributions paid periodically throughout the life of the robots. It is worth mentioning that, in this case, companies would be responsible for bearing this burden. Despite this proposal, however, the topic continues open to debate, with new alternatives and more interesting models - such as private funds, specific records, among other possibilities - that will not be the subject of a deep analysis in this thesis.

humans in complex tasks and analyzing also the decision-making capacity of the machine (Chagal, 2018). The more machines get closer to a “robot-doctor” stage, the more reasonable it would be to attribute new forms of accountability, liability, rights or even an electronic personhood.

	Roomba robot	Autopilot	Autonomous vehicle	Robo-doctor
Success rates not measurable?				
Responsible for more than 2 OODA loop stages?			+	+
Independently selects type of info to collect?			?	+
Independently selects sources of info to collect from?				+
Dynamic nature of sources of info?				+
Replaces professionals in complex fields?		?	?	+
Life and death nature of decisions?		+	+	+
Real time decisions required?		+	+	?

One criteria used by Chagal is the OODA [observe-orient-decide-act] cycle.²⁸ Since the analysis of autonomy is complex, Chagal states that we should observe the characteristics of different decision-making systems. These systems manifest themselves in four different stages, according to the OODA cycle, affecting different justifications for liability concerning machines. These four points are: (i) Observe: collect current information from all available sources; (ii) Orient: analyze the information collected and use it to update its reality; (iii) Decide: decide the course of action; (iv) Act: implement its decision.

Considering the stages of the OODA cycle used by Chagal, the more the characteristics of the system are analogous to traditional products/things, the greater the possibility of being embedded in the logic of consumer law. However, advanced robots and algorithms, because of their specific characteristics, might be classified differently from traditional consumer products and, therefore, needing a differentiated treatment and responsibility perspective.

The parameters for assigning responsibility under consumer law are defined and precise. However, as the complexity of systems increases, in the case of ‘doctor robots’, for instance, as an specific example brought in the study, the number of scenarios and justification for assigning responsibility depends on several factors. The doctor robots’ example corresponds to the last stage of autonomy thought by Karni Chagal, in which algorithms of reasoning are programmed capable of replacing the human being in highly complex activities, like medical activities of diagnosis and surgery.

In order for the degree of autonomy-based responsibility to be measured, one should consider the size of the parameter matrix that the algorithm judges before the final decision-making and how much of that decision was decisive for the damaging outcome. It is

²⁸ OODA means the “*observe-orient-decide-act*” orientation cycle, a strategy developed by military strategist John Boyd to explain how individuals and organizations can win in uncertain and chaotic situations.

necessary to consider that the more stages of OODA a system is able to operate, the greater the unpredictability of the manufacturer on the decisions taken by Artificial Intelligence (Magrani, Viola, and Silva, 2019).²⁹

In the case of the robot doctor, for instance, it is up to the machine to decide to what extent it should consider the medical history of the patient and the more independent of human action these decisions are, the further the human responsibility will be. On the contrary, it would be possible to program the machine in such a way as to consult a human being whenever the percentage of certainty for a decision-making is below a certain level, but the establishment of such issues would also imply an increase in the responsibility of the manufacturer (that should also be based on a deontological matrix type). The limit of action of the machine will be determinant in the continents aspects to the responsibility, and dependent on the ethical vision adopted (Magrani, Viola, and Silva, 2019).

Although our technology has not yet developed robots with sufficient autonomy to completely replace the human being in very complex tasks, such as the case of doctor robots, specialists envision, in the near future, a moment when this autonomy will be possible and, when that moment arrives, we should have theoretical mechanisms to implement this type of attribution of responsibility, but in order not to provoke a chilling effect on technological innovations.

For the time being, the responsibility should be attributed to the manufacturer, according to the consumerist logic. Nevertheless, considering the possibility of robots reaching more independence with respect to humans, fulfilling the four stages of OODA, the aforementioned logic of accountability of the consumer chain may

²⁹ Parts of this subsection were built upon a recent and unpublished work of the author, in co-authorship (Magrani, Viola, and Silva, 2019), and cited here to bring an updated vision of the author in dialogue with other recent publications.

not be applicable. That would arise the need to assign rights and even eventually even a specific personality to smart robots with high autonomy level, besides the possibility of creating insurance and funds for accidents and damages involving robots.

Because we are not yet close to a context of substantial or full robotic autonomy, such as a 'strong AI' or 'general artificial intelligence', there is a strong movement against the attribution of legal status to them. Recently, over 150 experts in A.I., robotics, commerce, law, and ethics from 14 countries have signed an open letter denouncing the European Parliament's proposal to grant personhood status to intelligent machines.³⁰ The open letter suggests that current robots do not have moral standing and should not be considered capable of having rights.

However, as computational intelligence can grow exponentially, we should deeply consider the possibility of robots gaining substantial autonomy over the next years, demanding a real need for the attribution of rights.

Considering the myriad of possibilities, the Italian professor and researcher Ugo Pagallo states (Pagallo, 2018):

30 The characteristics most used for the foundation of the human personality are: consciousness; rationality; autonomy (self-motivated activity); the capacity to communicate; and self-awareness. Another possible social ^{crit}erion is to be considered a person whenever society recognizes thus recognises one (we can even apply the Habermasian theory here, through a deliberative process in the public sphere). Other theorists believe that the fundamental characteristic for the attribution of personality is sensibility, which means the capacity to feel pleasure and pain. The legal concept of a person is changeable and is constantly evolving. For example, Afro-descendants have once been excluded from this category, at the time of slavery. Therefore, one cannot relate the legal concept of a person to *Homo sapiens*. A reservation is necessary at this point because even if robots can feel and demonstrate emotions as if they were sensuous, the authenticity of these reactions is questioned since they would not be genuine, but at most a representation (or emulation), analogous to human actors when they simulate these emotions in a play, for example, feelings in certain roles, not being considered by many as something genuine. Because of this, the Italian jus-philosopher Ugo Pagallo calls this 'artificial autonomy'.

Policy makers shall seriously mull over the possibility of establishing novel forms of accountability and liability for the activities of AI robots in contracts and business law, e.g., new forms of legal agency in cases of complex distributed responsibility. Second, any hypothesis of granting AI robots full legal personhood has to be discarded in the foreseeable future. (...) However, the normative reasons why legal systems grant human and artificial entities, such as corporations, their status, help us taking sides in today's quest for the legal personhood of AI robots.

One of the important features to consider is the learning speed and individual evolution of the robot (based on data processing and deep learning), which may represent in some cases the infeasibility of an educational process, thus limiting its moral and legal liability. But how could one punish a robot? It could not be as simple as “pulling the plug”. In this case, there are two viable options: rehabilitation and indemnification. The first would involve reprogramming the guilty robot. The second would be to compel the same to compensate the victim for the damage caused. In such a context, the European resolution is relevant. The proposition in assigning a new type of personhood, an electronic one, considering the characteristics of intelligent Things, coupled with the idea of compulsory insurance or a compensatory fund can be an important step.

The new European proposal reflects, therefore, a practical and prompt response to the previously mentioned problem of “distributed irresponsibility”, which occurs when there is no clear connection between an agent and the harm generated (unclear causal nexus between agents and damages).

In view of a causal nexus that cannot be identified directly, for some scholars, we can infer its presumption from the economic group,

making it possible to repair the damages caused by facilitating the burden of proof for the victim. However, when we think of the damages that can occur within complex socio-technical systems, we can have an unfair or unassured application of the causal nexus and legal liability. This is because we are often talking about the action caused by a sum of agencies of human beings, institutions and intelligent things with autonomy and agency power of their own. In this case, the focus on the economic group, despite being able to respond to several cases of damages, may not be sufficient for the fair allocation of liability in the artificial intelligence and internet of things era.

Therefore, as a pragmatic response to this scenario of uncertainty and lack of legal appropriateness, the European proposal suggests that in case of damages the injured party may either take out the insurance or be reimbursed through the compensatory fund linked to the intelligent robot itself.

Besides the concern that this legal arrangement must not lead to a convenient tool for companies and producers to disproportionately set aside its responsibility before users and consumers, this step should be closely followed by a continuous debate on the ethical principles that should guide such technical artifacts. Furthermore, this discussion must be coupled with an adequate governance of all the data used by these agents. In observance of these factors, the recommendation is that the development of these intelligent artifacts should be fully oriented by the previously described values, such as: (i) fairness; (ii) reliability; (iii) security (iv) privacy and data protection; (v) inclusiveness; (vi) transparency; and (vii) accountability.

8. Governing Intra-action With Human Rights And Design

One point worth considering in this context is that flaws are natural and can be considered even desirable for the faster improvement of a technical artifact. Therefore, a regulatory scenario

that would extinguish all and any flaws or damages would be uncalled for. AI-inspired robots are products with inherently unforeseeable risks. “The idea of avant-garde machine learning research is for robots to acquire, learn, and even discover new ways of interactions without the designer’s explicit instruction. The idea of artificial general intelligence (which is admittedly looking far into the future) is to do so even without any implicit instruction” (Yi, 2018). Therefore, we could say that those technologies are “unforeseeable by design”.

From a legal standpoint, it is fundamental to keep in mind the new nature of a diffused liability, potentially dispersed in space, time and agency of the various actants in the public sphere. In that sense, we need to think about the context in which assumptions on liability are made. The question that is presented to us is not only how to make computational agents liable, but how to reasonably and fairly apply this liability.

The idea of a shared liability between the different agents involved in the sociotechnical network seems a reasonable perspective, requiring, in order to attribute a fair liability to each one, the analysis of their spheres of control and influence over the presented situations and over other agents (humans and non-humans), considering their intra-relation (intra-action) (Barad, 2003).

However, we are still far from obtaining a reasonable consensus³¹ on the establishment of appropriate legal parameters for the development and regulation of intelligent Things, although we already see many advancements concerning ethical guidelines.

These agents can influence relationships between people, shaping behaviors and world views, especially and more effectively when part of their operation have technological complexity and different levels of autonomy, as it happens in the case of artificial

31 In the present article, it is argued that the consensus must be constructed according to Jurgen Habermas’s proposal, that is, through dialectical conflicts in the public sphere.

intelligence systems with the capacity of reasoning and learning according to *deep learning* techniques in artificial neural networks (Amaral, 2015).

In view of the increasing risks posed by the advance of techno-regulation, amplified by the dissemination of the 'Internet of Things' and artificial intelligence, the rule of law should be seen as the premise for technological development, or as a meta technology, which should guide the way technology shapes behavior rather than the other way around - which often results in a violation of human and fundamental rights.

For law to act properly as a meta technology, it must be backed by ethical guidelines consistent with the age of hyperconnectivity. In this sense, it is necessary to understand the capacity of influence of the non-human agents, aiming to achieve a better regulation, especially for more autonomous technologies, thinking about preserving the fundamental rights of individuals and preserving the human species.

The law, backed by an adequate ethical foundation, will serve as a channel for data processing and other technological materialities avoiding a techno-regulation harmful to humanity. In this new role, it is important that the law guides the production and development of Things (technical artifacts) in order to be sensitive to values, for example, regulating privacy, security and ethics by design. In a metaphor, law as meta technology would function as a pipeline suited to the digital age, through which all content and actions would pass.

With technology moving from a simple tool to an influencing agent and decision-maker, law must rebuild itself in the techno-regulated world, incorporating these new elements from a meta-perspective (as a meta-technology), building the normative basis to regulate the ethics of new technologies through design. To do so, we must enhance and foster human-centered design models that are sensitive to constitutional values (*value-sensitive design*).

Governing A.I. with the mentioned ethical principles (fairness; reliability; security; privacy; data protection; inclusiveness; transparency; and accountability) and the “by design” technique is an important step to try to follow the pace of technological innovation, at the same time as trying to guarantee the effectiveness of the law.

Conclusion

It is evident that these intelligent artifacts are consistently exerting more influence in the way we think and organize ourselves in society and, therefore, the scientific and legal advance cannot distance itself from the ethical and legal issues involved in this new scenario.

In that sense, new ontological and epistemological lenses are needed. We need to think about intelligent Things not as mere tools but as moral machines that interact with citizens on the public sphere, endowed with intra-acting agencies, entangled on sociotechnical systems.

Legal regulation, democratically construed in the public sphere, should provide the architecture for the construction of proper legal channels so that non-human agents can act and be developed within the prescribed ethical limits. To design adequate limits for the A.I. era, we must recognize Things as agents, based on a post-humanist perspective, but with a human rights’ based approach to guide its development.

Certainly, the reasons to justify an *electronic personhood* are not there yet. Nevertheless, since computational intelligence can grow exponentially, as well as their level of interaction on our daily lives and the connected public sphere, with the gain of new stages of autonomy, we must inevitably think about the possibilities of establishing new forms of accountability and liability for the activities of A.I., including the possibility of attributing rights, subjectivity and even an *e-personhood* in the future.

The granting of an electronic personality is the path suggested by the European Parliament for smart robots and we cannot reject this recommendation, as a future regulation, since there is a possibility that it can be necessary, depending on the degree of autonomy conferred on A.I.s, as explored in this work. Such construction, however, is not immune to criticism, notably as regards the comparison between an A.I. and a natural person.³²

As evidenced, the discussion about ethics and responsibility of artificial intelligence still navigates murky waters. However, the difficulties arising from technological transformations of high complexity cannot prevent the establishment of new regulations that can reduce the risks inherent in new activities and, consequently, the production and repair of damages (Magrani, Viola, and Silva, 2019). The exact path to be taken remains uncertain. Nevertheless, it is already possible to envision possibilities that can serve as important parameters. In the wise words of the Italian philosopher Luciano Floridi: “The new challenge is not technological innovation, but the governance of the digital”.

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32 Such criticism, however, can be overcome by instruments already available on legal regulation. The recognition that the A.I. expresses a centre of interests would already be more than sufficient to admit that it has subjectivity and therefore deserving at least some rights. Nothing would prevent the granting of subjectivity to A.I.s as a mid-term regulation and leaving the path open for a future grant of an effective e-personality depending on the degree of autonomy (based on a matrix type). As an initial measure, it would play an important role in guaranteeing the reparation of victims, avoiding a scenario of ‘distributed irresponsibility’.

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The Role Of Error In Machine Learning And The Law: Challenges And Perspectives

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Abstract

Error is a key element in machine learning, as every modern widely used machine learning algorithm performs some task to minimize - and not to nullify - a loss function, which basically measures the difference between the output of the predictive model and the function it tries to approximate. In that sense, machine learning algorithms, as they are today, will always make mistakes, even with large well-constructed datasets. This limitation, by itself, poses a challenge for lawmakers and jurists, as it may influence regulatory efforts or the possible usage of automated systems in real-life applications that may impact the legal field.

Keywords

Machine learning. Statistical learning theory. Law.

Introduction

From the early days of the Perceptron, through Backpropagation and Statistical Learning Theory, the error has been a key concept in machine learning literature. According to Tom Mitchell (1997), “Machine Learning is the study of computer algorithms that improve automatically through experience.”. It is a subfield of a much broader discipline known as artificial intelligence. Three main learning problems, that encompass a large spectrum of applications, are pattern recognition, regression estimation and density estimation (VAPNIK, 1999).

In this work, we approach learning from an optimization perspective (MITCHELL, 1997): learning is viewed as optimizing an objective function, typically associated with an error measurement, also known as a loss function. The loss function is a measurement of the difference between the output of the model and the function which we try to approximate (VAPNIK, 1999). A learning algorithm such as a neural network typically learns in epochs using a technique called gradient descent (or one of its many variations): for each iteration of the algorithm, the parameters (or neurons) of the neural network are changed in a direction (the opposite direction of the gradient, hence the name) that minimizes the loss function (HAYKIN, 2007).

When it comes to addressing *machine learning* from a legal perspective, legal literature tends to treat it either from a regulatory perspective, an approach that is probably influenced by the relevance given to Data Protection laws and regulations in the last few years, or from a “potential use in legal contexts” perspective.

Those who address the issue from the regulatory viewpoint are usually interested in how it is possible to legally regulate the use of machine learning models, discussing topics such as the impacts machine learning models may have on individuals’ rights (RASO et al., 2018), the difficulties in explaining them (and possible solutions) and

the possibilities of holding developers or companies accountable for decisions made based on their outcome (ROBERTO, 2020; TEPEDINO and SILVA, 2019), among other possible topics.

On the other hand, works that address machine learning from a “potential use in legal contexts” point of view are mainly concerned with the possibilities of using machine learning techniques in Law-related issues, aiding or even substituting professionals such as lawyers, judges, prosecutors and public officials. In this sense, it is worth mentioning the growing field of jurimetrics, which has been increasingly addressed by Brazilian legal researchers (MAIA and BEZERRA, 2020). Sometimes, this second approach overlaps with the first one.

In either case, errors that are inherent to algorithms covered by the term *machine learning* seem to be an overlooked topic, at least in Brazil, which, we argue, may lead to excessive optimism or pessimism in legal literature. In that sense, this work intends to contribute to the understanding of how error plays a key role in machine learning models, which, we believe, should impact the way legal literature and legal regulations address the matter.

It is worth mentioning that it is somewhat common for legal texts to address errors in machine learning, but from a very different perspective. Many recent researchers, certainly influenced by the growing field of fairness in machine learning, have been investigating mistakes in the context of explainability or accountability of automated decision-making systems (WACHTER et al., 2018; MORSE, 2019; DOSHI-VELEZ and KORTZ, 2017).

Even though these works are indeed very important, our aim is not to discuss ways to reduce mistakes or to explain decisions that could affect individuals. Nor is it to draw a regulatory framework applicable to artificial intelligence systems. What we do intend is to address the following question: how will the Law deal with the fact

that machine learning models will *always* make some mistakes, as error is a key subject in machine learning theory?

2. Statistical Learning Theory

Learning can be viewed as solving a function approximation problem (VAPNIK, 1999). An appropriate approximate function must be found, that is capable of approximating the behavior of a given function of interest. However, for finite datasets, there are infinite possible solutions.

The Statistical Learning Theory was developed by Vapnik and Chervonenkis and it builds a mathematical framework that allows a rigorous treatment of one of the main questions that machine learning scientists have to answer: ‘what is a good machine learning model?’ (VAPNIK, 1999; SCHÖLKOPF et al., 2002).

Some of the key concepts introduced by the Statistical Learning Theory are the Risk, the Empirical Risk and the Structural Risk. A more in-depth discussion of these concepts is beyond the scope of this work and the reader is referred to the work of Vapnik (1999) for definitions and proofs. However, an understanding of the concept of Risk and Empirical Risk is necessary for the following sections of this paper.

First, consider a typical machine learning training pipeline. For a given task, data is collected and preprocessed; it is then fed into a model, which learns from it; and, finally, the trained model is employed on unseen data.

In this case, the Risk would be the expected value for the loss when the model is applied on unseen data and the Empirical Risk would correspond to the loss calculated only on the training dataset (SCHÖLKOPF et al., 2002).

If one knew how to precisely compute the Risk, the best possible model would be obtainable, and performance on unseen data

would be maximum. However, training is limited to a finite amount of examples, which only allow the optimization of the Empirical Risk, which can converge, under some specific circumstances, to the real Risk (VAPNIK, 1999).

In that sense, the goal of *machine learning* is to find a model in which the Empirical Risk (which we can calculate) and the real Risk (which we cannot know for sure and can only estimate) are close to each other and are both low.

It is important to observe that, even when minimizing the real Risk, there is no way of guaranteeing a model with zero error in real-world applications. This result can be easily explained when the error decomposition (GEMAN et al., 1992) is performed, which results in three terms:

Bias and Variance are values that depend on the model and can be zeroed by a hypothetical perfect model; the irreducible error, however, as its name suggests can not be reduced, as it comes from noise and imprecision inherent to measurements.

3. Discussion

As we have discussed so far, the *error* appears in machine learning not only as an undesired effect of dataset limitations or poorly implemented machine learning algorithms, but as a fundamental concept in the way they function. Most major modern machine learning techniques rely on some form of error minimization, which is not the same as error nullification.

Systems that have empirical error equal to or very close to zero in the training set (i.e. the slice of the dataset used for training a machine learning model) may suffer from a problem called *overfitting*, which, in very general lines, happens when a model performs very well on - and *only* on - the data it has already seen (DIETTERICH, 1995). That means that even though a model may make very few or no

mistakes during its development, if it suffers from overfitting, it will behave poorly when it comes across previously unseen data, which is the whole point of using machine learning in the first place. A good model should, thus, generalize well, which implies accepting some degree of error.

Needless to say, machine learning models may be better or worse depending on the way they are implemented and on the quality of the data used for training them (EUROPEAN UNION AGENCY FOR FUNDAMENTAL RIGHTS, 2019). However, regardless of how good one dataset or algorithm may be, the fact is current state-of-the-art machine learning techniques will still make mistakes.

Given that, there is simply no way to guarantee a machine learning model will make no mistakes, and that poses a serious issue especially considering their outcome may not be fully understandable or explainable.

Model interpretability is desired in all applications of machine learning, but even more so in applications that involve human beings. Models with higher interpretability, however, tend to lack the capacity to treat complex problems. They are usually models with high bias, that lead to high error values when applied (MOLNAR, 2020).

That is not to say that a simpler, more interpretable model such as a decision tree or a linear regression should never be applied. Those models are perfectly capable of giving state-of-the-art solutions when applied to the correct classes of problems.

There are, however, problems that cannot be adequately solved by simple machine learning algorithms. More complex methods are needed and there is a significant decrease in terms of interpretability. The most famous example of non-interpretable black boxes are deep neural networks. Those neural networks are capable of astonishing results in areas such as image and sound processing, as well as natural language processing. They are composed of millions and millions of

parameters and it is really hard to understand the reasons for a given output, or the contribution of a subset of their neurons.

Even though an increasing number of studies on fairness, explainability, interpretability and transparency in machine learning has been done in recent years and are still being conducted by researchers from different areas, with some very interesting proposals³³, the fact is there is simply no current way of guaranteeing a machine learning model will not make mistakes in data it has not yet seen.

Even if the error of a certain machine learning model is very low, it is still possible that it makes many more mistakes than previously expected. Say, for example, that a certain model, during its training, makes 99,5% of its predictions correctly, meaning that, during its testing, it only makes mistakes in 0,5% of the cases - which is quite good for many tasks. When applied in the real world, with data it has never seen before, it is not possible to say, for sure, that those percentages will stay unchanged. In practice, it is perfectly possible that that same algorithm starts making more mistakes, say, with 2% or 3% likelihood.

Furthermore, machine learning algorithms are trained to minimize a loss function in a specific finite dataset, meaning that machine learning models, as accurate or well programmed as they may be, are not capable of interpreting deviant or new behavior that may affect the issue for which they were created in the first place. As a consequence, even if the error presented by the model during its development is very low, it will have no use if the correlations between the variables in its dataset are not present in a given new situation that presents itself to the system.

Nonetheless, there is a broader (and perhaps more philosophical) problem when it comes to the way machine learning

³³ For a very good example in this matter, refer to WACHTER et al. (2018). Their text provides an interesting discussion on the possibility of using counterfactual explanations in the context of the European General Data Protection Regulation (GDPR).

algorithms work. When it comes to models that somehow use information relating to human beings, training is always done with data about specific persons, i.e., to a group of people whose data is present in the dataset. However, such models may be used to make individual decisions that impact persons that are not part of that specific group. In that sense, it is possible to ask whether (and in which cases) certain patterns and correlations identified by an algorithm in a dataset restricted to a group of people should be used to make individual decisions for others.

As a matter of fact, machine learning techniques have many other limitations (MALIK, 2020) that are not addressed by this article and that should also be taken into account by anyone who intends to use, study or regulate them.

4. Conclusion

Machine learning techniques are not fail-proof and are still very limited for several applications, including the legal field. We are yet very far away from the development of a system that could, for example, substitute lawyers and judges, especially - but not only - in tasks that have particularities making them essentially different from previous ones.

The acknowledgment that machine learning algorithms have limitations and will inherently make mistakes is important to lower some expectations with the field and may pose some interesting questions to be addressed by jurists, practitioners and law-makers in their respective fields.

For instance, instead of immediately asking whether or not it is possible to use or to improve a machine learning technique for some specific task (with or without legal implications), it may be interesting to ask if, how and to what extent we *should* use them, considering all their limitations.

Furthermore, when addressing situations in which individuals are subject to decisions made by automated systems, the possibility of an error should always be taken into consideration, as there is no current way of eliminating it.

We do not intend to address the issue presented here entirely, but only to initiate a discussion that undoubtedly needs further investigation in future research.

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Ai And Legal Personhood: Perspectives In Brazilian Corporate Law

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Abstract

This article is focused on the impact of Artificial Intelligence (AI) on the legal sector. The first part is dedicated to making general points about AI. To face the new challenges, in Europe, the discussions are moving in the direction of granting legal personhood to AI. In the second part, Prof. Shawn Bayern's theory emerges as an alternative. According to him, it is possible to use an American LLC to encapsulate autonomous systems, letting them act juridically through this legal entity. In the sequence, Bayern's proposition is analyzed from the perspective of Brazilian LLC law, showing that the pace of technological innovations will soon lead to similar legal structures in Brazil.

Keywords

Corporate Law; Artificial Intelligence; Legal Personhood.

Introduction

The technological advances in the last few decades are unprecedented. As law is a mirror of society, even though a distorted one, it is undeniable that the technological revolution somehow impacts on legal structures. The increasing use of Artificial Intelligence (AI), both in the daily life of common people and in commercial transactions, probably is one of the most crucial points of this process.

Since AI represents the capability of a machine to mimic the rationality of a human being³⁴, it (AI) creates a deep moral and juridical conundrum about what should or should not be its legal *status*.

This article is dedicated to analyzing this legal issue. Nonetheless, assuming that the ethical, constitutional and public law debate about AI is not well developed, this study is focused on a very circumscribed problem: from the perspective of Brazilian law, can AI somehow act juridically without the need of a legal reform?

In the sequence, the path to the answer is presented.

2. General Considerations About Ai And The Law

Before thinking about the legal implications of AI arrival, it is necessary to comprehend its concept, to avoid fighting windmills as if they were giants, using Cervantes's metaphor. Yunhe Pan argues that the classic concept of AI was established more than sixty years ago, in 1956, in a conference held in Dartmouth College (USA). This conference was attended by the most famous scholars of Information Theory then, such as J. McCarthy, M. L. Minsky, H. Simon, A. Newell and C. E. Shannon. According to them, Artificial Intelligence could be

³⁴ This rationality is precisely the fundamental characteristic of a person in order to exercise rights and to be subject of obligations in accordance with private law tradition. (WEINRIB, Ernst. J. *The Idea of Private Law*. 2 ed. Oxford: Oxford University Press, 2012).

defined as “*the ability of machine understand, think and learn in a similar way of human beings*”³⁵.

From that conference on, too many things have changed. After the initial fuzz about the topics discussed over there, studies about AI did not cause the expected impact until the beginning of the XXIth Century. The massification of the internet provided a sufficient amount of data needed for autonomous machine learning through network data-crossing³⁶. As described by Yunhe Pan, the AI, interacting with *big data*, has become “AI 2.0”. It still can be conceptualized as “*the ability of machine understand, think and learn in a similar way of human beings*”³⁷, but now AI is qualified and potentialized by the infinitude of data and possibilities of hyperconnected reality³⁸.

In a more analytical approach, Gabriel Hallevy identifies the attributes required for an entity to be considered intelligent. In consonance with this author, there are five attributes that could be enlisted: communication, internal knowledge, external knowledge, goal-driven behavior and creativity. Hallevy explains the meaning of these attributes in his text *The Criminal Liability of Artificial Intelligence Entities - from Science Fiction to Legal Social Control*³⁹. Summarizing

35 PAN, Yunhe. Heading toward artificial intelligence 2.0. *Engineering*, Pequim, n. 2, p. 409-413, 2016. p. 410.

36 PAN, Yunhe. Heading toward artificial intelligence 2.0. *Engineering*, Pequim, n. 2, p. 409-413, 2016.

37 PAN, Yunhe. Heading toward artificial intelligence 2.0. *Engineering*, Pequim, n. 2, p. 409-413, 2016. p. 410.

38 PAN, Yunhe. Heading toward artificial intelligence 2.0. *Engineering*, Pequim, n. 2, p. 409-413, 2016.

39 “There are five attributes that one would expect an intelligent entity to have. The first is communication. One can communicate with an intelligent entity. The easier is to communicate with an entity, the more intelligent the entity seems. One can communicate with a dog, but not about Einstein’s theory of relativity. [...] The second is internal knowledge. An intelligent entity is expected to have some knowledge about itself. The third is external knowledge. An intelligent entity is expected to know about the outside world, to learn about it, and utilize the information. The fourth is goal-driven behaviour. The fifth is creativity. An intelligent entity is expected to have some degree of creativity”. (HALLEVY, Gabriel. *The criminal liability of artificial intelligence entities - from science fiction to legal social control*. *Akron Intellectual Property Journal*,

the author's key ideas, an AI could be understood as a machine that, especially through big data, can communicate, knows itself, knows the world, pursues goals and creates, behaving like human beings.

Once the theoretical departure is explained, the assumption that AI is today a reality is obvious. In fact, AI is present in the internet of things, autonomous cars, medical diagnosis systems, stock exchange, drones, maps, social media, along with others⁴⁰. What was considered eccentricity a few years ago, more suitable to science fiction, today is noticed in every detail of daily life, something common. This technological innovation raises some legal issues which cannot be ignored by legal professionals (scholar or practical). The multiplication of AI uses in everyday business, mainly in the market, poses new challenges for the law.

To illustrate the variety of legal problems concerning the use of AI, some stories are worth telling. In 1981, in Japan, a worker of a motorcycle industry was killed by an AI robot who thought the man was a threat to its mission. In 2015, a German worker was killed in similar circumstances in an electric motors' producing line. The reasons for the AI violent behavior remain unknown. In 2016, a semi-autonomous vehicle was involved in a fatal accident, even though the investigation ended up not implying that the AI system was responsible for the tragedy. In the same year, in California, a security robot in a shopping center has accidentally stumbled into a toddler, hurting it slightly⁴¹. As can be seen, juridical concerns about AI are no longer a far-fetched Asimov's romance.

Akron, vol. 4, iss. 2, 2010. p. 6).

40 For an overview of the multiple uses of AI daily: SOUZA, Carlos Affonso Pereira de; OLIVEIRA, Jordan Vinícius de. Sobre os ombros de robôs? A inteligência artificial entre fascínios e desilusões. In: FRAZÃO, Ana; MULHOLLAND, Caitlin. *Inteligência artificial e direito: ética, regulação e responsabilidade*. São Paulo: Revista dos Tribunais, 2019.

41 Those cases are narrated in: CHAVES, Natália Cristina. *Inteligência Artificial: os novos rumos da responsabilidade civil*. In: GONÇALVES, Anabela Susana de Sousa *et al.* (Coords.). *Direito civil contemporâneo*. Braga: CONPEDI, 2017. p. 68.

With the objective of addressing this problem, especially regarding damages caused by AI functioning (civil liability), the European Parliament has recently recommended the Commission of Civil Law Rules on Robotics to study granting legal personhood to certain types of AI⁴². This proposition of creating somehow a *sui iuris* kind of e-person, nonetheless, raises a series of ethical implications, which were severely criticized by some scholars. According to them, the recommendations are a big step to solve what they consider, until now, minor legal issues⁴³.

3. Bayern's Proposition On Using Llc To de Facto Personalizing Ai

As the European directives tend to solve liabilities' problems by creating a new hypothesis of legal personality, the e-person, another way of dealing with the problem, with less ethical conundrum, could be considered: using corporate law to *de facto* empower AI to act juridically. This is exactly the proposition of Prof. Shawn Bayern, expressed in his article called *The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems*, which was published in 2015 in *Stanford Technology Law Review*⁴⁴.

Bayern starts his analysis by pointing out that in American law AI formally lacks legal personhood. Notwithstanding, it is undeniable, the author remarks, that artificially intelligent mechanisms are

42 EUROPEAN PARLIAMENT. *Resolution of 16 February 2017 with recommendations to the commission on civil law rules on robotics*. Brussels, 2017.

43 The creation of an e-person was harshly criticized by the Portuguese Scholar Mafalda Miranda Barbosa in her article: BARBOSA, Mafalda Miranda. *Inteligência Artificial, e-persons e direito: desafios e perspectivas*. *Revista Jurídica Luso-Brasileira*, Lisbon, y. 3, n. 6, pp. 1475-1503, 2017.

44 This section of the article is a summary of the insights registered in: BAYERN, Shawn. *The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems*. *Stanford Technology Law Review*. Palo Alto, iss. 19, p. 93-112, 2015. Information or insights diverse of this source will be directly referenced in notes.

physically capable of making decisions, performing actions, and so on. In his line of thoughts, considering AI a legal person is not a matter of physical impossibility, but only a question of legal recognition.

The fact that American law has not expressly granted legal personhood to AI does not implicate, though, that autonomous decision-making entities cannot *de facto* operate legally in a similar way as corporations do. At least in the realms of Private Law, this is true. AI can, *de facto*, by its own decisions (and, as long as it could be conceived, by its own “will”) make promises, accept proposals and, in this process, acquire property. All that AI needs is a legal receptacle to encapsulate it, a role that a corporation could play. To be more specific, in American corporate law, a Limited Liability Company (LLC) could be used for this purpose⁴⁵.

American corporate law was traditionally strict in legal terms. That’s why Bayern refers to LLC regulations as “*modern business-entity law*”. The legal landscape changed. The Uniform Limited Liability Company Act (ULLCA), first edited in 1994, has gathered legal provisions concerning LLC from different American States in the late XXth Century. In 2006, another effort was made, focused on the purpose of standardizing States’ law, turning LLC regulations more flexible⁴⁶. The new version of LLCA has been called RULLCA and the latest adjustments were done in 2013.

To avoid misunderstandings, it is important to remark that uniform acts are not laws *stricto sensu*, but uniformization models designed by a commission of notorious jurists to inspire States’ laws to endorse it⁴⁷. In the US, differently from Brazil, where a federal law

45 It is important to clarify that Prof. Bayern’s strategy was based on the provisions of RULLCA and not on any American State’s legislation.

46 UNIFORM LAW COMMISSION. *Prefatory Note to ULLCA (2006)*. Chicago, 2006.

47 PARENTONI, Leonardo Netto; GONTIJO, Bruno Miranda. Competência legislativa em Direito Societário: Sistemas brasileiro, norte-americano e comunitário europeu. *Revista de Informação Legislativa*, Brasília, y. 53, n. 210, p. 239-265, apr./jun. 2016. p. 245.

regulates in a uniform manner the terms of Brazilian LLC, this field is occupied by States, which have their own laws. Concerning the RULLCA, till recently it was internalized only by 19 of the 50 US States. Despite this fact, the advantage of the LLC models points out to its fast expansion to the remaining States⁴⁸. That's why, with regards to comparative law, using RULLCA as a standard for LLC regulations in the US is more accurate than using a specific law from an American State.

Essentially there are two documents related to LLC formation. The first one is the certificate of organization, or the articles of organization. It is the filing document for an LLC. It includes the mandatory clauses for an LLC according to the applicable State's law. The second one is the operating agreement, which is the “*foundational contract among the entity's owners*”⁴⁹, a creature of contract. By this model, the company's members are free to customize the LLC's terms. More than that, the flexibility of the operating agreement in RULLCA made it even possible for the members to determine that all the functioning features of an LLC could be undertaken by an AI. At least, it is Prof. Bayern's understanding.

The author himself recognizes that, in a first moment, the AI needs a human being or a recognized legal person to file the papers and draw the operating agreement for the LLC. But from that moment on, since the LLC is legally constituted, the founding member could step out of the company and by translating the provisions of the operating agreement into an algorithmic language, the AI could keep operating autonomously.

Bayern sustains that an AI could be “*encapsulated*” by an LLC under US uniform law according to the following steps:

48 PARENTONI, Leonardo Netto. Sociedade limitada: algumas das principais diferenças entre as legislações brasileira e estadunidense. *Revista Opinião Jurídica*, Fortaleza, y. 17, n. 24, p.72-98, jan./apr. 2019. p. 74.

49 UNIFORM LAW COMMISSION. *Prefatory Note to ULLCA (2006)*. Chicago, 2006. p. 2.

(1) an individual member creates a member-managed LLC, filing the appropriate paperwork with the state; (2) the individual [...] enters into an operating agreement governing the conduct of the LLC; (3) the operating agreement specifies that the LLC will take actions as determined by an autonomous system [...]; (4) the individual transfers ownership of any relevant physical apparatus of the autonomous system to the LLC; (5) the sole member withdraws from the LLC, leaving the LLC without any members⁵⁰.

Bayern concludes, then, that after these measures have been taken, “[t]he result is potentially a perpetual LLC — a new legal person — that requires no ongoing intervention from any preexisting legal person in order to maintain its status”⁵¹.

According to Bayern, the provision of RULLCA’s §701 (a)(3)⁵², which provides that if an LLC lacks members for the time-lapse of ninety days it must be extinguished, is not an obstacle to his proposition. This rule, the author argues, is not mandatory, but merely a default rule to be used only if the operating agreement is silent concerning the period that an LLC could operate without members. *Ex positis*, Bayern sustains that nothing positively determined in RULLCA could be an impeditive to the use of LLC as a recipient for AI to act juridically.

50 BAYERN, Shawn. The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems. *Stanford Technology Law Review*. Palo Alto, iss. 19, p. 93-112, 2015. p. 101.

51 BAYERN, Shawn. The Implications of Modern Business-Entity Law for the Regulation of Autonomous Systems. *Stanford Technology Law Review*. Palo Alto, iss. 19, p. 93-112, 2015. p. 101.

52 SECTION 701. EVENTS CAUSING DISSOLUTION. “(a) A limited liability company is dissolved, and its activities and affairs must be wound up, upon the occurrence of any of the following: [...] (3) the passage of 90 consecutive days during which the company has no members unless before the end of the period: (A) consent to admit at least one specified person as a member is given by transferees owning the rights to receive a majority of distributions as transferees at the time the consent is to be effective; and (B) at least one person becomes a member in accordance with the consent; [...]”. UNIFORM LAW COMMISSION. *Uniform Limited Liability Company Act (2006)*. Chicago, 2006.

The advantage of Bayern's proposition is that it does not demand any legal reform in the perspective of American corporate law. As it is known, the legislative process comprises several steps and is often seen to be moving at a slow pace, and the results are not always effective. Moreover, the recognition of e-personalities by a statute, such as it seems to be the next move in European directives, necessarily makes things more complex than they could be. The entitlement of personhood means not only providing possibilities of owning property, making agreements and being responsible for its own acts but also raises ethical issues, matters of fundamental constitutional rights and questions to public law.

In this incipient moment, limiting discussion about AI to corporate law, without immediately granting it legal personhood, postpones the ethical, constitutional and public law debate to a further moment, when, hopefully, those issues will be better addressed.

Bayern's strategic proposition has spread beyond the borders of American legal debate. In 2017, Shawn Bayern himself and other European legal scholars, funded by St. Gallen University, in Switzerland, developed a study about the suitability of this strategy to German, Swiss and British legal systems. The conclusions of this working group were published in an article named *Company Law and Autonomous Systems: A Blueprint for Lawyers, Entrepreneurs, and Regulators* in *Hastings Science and Technology Law Journal*⁵³.

None of the three above corporate law systems appeared to have a legal entity with the same flexibility of the American LLC, although good perspectives were found in German limited liability company, the GmbH (*Gesellschaft mit beschränkter Haftung*), the British limited liability partnership, the LLP, and, to a lesser extent, in the Swiss foundation, the *Stiftung*.

53 BAYERN, Shawn *et al.* *Company Law and Autonomous Systems: A Blueprint for Lawyers, Entrepreneurs, and Regulators*. *Hastings Science and Technology Law Journal*. San Francisco, vol. 9, n. 2, p. 135-161, summer 2017.

If the effort of adapting Bayern's proposition to different legal systems was somehow fruitful, we could make the same effort concerning Brazilian law. Could this proposition be also suitable for corporate law in Brazil? Indeed, questioning the application of Bayern's proposition to other legal systems, as the Brazilian one, was, in fact, the very objective of his work:

[...], the paper lays out a template suggesting how existing laws might provide a potentially unexpected regulatory framework for autonomous systems, and to explore some legal consequences of this possibility. We do suggest that these considerations might spur others to consider the relevant provisions of their own national laws with a view to locating similar legal 'spaces' that autonomous systems could 'inhabit'.⁵⁴.

In the following topics, the application (or not) of Bayern's proposition to the Brazilian legal system will be examined. For this purpose, the Brazilian LLC will be taken as a reference.

4. From The Creation Of Brazilian Llc To The Civil Code Of 2002: a Contractual View

Just as the US, Brazil has its own type of LLC as a corporate entity, the so-called "*Sociedade Limitada*". As a matter of fact, the Brazilian LLC has an older and more stable tradition in comparison with US corporate law. If LLC in the US is a product of the late XXth Century, Brazil, inspired in German law, has incorporated the figure of LLC more than one hundred years ago, with the edition of the Decree

54 BAYERN, Shawn *et al.* Company Law and Autonomous Systems: A Blueprint for Lawyers, Entrepreneurs, and Regulators. *Hastings Science and Technology Law Journal*. San Francisco, vol. 9, n. 2, p. 135-161, summer 2017. p. 136.

n. 3.708, from January 10th of 1919. The Decree has regulated the Brazilian LLC for more than eighty years, until the Brazilian Civil Code of 2002 came into force in 2003⁵⁵.

The Brazilian Decree n. 3.708 was an answer to the need of the bourgeoisie (more flexibility, less bureaucracy and limited liability for all the members).

The main feature of a Brazilian LLC is its flexibility. Its founding act is a declaration of will which allows the members the freedom to contract with one another upon whatever terms they consider are best suited to their business, as long as these terms do not collide with mandatory requirements of law.

Here we can see some similitudes between the American LLC as established by RULLCA and the traditional Brazilian LLC. Said that, if it is thinkable, according to Prof. Bayern's insight, that the LLC operating agreement makes it possible for an American LLC "encapsulates" AI in a way that it can autonomously act juridically, can the Brazilian LLC's constitutional document do the same?

The similarities between American LLC and Brazilian LLC concerning its flexibility seem to indicate a positive answer. Nonetheless, a safe opinion on the matter depends on a closer analysis of the LLC regulation of the Brazilian Civil Code and its legal interpretation.

The main difficulty about using LLC to encapsulate AI in Brazil is the admission or not of a company without members. In fact, the Brazilian Civil Code does not refer to an LLC without members. The LLC's legal provisions govern the company's members, their internal relationship and their interaction with the legal entity. According to article 981 of the Brazilian Civil Code, companies are defined as a

55 This overview of BRAZILIAN LLC in Brazil is based on: CHAVES, Natália Cristina. *Casamento, divórcio e empresa: questões societárias e patrimoniais*. Belo Horizonte: D'Plácido, 2018. part 1, chapter 1: "Panorama das Sociedades Limitadas no Brasil". p. 27-52.

contract, an agreement celebrated between two or more people who reciprocally undertake to contribute, with goods or services, to the exercise of economic activity and the sharing of the results. So, the Brazilian LLC, under the provisions of the Civil Code, is traditionally seen from the perspective of a contract⁵⁶. Even though the association of LLC with the contractual view is *parti pris* in Brazilian corporate law, having its constitutional act received the name of “contract” since the edition of the Decree n. 3.708/1919, the theorization about the contractualism in corporate law as it is now known in Brazil was imported from mid XXth Century Italian doctrine⁵⁷.

It was due mainly to the influence of Tullio Ascarelli that contractual theories were spread in Brazil⁵⁸. Ascarelli, against the institutionalist view⁵⁹, developed the concept of plurilateral contract, stating a cooperative behavior among partners to achieve a common goal⁶⁰.

The contractual view of the Brazilian LLC can be inferred not only from the referred article 981 but also from other Civil Code’s provisions. For instance, article 1.052 limits the members’ liability to the payment of the quotas subscribed. However, all partners are jointly liable for the complete payment of the corporate capital⁶¹.

56 SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 38.

57 SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 28-31.

58 BORBA, José Edwaldo Tavares. *Direito Societário*. 10^a ed. Rio de Janeiro: Renovar, 2007. p. 32.

59 ASCARELLI, Tullio. *Problemas das sociedades anônimas e direito comparado*. 2^a ed. São Paulo: Saraiva, 1969. p. 265.

60 ASCARELLI, Tullio. *Problemas das sociedades anônimas e direito comparado*. 2^a ed. São Paulo: Saraiva, 1969. p. 266.

61 The original version of this article is reproduced in the following text: “*Na sociedade limitada, a responsabilidade de cada sócio é restrita ao valor de suas quotas, mas todos respondem solidariamente pela integralização do capital social*”. In free translation: “*In the LLC each member’s liability is limited to the value of its own quotas, but all of them are responsible for the payment of the corporate capital*”.

Article 1.053 states that the legal provisions of the Simple Company (which has a contractual structure *par excellence*), are subsidiarily applicable to the Brazilian LLC⁶². Due to this, article 997, which disciplines the constitution of the Simple Company, applies to the Brazilian LLC, establishing that “*The company is constituted by a written contract, in public or private form, which, in addition to the clauses stipulated by the parties, will mention: [...]*”⁶³.

Following article 1.053 of the Civil Code, the subsequent articles cover the member’s quotas, company’s administration, general meetings, partial corporate dissolution and, finally, causes of extinction. Concerning the total dissolution causes, it is worth noting that until recently the absence of more than one member was considered a cause of total dissolution of a Brazilian LLC, according to article 1.033, item IV, of the Civil Code, applicable to this type of company. This item expressly commands: “*the company shall be dissolved when occur: [...] IV – the absence of a plurality of members for the time-lapse of one hundred and eighty days*”⁶⁴.

Considering all these legal provisions, the companies’ contractual view seems to be endorsed by the Brazilian legal system. From this perspective, thinking of Brazilian LLC without any members would be a *contraditio in terminis*. Nevertheless, at least in one hypothetical circumstance, this situation will be applied.

Assuming that all the members of a specific Brazilian LLC are dead (in an airplane accident, for example) and that the company is managed by a no partner administrator who keeps the business

62 In the original text: “*Art. 1.053. A sociedade limitada rege-se, nas omissões deste Capítulo, pelas normas da sociedade simples*”. In free translation: “*Art. 1.053. The LLC is governed, in the omissions of this chapter, by the rules of the simple company*”.

63 Free translation. In the original text: “*Art. 997. A sociedade constitui-se mediante contrato escrito, particular ou público, que, além de cláusulas estipuladas pelas partes, mencionará:[...]*”.

64 Free translation. In the original text: “*Art. 1.033. Dissolve-se a sociedade quando ocorrer: [...] IV - a falta de pluralidade de sócios, não reconstituída no prazo de cento e oitenta dias*”.

moving on. Are the acts practiced by the administrator after the members' death, legally valid? Does the LLC need to be immediately dissolved?

It is true, according to Brazilian succession law, that all the possession of a deceased one passes on to its heirs immediately (article 1.784 of the Civil Code⁶⁵). However, even admitting that patrimonial rights regarding the member's quotas in the Brazilian LLC are immediately transferred to the heirs, the attribute of *being a member* does not automatically pass on. An amendment to the constitutional act is necessary.

Although the situation above shall be considered unusual, it could really happen. Unfortunately, there is no specific reference in the Brazilian legal system concerning this practical problem.

The company's contractual view does not offer a satisfactory solution. However, the legal landscape started changing in 2011, with the introduction of the individual limited liability enterprise (EIRELI). It meant a significant step in the direction of the institutionalist view of corporate law. In this new scenario, a company with no-member is more palpable.

5. Eireli And Single-member Companies: a Path To An Institutional View

The institutionalist view of corporate law was developed in reaction to what Ascarelli called a "*traditional approach*" to a contractual view. The institutionalist ideas rendered the first fruits in German during the inter-war period. The concerns about the tragic economic crisis that ended up feeding the Nazi catastrophe made

65 Free translated as: "Art. 1.784. Once the succession is opened, inheritance is passed on, therefore, to legitimate heirs and to testamentary ones". In the official text: "Art. 1.784. Aberta a sucessão, a herança transmite-se, desde logo, aos herdeiros legítimos e testamentários".

jurists then sensible to the importance of corporations not only as a tool for private thriving, but also as a fundamental asset to a country's economic stability. In this sense, the relevance of a corporation, far beyond a mere contract (an agreement celebrated between the parties), was emphatically remarked by the doctrine⁶⁶.

The contours of the institutionalist view were well synthesized and spread by the French jurist and sociologist Maurice Hauriou. One of the key names of France's public law, Hauriou has written an essay about corporate institutions that have deeply impacted the debate regarding corporate law. This essay has influenced even Brazilian jurists, such as Fran Martins⁶⁷. Hauriou defined three elements of the corporate institution:

We already know that there are three elements of any corporate institution: 1) the idea of a work to be done in a social group; 2) the power organized to perform this idea; 3) the communitary manifestations which are produced in the social group regarding the idea and its performance⁶⁸.

The institutionalist view, as theorized by the German jurists and by Hauriou, focuses on the corporations' social role. The importance of a company, as an LLC, for instance, extends beyond the interests and even the presence of its member. It resides, precisely, in the social role that this legal entity performs, creating wealth, providing jobs, fostering innovation, and so on.

66 SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 32-34.

67 CHAVES, Natália Cristina. *Casamento, divórcio e empresa: questões societárias e patrimoniais*. Belo Horizonte: D'Plácido, 2018. p. 45, note 63.

68 Free translation. In the original text from the Italian edition: "*Già sappiamo che sono tre gli elementi di qualsiasi istituzione corporativa: 1) l'idea dell'opera da realizzare in un gruppo sociale; 2) il potere organizzato per la realizzazione di questa idea; 3) le manifestazioni comunitarie che si producono nel gruppo sociale in rapporto all'idea e alla sua realizzazione*". (HAURIOU, Maurice. *Teoria dell'istituzione e della fondazione*. Trasl. Widar Cesarini Sforza. Milan: Giuffrè, 1967. p. 14).

In the Brazilian legal scenario, Prof. Calixto Salomão Filho, Full Professor of Commercial Law at the University of São Paulo, has long sustained, with broad repercussion, that the current comprehension of corporate law in Brazil must not be restricted to a mere contractual view. For the author, even in Brazilian law and despite the first impression of the Civil Code, a corporation is more than the sum of its members.

Salomão Filho proposes in his well-known works that corporate law should abandon its contractual original view, turning to an institutional view. It would be unfair to reduce the author's perspective to the strict institutionalism developed in Germany during the inter-war period, which conceived the corporation solely as a social tool⁶⁹. As a matter of fact, Salomão Filho refers to his theory as *organizational*, and not properly *institutionalist*. Nonetheless, even though Prof. Salomão Filho's contemporary view is capable to avoid the common criticism addressed to classical institutionalism, his theory's premises and institutionalism are very much alike. The author himself recognizes it: "*the organizational theory, when well applied, is not a return to the individualism of the contractualists, but, in fact, is a step forward towards institutionalism in the defense of public interest*"⁷⁰.

This remark is not a critic of Prof. Salomão Filho's work. On the contrary, the institutionalist view, in the more contemporary perspective sustained by Salomão Filho, can be a powerful tool to solve serious legal issues concerning corporate law, such as the use of an LLC as a legal receptacle of AI.

69 This paragraph is a summary of Prof. Calixto Salomão Filho's ideas published in the book: SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 27-51.

70 Free translation. In the original text: "*a teoria organizativa, quando bem aplicada, não é um retorno ao individualismo dos contratualistas, mas sim um passo avante em relação ao institucionalismo na defesa do interesse público*". SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 52.

In the Brazilian legal system, the path to the institutionalist view began to be covered in a more significant way in 2011, with the introduction of a legal entity constituted of a sole member: the EIRELI. Although this legal person wasn't defined as a company, it remained (and still is) halfway between that legal structure (a company) and an individual businessman, distancing from the contractual approach.

The EIRELI was incorporated in the article 980-A of the Brazilian Civil Code by the Federal Law n. 12.441 of 2011. Its doctrinal formulation is deeply controversial⁷¹. Despite not being a company or a corporation, this new legal entity, owned by one sole person (natural or legal) is governed, in the omissions of the article 980-A of the Brazilian Civil Code, by the rules of the Brazilian LLC. So, the responsibility of the sole member is limited. However, unlike the Brazilian LLC, an EIRELI requires a capital of at least a hundred minimum wages.

After the EIRELI, came the single-member law firms. This legal person was incorporated by Federal Law n. 13.247 of 2016 in the Brazilian Bar Statute (Federal Law 8.906/1994) to authorize individual lawyers to create a legal person to exercise its legal activities. With regards to the single-member law firm, the legislation has considered this new entity as a type of company, moving a little further in the direction of the institutionalist view.

If it is impossible for one person to celebrate an agreement with itself and, even though, this sole person can create an EIRELI or even constitute a single-member law firm, those entities are not contractual in nature. That is why their creation by law represented a break with the contractual perspective.

This paradigm shift was accelerated with the acceptance of a Brazilian LLC composed of a sole member. This possibility was

71 GONÇALVES, Oksandro. EIRELI - Empresa Individual de Responsabilidade Limitada. In: Celso Fernandes Campilongo, Alvaro de Azevedo Gonzaga e André Luiz Freire (Coords.). *Enciclopédia jurídica da PUC-SP*. Issue: Direito Comercial. Fábio Ulhoa Coelho, Marcus Elidius Michelli de Almeida (Issue coords.). São Paulo: Pontifícia Universidade Católica de São Paulo, 2017.

incorporated in the Brazilian legal system by Federal Law 13.874/2019, which added two paragraphs to article 1.052 of the Civil Code⁷². This proposition introduced, in the legal text of the Civil Code, an element of the institutionalist theory, since it is unthinkable, in a contractual perspective, to found a company with just one member.

The single-member LLC is incompatible with article 1.033, item IV, of the Civil Code, which, as said before, considers the absence of plurality of members a company's cause of compulsory dissolution⁷³. So, the creation of this single-member company implicated the tacit abrogation of this referred article in the field of LLC. This tacit abrogation of the only statutory command that determinates the extinction of a company in case of lack of plurality of members (and zero is obviously not plurality), makes it much easier granting AI a legal receptacle to exercise its activities in Brazil.

Returning to the point, in the theoretical perspective of corporate law as an institution, it would not be absurd to conceive an LLC without members to preserve the social function it performs. It is what Prof. Calixto Salomão Filho himself sustains:

Once the corporation is seen as an organization and not as a plurality of members it is pretty evident that the single-member corporation and the corporation without any member are admissible. In fact, it is in those structures that the contract which gives life to a corporation acquires

72 According to the first paragraph: “[...]§1º A sociedade limitada pode ser constituída por 1 (uma) ou mais pessoas”. Free translation: “[...] §1º The LLC can be constituted by one person or more”.

73 According to article 4º of Normative Instruction DREI n. 63/19, the article 1.033, item IV, of the Civil Code does not apply to single-member LLC. In the original text: “Não se aplica às sociedades limitadas, que estiverem em condição de unipessoalidade, o disposto no inciso IV do art. 1.033 do Código Civil”. (BRAZIL. Ministério da Economia. Normative Instruction DREI 63, 2019. Available at: <<http://www.mdic.gov.br>>. Accessed on 30 Jan. 2020).

its pure organizational value, meaning that it has by object only the structuring of a bundle of contracts⁷⁴.

So, according to this contemporary institutionalist view of corporate law, it is feasible to accept the theoretical existence of an AI encapsulated by a Brazilian LLC, which will continue to carry out the business, despite the absence of members.

6. A Dialogue With Bayern's Proposition

Even though the existence of companies without members are theoretically admissible in Brazilian corporate law, some difficulties regarding Prof. Sawn Bayern's proposition to "encapsulate" the AI by an LLC remains. Until this point, the only conceived hypothesis of a no-member company involves the decease of all members. So, if the only possibility of an autonomous system operates a Brazilian LLC is in the event of death (providing that all members are humans), the proposition should be almost ineffective, due to the low probability of happening.

The question is: is it possible to apply Prof. Bayern's proposition in other situations, in which all the members of a Brazilian LLC withdraw from a company? As surprisingly as it may seem, the proceedings for doing so were proposed a long time ago by João Eunápio Borges, a distinctive Brazilian corporate law scholar, Full Professor at the Federal University of Minas Gerais (UFMG). In 1967, he remarked on the possibility of a company ending up with no-member⁷⁵.

74 Free translation. In the original text: "*Uma vez vista a sociedade como organização e não como uma pluralidade de sócios é bastante evidente como tanto a sociedade unipessoal como a sociedade sem sócio são admissíveis. Aliás, é nessas estruturas que o contrato que dá vida à sociedade adquire seu valor organizativo puro, ou seja, passa a ter como objeto exclusivamente estruturar um feixe de contratos*". SALOMÃO FILHO, Calixto. *O novo direito societário*. 4^a ed. São Paulo: Malheiros, 2011. p. 50.

75 "[...] risking scandalizing many, I confidently take a step further in the way of institu-

Back then, Borges already defended the institutionalist comprehension of corporate law, based on mid XXth Century German theories. According to him, the relevance of the continuity of business justified its maintenance even if the company was reduced to one member or no member at all⁷⁶.

The scenery depicted by Borges about how a Brazilian LLC could get rid of all members by acquiring its own quotas is slightly different in contemporary Brazilian corporate law. In the past, article 8^o of Decree n. 3.708/1919 expressly authorized the LLC to acquire its own quotas. Nonetheless, as previously said, when, in 2003, the Brazilian Civil Code entered into force, the Decree n. 3.708/1919 was revoked, and the new Code did not and still does not have a similar disposition.

The lacuna in the Civil Code has raised some doubts about the possibility of the LLC being a member of itself, negotiating with its own quotas. The Journey of Private Law, an assembly of legal scholars that enacts briefings about controversial questions in Brazilian Private law, has opined that “*the LLC can acquire its own quotas observing the*

tionalizing LLC; among us, it could occasionally exist, not only with a sole member, but without any member at all. The LLC can acquire its own quotas, according to article 8^o of the Decree n. 3.708, quotas which the company can conserve with itself in order to ulterior cession or resale. There is not any juridical impossibility in the occurrence of such phenomenon: a LLC that, having acquired, observing legal formalities, all of its own quotas transforms itself in a company with no-members”. (BORGES, João Eunápio. Sociedade por quotas – liquidação. *Revista Forense*, São Paulo, y. 63, i. 763-764-765, v. 217, jan./mar. 1967). Free translation. In the original text: “[...] embora correndo o risco de escandalizar a muitos, dou convictamente um passo a mais no caminho da institucionalização da sociedade por quotas de responsabilidade limitada; entre nós ela poderá existir ocasionalmente, não apenas com sócio único. Mas sem qualquer sócio... Podendo ela adquirir as próprias quotas, nos termos do art. 8^o do Decreto n. 3.708, quotas que ela pode conservar em carteira para ulterior cessão ou revenda, não existe juridicamente, nenhuma impossibilidade na ocorrência de tal fenômeno: uma sociedade por quotas de responsabilidade limitada que, havendo adquirido, com estrita observância de todas as formalidade legais, totalidade de suas quotas transformou-se em uma sociedade sem sócios”. (BORGES, João Eunápio. Sociedade por quotas – liquidação. *Revista Forense*, São Paulo, y. 63, i. 763-764-765, v. 217, jan./mar. 1967).

76 CHAVES, Natália Cristina. O menor empresário na sociedade limitada unipessoal. *Revista de Direito Empresarial*, Curitiba, n. 3, jan./jun. 2005. p. 143.

conditions of the Law of Business Corporations”⁷⁷ (Federal Law n. 6.404/76). At first, the National Department of Business Register and Integration (DREI) refused the idea of a Brazilian LLC acquiring its own quotas (Normative Instruction DREI n. 10/2013⁷⁸). In 2017, though, the DREI has changed its opinion, enacting the Normative Instruction DREI n. 38, which is still in force⁷⁹. This new Instruction, in its item 3.2.6.1, admits that Brazilian LLC can acquire its own quotas if its constitutional act provides that the company will be additionally governed by the rules of corporation, especially Federal Law n. 6.404/76⁸⁰.

Accepting that an LLC can acquire its own quotas, makes possible the adaptation of Prof. Bayern’s proposal to the Brazilian landscape.

This possibility is reinforced by the absence of a rule demanding the presence of members as a requirement for the company’s juridical validity after its creation. In fact, the existence of one or more members is just required for the constitution of the LLC, but not for its maintenance from then on.

Brazilian private law doctrine, influenced by the jurist Pontes de Miranda, usually segments the juridical acts (“*negócios jurídicos*”), such as the constitution of a company, in three steps: existence, validity and efficacy⁸¹. In this line of thought, a company needs a member-only to validly come into existence. After its creation, the referred company can exercise its activities, reaching juridical efficacy.

77 Free translation. In the original text: “*A sociedade limitada pode adquirir suas próprias quotas, observadas as condições estabelecidas na Lei das Sociedades por Ações*”. CONSELHO DA JUSTIÇA FEDERAL. IV Jornada de Direito Civil, *Enunciado 391*. Brasília, 2006.

78 BRAZIL. Ministério da Economia. *Normative Instruction DREI 10*, 2013. Available at: <<http://www.mdic.gov.br>>. Accessed on 30 Jan. 2020.

79 BRAZIL. Ministério da Economia. *Normative Instruction DREI 38*, 2017. Available at: <<http://www.mdic.gov.br>>. Accessed on 30 Jan. 2020.

80 In Private Law, what is not prohibited is permitted. So, even without this provision, in our opinion, the LLC could acquire its own quotas.

81 PONTES DE MIRANDA, Francisco Cavalcanti. *Tratado das Ações*. V. 1. São Paulo: RT, 1970. p. 4.

In addition, Brazilian corporate law is facing a movement towards the direction of more economic freedom. The Federal Law n. 13.874/2019, known as the Law of Economic Freedom, reduces state intervention in private businesses. One of its principles is the subsidiary and exceptional state intervention in the exercise of economic activities (article 2º, item III). The free will of parties plays an important role. In entrepreneurial business, party autonomy prevails over Brazilian business law, except in matters of public order (article 3º, item VIII).

Considering this movement and the absence of a rule prohibiting the maintenance of a company without a member or prohibiting the company as a member of itself, the application of Bayern's theory in Brazil becomes more tangible.

There is just one rule in Brazilian corporate law that seems to present somehow an obstacle to AI's maximum potential of acting juridically. Article 1.060 of the Brazilian Civil Code provides that the LLC administrator must be a *person* (a member or a non-member). Besides, article 997 of the same Code (which is applied to LLC) requires that the company must be managed by a natural person. There is some conundrum about this matter, especially because, in some situations, as in bankruptcy, per example, the company can be driven by a legal person⁸². The current position of the DREI, in the Normative Instruction n. 38 of 2017 (item 1.2.8, b), an LLC cannot be administrated by a legal person. But be that as it may, the requirement of a natural person to administrate an LLC, even if not a member, represents a substantial restriction to AI autonomy in a company, as it will not be able to manage.

On the other hand, this obstacle solves one of the crucial juridical problems of AI: responsibility⁸³. Ordinarily, the responsibility

82 Article 21 of Brazilian bankruptcy law provides that the judicial administrator can be a specialized legal person.

83 CHAVES, Natália Cristina. Inteligência Artificial: os novos rumos da responsabili-

for the AI acts will be taken by the LCC. As AI's commands will be juridically performed in the name of the LLC, the company will be responsible for any contractual or tortious damages that may occur under various conditions.

Nonetheless, it is undeniable that, in some cases, abuses can happen and measures must be taken in order to avoid that unjust damages remain unpaid. In this context, a human administrator can be the solution to the problem of liability.

In consonance with article 50 of the Brazilian Civil Code, Federal Law n. 13.874/2019⁸⁴⁸⁵, in case of abuse of legal personality, the

dade civil. In: GONÇALVES, Anabela Susana de Sousa *et al.* (Coords.). *Direito civil contemporâneo*. Braga: CONPEDI, 2017.

84 "Art. 50. In case of abuse of legal personality, characterized by deviance of function, patrimonial confusion, the judge may, by requirement of the interested party or the public attorney office, when its intervention is required, pierce the corporate veil in order that the effects of certain and determined duties be extended to the particular belongings of the administrators or members who were directly or indirectly beneficiaries of the abuse.

§ 1º With regard to this article, deviance of function is the use of the legal personality with the purpose of damaging creditors or practicing unlawful acts of any kind.

§ 2º Patrimonial confusion means the absence of factual discrimination between the belongings of the legal persons and its members, such as:

I - frequent performance of the obligations of the members or administrators by the legal person, vice versa;

II - transferring of assets and liabilities without actual counterpart, except for proportionally insignificant amounts;

III - other acts of noncompliance related to patrimonial autonomy".

85 Free translation. In the original text: "Art. 50. *Em caso de abuso da personalidade jurídica, caracterizado pelo desvio de finalidade ou pela confusão patrimonial, pode o juiz, a requerimento da parte, ou do Ministério Público quando lhe couber intervir no processo, desconsiderá-la para que os efeitos de certas e determinadas relações de obrigações sejam estendidos aos bens particulares de administradores ou de sócios da pessoa jurídica beneficiados direta ou indiretamente pelo abuso. (Redação dada pela Lei nº 13.874, de 2019) § 1º Para os fins do disposto neste artigo, desvio de finalidade é a utilização da pessoa jurídica com o propósito de lesar credores e para a prática de atos ilícitos de qualquer natureza. (Incluído pela Lei nº 13.874, de 2019) § 2º Entende-se por confusão patrimonial a ausência de separação de fato entre os patrimônios, caracterizada por: (Incluído pela Lei nº 13.874, de 2019) I - cumprimento repetitivo pela sociedade de obrigações do sócio ou do administrador ou vice-versa; (Incluído pela Lei nº 13.874, de 2019) II - transferência de ativos ou de passivos sem efetivas contraprestações, exceto os de valor proporcionalmente insignificante; e (Incluído pela Lei nº 13.874, de 2019) III - outros atos de descumprimento da autonomia patrimonial. (Incluído*

liability for unlawful acts can be extended to the particular belongings of the administrator.

So, even if the company has no member or even if it is a member of itself, operated, in both cases, by an autonomous system, any damage that a person may suffer due to an unlawful act will be compensated (by the company or the administrator).

These provisions (articles 1.060 and 50 of the Civil Code) can be considered a safety measure, the well-known “human-in-the-loop” solution. In other words, even though recognizing the AI autonomy, at some point, a human being intervenes to avoid further damages.

Conclusion

As seen above, due to technological improvements, the use of AI in daily life increases and poses new challenges for the law.

In order to address these challenges, especially in the field of liability for tortious incidents, in Europe, the discussions regarding AI are moving in the direction of granting it legal personhood, creating a type of an e-person. However, the creation of an e-person raises problems regarding ethics, constitutional fundamental rights and public law.

In this context, Prof. Shawn Bayern’s theory emerges as an alternative to the European solution. The theory suggests the use of an American LLC to encapsulate autonomous systems, letting them act juridically through this legal entity, without the need for a law reform.

Starting from this theory, Bayern’s proposition was analyzed from the perspective of Brazilian LLC law. The latest legal reforms implemented in this field, especially the creation of a single-member Brazilian LLC, showed a movement from a contractual view to an institutionalist one. This new paradigm made possible, at least

pela Lei nº 13.874, de 2019”.

in theory, the dialogue between Prof. Shawn Bayern's theory and Brazilian legislation.

As a conclusion, Brazilian LLC law gives the non-human autonomous systems the opportunity to become, in Bayern's words, their "*own instrumentality*" to operate under existing law. In fact, there is no statutory impediment to the adoption of Bayern's thesis in Brazilian corporate law.

Although the application of Bayern's theory in Brazil is just conceptual, in the near future legal structures as those conceived by Prof. Shawn Bayern will be seen.

This point of view is certainly not exempt from criticism. In 2018, Prof. Lynn LoPucki, Distinguished Professor of UCLA, has published an article called *Algorithmic Entities*, in Washington University Law Review, calling attention to the danger that the creation of an AI-run corporation could represent to humankind, given to the difficulty of governmental control, its propensity for wrongdoing and the virtual impossibility of its deterrence⁸⁶.

This sort of criticism has its value and, even though, it can show the path for future *lege ferenda* adaptations, it does not invalidate the juridical correction of Bayern's proposition. Its ideological background, nonetheless, resembles much of that apocalyptic fear that always rises against any kind of innovation.

Some splashes of this fear are already experimented in Brazilian recent legal projects which are being processed in the Senate (numbers 5691/2019 and 5051/2019). These projects establish, as principles of AI regulation, the gradual incorporation, the constant human supervision and even the subsidiary nature of AI regarding the human process of decision-making. Those legal propositions have already been severely criticized by Daniel Becker, Isabela Ferrari and Bernardo Araujo as a perfect example of a "*law of fear*", identified by

⁸⁶ LOPUCKI, Lynn M. Algorithmic entities. *Washington University Law Review*, St. Louis, vol. 95, iss. 4, p. 887-953, 2018.

Cass Sunstein as those rules edited in a hurry to address the worries of the people⁸⁷.

At the end of the day, the evolution turns out to be inevitable and all this apocalyptic fear represents nothing more than a pointless angst. As Yuval Noah Harari said in *Sapiens*:

Unless some nuclear or ecological catastrophe intervenes, so goes the story, the pace of technological development will soon lead to the replacement of Homo Sapiens by completely different beings who possess not only different physiques, but also very different cognitive and emotional worlds⁸⁸.

Why deny reality? It “is naïve to imagine that we might simply hit the brakes and stop the scientific projects that are upgrading Homo Sapiens into a different kind of being”⁸⁹.

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On The Waterfront: Personal And Non-personal Data At Both Eu Regulations⁹⁰

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Abstract

European Union Law on data protection does not apply to non-personal data. However, the legal limits between personal and non-personal data are unstable, relying on the development of anonymization and de-anonymization technologies, with increasing risks to be handled by controllers and processors. This paper intends to identify the mentioned risks and the possible remedies, according to the General Data Protection Regulation.

Keywords

European Union, non-personal data, personal data, regulation, risk

⁹⁰ Text of the Communication presented at the Nordic Conference on Legal Informatics 2019, hosted in the University of Lapland, in Rovaniemi (Finland), from 12 to 14 November 2019. Some parts and footnotes notes were added.

1. Land and Sea

For starters, this short paper was built having in mind an ancient maritime cartographic metaphor that has a remarkable heuristic potential, given the current state of EU Sources regarding the regulation of data, both personal and non-personal: *hic sunt dracones*, the sea monsters that were supposed to populate uncharted waters.

Besides, being this a “Nordic Conference”, taking place at Rovaniemi, the *Carta Marina*⁹¹, of *Olaus Magnus* / Olof Månsson, dating from 1539, other than the Atlantic and Arctic Oceans, shows one of the first known and accurate representations of Scandinavia and the Baltic, including Lapland.

As a matter of fact, if we take a closer look at the EU Sources, we will notice that there’s in place a detailed and consistent set of rules regarding Personal Data, *Terra Firma*, based on [Regulation 2016/679](#) of the European Parliament and of the Council of 27 April 2016, on the protection of natural persons with regard to the processing of personal data and the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) – the *GDPR*⁹².

91 In full, *Carta marina et Descriptio septemtrionalium terrarum ac mirabilium rerum in eis contentarum, diligentissime elaborata Anno Domini 1539 Veneciis liberalitate Reverendissimi Domini Ieronimi Quirini*, written during his exile in Italy and available here: http://www.npm.ac.uk/rsdas/projects/carta_marina/carta_marina_small.jpg.

92 Another *Continent*, or rather a few *rocky islands*, as to do with the EU legal answers towards Cybercrime, namely Directive 2011/93/EU, of the European Parliament and the Council of 13 December 2011, on combating the sexual abuse and sexual exploitation of children and child pornography and Directive 2013/40/EU of the European Parliament and the Council of 12 August 2013, on attacks against information systems, both aiming to consolidate the *Council of Europe Convention on Cybercrime*, ETS No. 185, signed at Budapest the 23rd November 2001, and its complementing framework, as the *Additional Protocol to the Convention on Cybercrime*, concerning the criminalisation of acts of a racist and xenophobic nature committed through computer systems, ETS No. 189, signed at Strasbourg the 1st March 2003, and the *Council of Europe Convention on Protection of Children against Sexual Exploitation and Sexual Abuse*, CETS No. 201, signed at Lanzarote, the 25th October 2007.

This *Continent* is bordered by a *Sea* of loose and unsettled rules⁹³, notwithstanding Regulation (EU) 2018/1807 of the European Parliament and of the Council of 14 November 2018, on a framework for the free flow of non-personal data in the European Union – the *FFD Regulation*.

Our subject is akin to a *Waterfront*, where *Terra Firma* and the *Sea* met dynamically, under the effect of technological *tides*.

93 Also having in mind the EU *Archipelago* of Intellectual Property Acts, with a *reef*, Directive 2004/48/EC of the European Parliament and of the Council of 29 April 2004, on the enforcement

of intellectual property rights; *sandbanks*, as Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001, on the harmonisation of certain aspects of copyright and related rights in the information society, and Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019, on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC; and some *islands* apart like Council Directive 91/250/EEC of 14 May 1991, on the legal protection of computer programs, Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996, on the legal protection of databases, Directive 98/71/EC, of the European Parliament and of the Council of 13 October 1998, on the legal protection of designs, also Council Regulation (EC) No 6/2002 of 12 December 2001, on Community designs, Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998, on the legal protection of biotechnological inventions, Regulation (EU) No 1257/2012 of the European Parliament and of the Council of 17 December 2012, implementing enhanced cooperation in the area of the creation of unitary patent protection, both complementing the *Convention on the Grant of European Patents*, of 5 October 1973, Regulation (EU) 2017/1001 of the European Parliament and of the Council of 14 June 2017, on the European Union trade mark, Directive (EU) 2015/2436 of the European Parliament and of the Council of 16 December 2015, to approximate the laws of the Member States relating to trade marks, Regulation (EU) No 1151/2012 of the European Parliament and of the Council of 21 November 2012 on quality schemes for agricultural products and foodstuffs and Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018, on organic production and labelling of organic products; and a *marsh*, Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016, on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure.

2. Even on Wetlands

As well known, the *GDPR* “applies to the processing of personal data” (Article 2.1), not just of an “identified person” but also relating to an “identifiable natural person”, “[that is] one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person” (Article 4.1), including quasi-identifiers and metadata (Article 4.1), as “Natural persons may be associated with online identifiers provided by their devices, applications, tools and protocols, such as internet protocol addresses, cookie identifiers or other identifiers such as radio frequency identification tags [...]” (Recital 30).

Concluding that “[...] The principles of data protection should therefore not apply to anonymous information, namely information which does not relate to an identified or identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable. This Regulation does not therefore concern the processing of such anonymous information, including for statistical or research purposes” (Recital 26 *in fine*).

In addition and regarding this subject, we should keep in mind the *Breyer Case Law* of the Court of Justice of the European Union⁹⁴.

Later and on the other hand, the *FFD Regulation* clarified that it “applies to the processing of electronic data other than personal” (Article 2.1). Intending to address the legal issues resulting from “The expanding Internet of Things, artificial intelligence and machine learning, [that] represent major sources of non-personal data, for

94 Namely, after Case C-582/14, Patrick Breyer, of 19 October 2016, reiterated at Case C-434/16, Peter Nowak, of 20 December 2017, preceded by *Article 29 Working Party Opinion 4/2007*, on the concept of personal data, of 20 June 2007. About these issues, Paul SCHWARTZ and Daniel SOLOVE (2011), Frederik Zuiderveen BORGESIUS (2017), Nadezhda PURTOVA (2018) and Lorenzo dalla CORTE (2019).

example as a result of their deployment in automated industrial production processes. Specific examples of non-personal data include aggregate and anonymized datasets used for big data analytics, data on precision farming that can help to monitor and optimize the use of pesticides and water, or data on maintenance needs for industrial machines.” (Recital 9).

However, the *GDPR* keeps a strong *vis attractiva*. So, “In the case of a data set composed of both personal and non-personal data, this Regulation applies to the non-personal data part of the data set. Where personal and non-personal data in a data set are inextricably linked, this Regulation shall not prejudice the application of Regulation (EU) 2016/679” (Article 2.2).

3. But, Eventually, The Tide Retreats

Concerning des-anonymization, Directive 95/46/EC, relied on a *legal fiction*, stating that “[...] whereas the principles of protection shall not apply to data rendered anonymous in such a way that the data subject is no longer identifiable [...] and retained in a form in which identification of the data subject is no longer possible” (Recital 26), implying the irreversibility of anonymization.

Though, that’s no longer the case for the *GDPR*. Following what we’ve seen, “Natural persons may be associated with online identifiers provided by their devices, applications, tools and protocols [...]. This may leave traces which, in particular when combined with unique identifiers and other information received by the servers, may be used to create profiles of the natural persons and identify them.” (Recital 30)

On the other hand, the *FFD Regulation* is limpid, “If technological developments make it possible to turn anonymized data into personal data, such data are to be treated as personal data, and Regulation (EU) 2016/679 is to apply accordingly” (Recital 9 in fine).

Meanwhile, EU Institutions became quite aware of these facts, at least by the Opinions of the *Article 29 Working Party*, as Opinion 7/2003 on the re-use of public sector information and the protection of personal data, of 12 December 2003, Opinion 06/2013 on open data and public sector information ('PSI') reuse, of 5 June 2013⁹⁵, and, above all, Opinion 05/2014 on "Anonymisation Techniques", of 10 April 2014.

The same for some National Supervisory Authorities, such as the UK Information Commissioner's Office, with the "Anonymisation: managing data protection risk code of practice", of November 2012, or the *Agencia Española de Protección de Datos*, with the "Orientaciones y garantías en los procedimientos de anonimización de datos personales", of October 2016.

For its part, the Commission came forward and issued a "Guidance on the Regulation on a framework for the free flow of non-personal data in the European Union" (COM/2019/250 final, of 29 May 2019), with specific and clear references to the data protection risks coming from des-anonymization technologies (2.1).

And the Report (A/HRC/31/64), of 24 November 2016, delivered by the Special Rapporteur on the rights to privacy, Prof. Joseph Cannataci to the Office of the UN High Commissioner for Human Rights, also has to be mentioned.

Furthermore, over the last decade, Academia has shown the limits of anonymization. Already in 2010, Paul Ohm exposed the shortcoming of the available techniques, and, last July, from a mathematical approach, a group of Belgian researchers from the University of Leuven and the Imperial College, London, Luc Rocher, J.M. Hendrickx & Y.-A. de Montjoye, demonstrated how easily (re) identification can be achieved⁹⁶.

95 On the tension concerning open data, the reuse of public sector data and data protection, Katleen JANSSEN and Sara HUGELIER (2013).

96 On the issue, Paul SCHWARTZ and Daniel SOLOVE (2011), again Daniel SOLOVE (2014), Samson Y. ESAYAS (2015), Sophie STALLA-BOURDILLON and Alison KNIGHT (2017), and also, from technological perspective, Arvind NARAYANAN and Vitaly

4. Precautions To Take Before Boarding

To identify the *coastal rocks* to be covered during the *high tides*, before any processing of non-personal data, the *Captain* (Controller) and the *Pilot* (Data protection officer) should perform risk evaluations, in order to “ascertain whether means are reasonably likely to be used to identify the natural person, account should be taken of all objective factors, such as the costs of and the amount of time required for identification, taking into consideration the available technology at the time of the processing and technological developments.” (Recital 26)⁹⁷.

Being implied by the *Principle of Accountability* (Article 5.2 of the *GDPR*)⁹⁸, these evaluations should follow the stated criteria concerning “Data protection by design and by default” (Article 25)⁹⁹ and, if necessary, a “Data protection impact assessment” (Article 35)¹⁰⁰ has to be performed.

Additionally, “an approved certification mechanism pursuant to Article 42” (as stated in Article 25.3 considering “data protection by

SHMATIKOV (2008); and a special attention has to be provided to Big Data Analytics, as shown by Benjamin HABEGGER *et al.* (2014), Jens-Erik MAI (2016), Alessandro MANTELERO, (2016), Nils GRUSCHKA *et al.* (2018), and also by my paper with Cristiana Teixeira SANTOS (2019).

97 For the role performed by these evaluations, Niels van DIJK, Raphaël GELLERT and Kjetil ROMMETVEIT (2016), as well as Raphaël GELLERT (2018).

98 About its scope, besides *Article 29 Working Party* Opinion 3/2010 on the principle of accountability, of 13 July 2010, Lachlan URQUHART, Tom LODGE and Andy CRABTREE (2019).

99 Besides the reports commissioned by ENISA to George DANESIS *et al.* (2014), to Giuseppe D'ACQUISTO *et al.* (2015) and to Marit HANSEN and Konstantinos LIMNIOTIS (2018), the papers by Lee A. BYGRAVE (2017), Irene KAMARA (2017) and Filippo A. RASO (2018).

100 For a synthesis, Niels van DIJK, Raphaël GELLERT and Kjetil ROMMETVEIT (2016), notwithstanding the Guidelines on Data Protection Impact Assessment (DPIA) and determining whether processing is “likely to result in a high risk” for the purposes of Regulation 2016/679, from the Article 29 Working Party, of 4 April 2017, revised on 4 October 2017.

design and by default” and at Article 32.2 in relation to the “security of processing”) could be utterly relevant in order to avoid major *rocks*¹⁰¹.

A completing tool could be, when available, a “European cybersecurity certification scheme”, particularly one providing a ‘substantial’ or a ‘high’ assurance level (as at Art. 52 of Regulation (EU) 2019/881 the European Parliament and of the Council of 17 April 2019, on ENISA (the European Union Agency for Cybersecurity) and information and communications technology cybersecurity certification (Cybersecurity Act)¹⁰².

5. Preventing Maritime Incidents

In order to avoid *shoals*, “Where a type of processing in particular using new technologies, and taking into account the nature, scope, context and purposes of the processing, is likely to result in a high risk to the rights and freedoms of natural persons, the controller shall, prior to the processing, carry out an assessment of the impact of the envisaged processing operations on the protection of personal data” (Article 35.1), following the *state of the art* on the (re) personalization of data.

Though, the most effective procedure would be *drainage* of the relevant part of the *shore*, that is, to apply the *GDPR* to ALL processing of data, personal and non-personal, at least when technologies such as “Internet of Things, artificial intelligence and machine learning” (Recital 9 of *FFD Regulation*) are being used. Starting with encryption

101 Apart from the very recent Guidelines 1/2018 on certification and identifying certification criteria in accordance with Articles 42 and 43 of the Regulation (Version 3.0), of 3 June 2019, adopted by the European Data Protection Board, for a general approach to this subject, Giovanni Maria RICCIO and Federica PEZZA (2018), as well as Eric LACHAUD (2018).

102 On the European Union Cybersecurity framework, Helena CARRAPIÇO and André BARRINHA (2017) and (2018), more specifically but from a somewhat outdated perspective, Roksana MOORE (2013), while Christopher CUNER *et al.* (2017) put the focus on its connections with data protection.

(Article 32.1 a)¹⁰³, at least, in order to limit the consequences of a “personal data breach” (Article 34.3 a) and Article 4 12)¹⁰⁴.

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103 About these, Gerald SPINDLER and Philipp SCHMECHEL (2016), in general, as well as Samson Y. ESAYAS (2015), for the precise context.

104 About the scope of the rules regarding these security incidents, Stephanie von MALTZAN (2019).

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Privacy And Personal Data Protection: Uses And Misuses Of Personal Data Under Brazilian Law

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1. a Privacy Sketch For The Digital Age

The study of privacy in its historical perspective is intertwined with the development of technology over the last centuries, especially from the invention of the mechanical press by William Caxton in 1476. More recently, through photography that led to the concept of Louis Brandeis and Samuel Warren from *the right to be left alone*. Both examples raised concerns about the disclosure of unauthorized information on a large scale.

Due to technological advances, the protection of property rights to safeguard individuals from illegal foreclosures in their homes, writings, letters and in their private life ended up becoming an outdated or notably ineffective instrument, as very well highlighted by Judge Erle in 1854¹⁰⁵:

the notion (...) that nothing is property which cannot be earmarked and recovered in detinue or trover, may be true in an early stage of society when property is in its pure

105 *apud* BRANDEIS, Louis; WARREN, Samuel. The right to privacy. <https://www.cs.cornell.edu/~shmat/courses/cs5436/warren-brandeis.pdf>

form, and the remedies for violation of it also simple, but is not true in a more civilized state, when the relations of life and the interests arising therefrom are complicated.

As SAMPAIO (1998, p.39) points out, it was from this understanding that judges and courts began to resort to property derivatives in the scope of the immaterial, such as copyright and the right to image. At the end of the 18th century, the notion that assuring the individual of only a remedy against the physical violation of his property was no longer sufficient to protect him in his entirety¹⁰⁶.

However, in the recent past, another technology has emerged to claim a new redefinition of the right to privacy. Through the emergence of computers and, mainly, through large-scale data processing, new possibilities of violations of individual rights were indirectly linked to the privacy of the individual, as they resulted from the collection of information about them.

The argument is found in the *Reporters Committee for Freedom of the Press vs. US Department of Justice*¹⁰⁷. In that case, the Supreme Court decided whether the FBI's rap sheet database should be exempted from the publicity duty provided for in the Freedom of Information Act Statute¹⁰⁸, to ensure the convicts' right to privacy and their excessive exposure through digital databases.

It is interesting to note that this FBI database was made up of public records, freely available through physical attendance at county courts, and accessible to anyone interested. However, the existence of a centralized database with all the information previously sparsely distributed led the Supreme Court to decide that:

106 As seen in the following U.S. Supreme Court cases: *United States vs. Olmstead* and *United States vs. Katz*.

107 <http://cdn.loc.gov/service/ll/usrep/usrep489/usrep489749/usrep489749.pdf> Avail. mar. 08 2020.

108 <https://www.foia.gov/foia-statute.html> Avail. mar. 08 2020.

... in many contexts, the fact that information is not freely available is no reason to exempt that information from a statute generally requiring its dissemination. Nevertheless, the issue here is whether the compilation of otherwise hard-to-obtain information alters the privacy interest implicated by disclosure of that information. There is a vast difference between the public records that might be found after a diligent search of courthouse files, county archives, and local police stations throughout the country and a computerized summary located in a single clearinghouse of information.

The data processing capacity made possible by computers, currently enhanced by the ubiquity of the internet, IoT and big data algorithms, leads to a reflection on the redefinition of the concept of privacy and its extension, which has been occurring uniformly throughout the world.

The decision of the US Supreme Court is an example of how the concept of privacy as negative individual freedom needed to be reframed to preserve its effectiveness in contemporary times. This argument is well understood by RODOTÀ (2008) as he points out that this concept has evolved from the notion of *person-information-secret* to that of *person-information-circulation-control*.

Despite all the importance of the theme, it is difficult to establish a unique concept of privacy through Common Law and Continental Law. The cultural distance between these legal systems results in a mutation on the extent and core of that right. A clear example of this antagonism is that in the American culture, a full credit report is considered natural when contracting with financial institutions. Also, in Continental culture, partial nudity on beaches and some public spaces is not seen as an offense to privacy.

As pointed by WHITMAN (2004, p.1156):

But it is not just a matter of the boorish American lack of privacy etiquette. It is also a matter of American law. Continental law is avidly protective of many kinds of “privacy” in many realms of life, whether the issue is consumer data credit reporting, workplace privacy, discovery in civil litigation, the dissemination of nude images on the Internet, or shielding criminal offenders from public exposure. To people accustomed to the continental way of doing things, American law seems to tolerate relentless and brutal violations of privacy in all these areas of law. I have seen Europeans grow visibly angry, for example, when they learn about routine American practices like credit reporting. How, they ask, can merchants be permitted access to the entire credit history of customers who have never defaulted on their debts? Is it not obvious that this is a violation of privacy and personhood, which must be prohibited by law?

All of which leads us to believe that although the considerable difference between the culture and legal systems of Common Law and Continental tradition, there is a reasonable margin of convergence on privacy and its development in informational self-determination. As WHITMAN (*op. cit.* , P.1161) points out, this apparent and relative conflict seems to stem from the institutional struggle of dignity vs. freedom. Whereas for Continental Law, privacy is seen as an unfolding issue of the human personality, which is expressed and represented through its self-exposure and self-determination in society, in American Common Law it is interpreted as a barrier to state intrusion into life and property of the individual.

Added to this is another variable in this delicate equation: a significant cultural change that has occurred over the past few decades that also directly influences the individual’s right to personality.

We started from a contemplative world to a world mediated by technology, due to the ubiquity of smartphones and devices connected to IoT, which can passively collect data about preferences, locations, displacements, purchases, choices, opinions, friendships, frequency communications, among others. As PARISER (2011) poses, we have come to an era where *the user is the content*. In other words, there is significant potential for databases that are unusual and objectively unknown by the individual to be created and used in the background of new business models.

Many countries have established more explicit Laws to address the individual's right to privacy and data protection without neglecting that these provisions cannot and should not represent an obstacle to innovation and the development of new businesses.

From the technological and cultural evolution added the historical differences of these legal systems, among which stand out the Common Law and those whose tradition goes back to the roman-germanic family, called Continental, we can identify different approaches to privacy law and its regulation.

In Brazil, the recently approved Law 13,709 / 2018¹⁰⁹, known as LGPD and which will run from August 16, 2020, is reportedly inspired by the European data protection model, in slight opposition to the American bias. However, this does not mean that the national legal framework will inhibit the development of new business. A clear view of the argument requires understanding the confluence of Laws, added to the collision of cultures so that the path is plain.

Throughout this historical scenario, the concern with the establishment of a Law that regulates the right to privacy and data protection in a contemporary and stratified way is only recent in our legislative history. Although other countries in Latin America, such as Argentina, have had Laws regarding this since 2001, in Brazil

¹⁰⁹ Known as the Data Protection General Act, which stands for the initials LGPD in portuguese.

this matter had been regulated until then by the intersections of the Federal Constitution, the Civil Code, the Consumer Protection Code and the Internet Bill of Rights, like a patchwork under the mantle of human dignity.

However, the absence of a specific Law did not prevent Brazilian courts from deciding cases of abuse in the processing of data and deciding on it, as well as allowing the Government to act in investigating violations of consumer relations in practices that are offensive to privacy.

2. Common Law And Continental Law Effects On Brazil Law

Although there was an inevitable convergence in the development of Privacy Laws around the world, until then in Brazil, the pre-LGPD system worked much like the American patchwork. In any case, it is essential to note that the Brazilian data protection law is reportedly inspired by the European regulation and taking advantage of the common origin of both legal frameworks.

Perhaps the most significant difference between the Brazilian and the American systems is that in Brazil, the right to privacy and, consequently, the right to informational self-determination, are recognized as personality rights, safeguarded by the founding principle of the republic of protection of the dignity of the human person.

The current statement that the right to privacy is one of several personality rights means giving it a central status in the legal system, as one of the most protected supreme values because they are related to the exercise of the individual's private autonomy. CUPIS (2008, p.24) illustrates this position well:

In other words, there are certain rights without which the personality would remain a completely unrealized susceptibility, deprived of all tangible value: when all

other rights would lose interest to the individual - which is to say that if they did not exist, the person would not exist as such. These are the so-called essential rights, with which personality rights are precisely identified. That the designation of personality rights is reserved for essential rights is fully justified because they constitute the core of personality.

SCHREIBER (2014, p.13) is also very clear when complementing that:

Personality rights are essential attributes of the human person, whose legal recognition results from a continuous march of historical conquests. Over the past few centuries, the topic has been treated under different approaches and different denominations. The French Constituent Assembly, for example, referred, in its famous declaration of 1789, to the Rights of Man and Citizen. The United Nations Declaration of 1948 uses the expression of Human Rights. The Brazilian Constitution of 1988 is dedicated, in Title II, to Fundamental Rights and Guarantees. The Brazilian Civil Code reserves a chapter on Personality Rights. What, after all, is the distinction between all these expressions?

The cultural and historical diversity among so many legal systems has meant that all of these terms are used as synonyms for a protective nucleus of individual interests, those personality attributes that demand recognition and legal protection. As SCHREIBER (*ibidem*) very well complements, the term personality rights is used to refer to human attributes that require special protection in the field of private relations, that is, in the interaction between private individuals,

without however also finding a constitutional basis and protection in national and international plans.

It is true that the Brazilian Civil Code that was in force during almost the entire 20th century, traditionally inspired by the Napoleon Code, did not regulate personality rights objectively, given its essentially patrimonial character. During that time, the vision of freedom of the Liberal State prevailed until the phenomenon of the massification of contracts and the fallacy of full individual autonomy paved the way to the Welfare State, which became very clear mainly after 1942 with reforms in the health and education systems. In Brazil, the peak of state intervention in the economy occurred between the 1970s and 1980s, culminating in the 1988 constitutional reform and the solidification of the Democratic Rule of Law paradigm. However, even in this historical scenario, the recognition of personality rights was carried out by national jurisprudence that directly applied the constitutional text in resolving conflicts between individuals.

It would not be correct to say, however, that the Common Law tradition would neglect the concept of privacy protection as a necessary control over the publicization of name, honor, image, and reputation. Incidentally, it is the central nucleus on which the two traditions converge. As highlighted by WHITMAN (2004, p.1150):

The idea that privacy is really about the control of one's public image has long appealed to the most philosophically sophisticated American commentators, from Alan Westin, to Charles Fried, to Jeffrey Rosen, to Thomas Nagel. In its most compelling form, the claim has come from Robert Post: For Post, privacy law protects norms of dignity that are "civility rules," just like the norms of etiquette; and without the protection of such norms, he argues, no society can maintain any form of community. Moreover, similar ideas can already be found in the most famous of

American articles, Samuel Warren and Louis Brandeis's 1890 *The Right to Privacy*.⁶⁹ All of these American writers have viewed the danger in the violation of our "privacy" as the danger that we will lose the capacity to control what Erving Goffman famously called our "presentation of self"-our image before the eyes of others in society. All of them have thought of our right to privacy, perhaps a shade paradoxically, as our right to a public image of our own making, as the right to control our public face. Indeed, it is precisely for that reason that they have insisted on the connection between privacy and personhood.

Although a different starting point can be seen at both legal systems, there are many features of conceptual convergence that allow for dialogue between them and that allow for a more precise mapping of risks and opportunities for companies in cross-border transactions.

The analysis of Continental heritage in the Brazilian system, the existing legal patchwork has never prevented the adequate performance of public agencies and the solution of disputes between private individuals even in the pre-LGPD scenario.

A categorical example of the government's action in determining the responsibility of companies for the uses and misuses of consumer personal data is found in the administrative process of abusive practices carried out by the Public Ministry of the State of Minas Gerais against a drugstore.

The practice adopted by the company was to request the consumer's CPF, which would stand for the social security number in the U.S., at the time of purchase to grant a discount on the price of medicines. No information about the discount program was passed on, as well as the purpose for which this data would be used later, how it would be stored if it would be shared with other companies, how

long they would stay there were not clarified. Consumers also had not any way to request its erasure or correction.

The legislative patchwork used in the construction of this representation against the company was a joint application not only of the guarantee of privacy provided for in the Federal Constitution but of several federal laws and sectoral regulations.

In this regard, Law 12,965/2014, known as the Internet Bill of Rights, envisions the imposition of transparency in the relations of supply of products and services, as well as the obligation to notify the purpose for which customer data is captured, stored and interpreted.

Law 12,965/2014 establishes that:

Art. 3. The discipline and use of the internet in Brazil have the following principles:

- I- the guarantee of freedom of expression, communication, and expression of thought, under the terms of the Federal Constitution;
- II- protection of privacy;
- III- protection of personal data, in accordance with the law;

These principles are followed by several provisions regulating the inviolability of intimacy and private life, as well as their protection and compensation for their violation, the duty to provide clear and comprehensive information about the collection, use, storage, treatment and protection of personal data, linking its use for specific purposes.

Although at first, the reader could question why the Internet Bill of Rights is being invoked to regulate the purchase and sale of medicines in drugstores, it is important to highlight two circumstances: first, this relationship also occurred through the Internet, and second and more importantly, the dialogue of sources is an institute

increasingly present in the post-positivist daily life of the Brazilian legal framework. In this case, the question was not even raised by the company itself.

Besides, Law 8,078/1990, known as the Consumer Protection Code, has a comprehensive regulation of the duty of transparency and protection of consumer vulnerability in the market, establishing limits for the free establishment of rules by corporations. In this sense, Article 6, item III, recognizes as a fundamental right of the consumer the adequate and transparent information on the different products and services, with correct specification of quantity, characteristics, composition, quality, taxes, and price, as well as on the risks they present.

It is also clear that the secondary use of the CPF database of drug buyers regarding the medications itself, the locations and dates on which they were bought, constitute an abusive practice if not informed clearly and previously to the consumer, all of which is provided for in article 6, item IV, of Law 8.078/1990. Consent is irrelevant for that matter. This section of the Law deals with misleading and abusive advertising, coercive and unfair commercial methods, and unfair or imposed practices and clauses as a condition for the supply of products and services. In this context, it would not be difficult to understand that the creation of a database in a mysterious way by the company could represent a risk to the health and safety of its consumers, especially when considering the hypothesis of sharing such data with third parties such as health plans for those there is a prohibition on the establishment of discriminatory practices.

In this regard, Brazilian consumers have a guaranteed right to access their information stored in company databases and an explanation about the sources from which they were obtained. The creation of a program for granting discounts on medicines through the collection of personal data without establishing an explicit and

publicized flow to allow the consumer to exercise these rights is considered as an abusive practice.

Allied to this whole scenario, to further aggravate the finding that the protection of privacy is a topic widely addressed by the Brazilian legal framework, the Resolution of the Anvisa Collegiate Board, RDC 44, of 08/17/2009, prohibits the use of personal data for the promotion, advertising and advertising in online drug purchases.

It is also important to highlight that given the recognition of the consumer's vulnerability in the mass market and the ostensibility of the duty to provide clear, complete and objective information about their services and products, their practices and the risks they offer, the consent individually expressed is not recognized as a safe harbor capable of justifying certain behaviors in many cases.

Although the LGPD establishes a much brighter scenario to regulate the processing of data on and offline, there is no need to talk about any gap or deficiency of the legal system in dealing with practices considered abusive to the consumer's right to personality, thus considered individually or collectively. For no other reason, the result of such an administrative proceeding was the application of a fine of more than R\$ 7,000,000.00 as well as other measures that may be adopted.

In a very similar line of reasoning, the Concessionaire of Line 4 of the São Paulo Metro S / A was triggered in a class action founded on the abusive practice of capturing biometric data of people who were transiting the public road for the identification and creation of a database on the emotions of anger, joy, and neutrality, in addition to gender and age range in front of ads disclosed in corridors. Still, without a decision, this claim presents a risk for collective damages of at least R\$ 100,000,000.00.

Faced with this scenario of apparent insecurity for those who are not used to the complexity of the Brazilian legal system, the LGPD

imposes itself as a comprehensive rule to regulate the processing of personal data in any activity.

The LGPD establishes the legal basis that can support the data processing performed by any corporation in the country, which involve: (a) the consent of the holder; (b) compliance with legal or regulatory obligation; (c) conducting studies by a research body with preferential use of anonymized data; (d) the execution of contracts or preliminary contract procedures at the request of the data subject; (e) the exercise of the right of defense in judicial, administrative or arbitral proceedings; (f) the protection of life or physical safety of the data subject or third party; (g) or to ensure health, in procedures performed exclusively by health professionals, health services or health authority; (h) to meet the legitimate interests of the controller or third party, except in the event of conflict with fundamental rights and freedoms that require data protection; (i) by the public administration in the formulation and execution of public policies or resulting from contracts, agreements or related acts; (j) and for credit protection, the latter being an innovation in terms of US law and European regulation.

Of all the legal basis envisaged, the one that draws the most attention in structuring new businesses and uniquely innovative and scalable business models is the legitimate interest, while highlighted as the legal foundation primarily used in the privacy plans of European companies. Even for this reason, and to avoid the misconception that legitimate interest could be linked only to the achievement of a company's core activity, it is common to propose a test of a legitimate interest that comprises four simplified steps.

The first involves analyzing whether the intended data processing encounters any pre-defined barriers or barriers in legislation or sectoral regulations. The second is the identification of the data that will be treated in operation, applying the purpose and necessity filters to them. The third consists of the required balance with the expectation of privacy of the individual whose data will be

processed, not admitting what is not reasonably expected by him. The fourth and final stage involves the establishment of safeguard hypotheses in the treatment of personal data, such as information security criteria, the form of exercise of the holder's rights, the term of storage, disposal, and anonymization.

Through this mapping, which can be found in article 10 of the LGPD, it is possible to create action plans and to adapt the activity performed by the company to the current legislation.

The central point to understand is that data protection under Brazilian Law does not, under any circumstances, stand in the way of innovation or the development of new businesses. However, the indiscriminate use of data in a secondary way to the supply of products and services increasingly belongs to the ideology of a distant past.

One of the imperatives proposed by the LGPD is the prohibition of processing data that has no direct causal relationship with the product or service provided. One can already see a common-sense of consumers with a negative view on such practices frequently performed by companies, which ends up making the protection of the privacy of individuals a real competitive advantage and an opportunity to overlap itself in a market that is surrounded by an economic crisis and a high margin of unemployment. When collecting data that is strictly necessary for the company's activity, it ends up demonstrating not only its respect for the legislation but mainly for the individuality of each of its consumers, which causes a definite impact on the perception of satisfaction and image of the brand itself to cultivate long-term relationships.

It is not uncommon for examples of national legislation in which modifications today considered necessary and even indispensable were initially seen as an increase in bureaucracy and an obstacle to innovation and the free movement of goods and services through the market.

Law 6,514/1977 introduced into Brazilian labor law the obligation for companies to provide personal safety equipment to their workers, aiming at reducing occupational accidents and mitigating the damage caused to them. It also recognized that it would constitute a functional fault for those workers who refused to use such equipment during their working hours.

During the years that followed, a great campaign of awareness was held for entrepreneurs, workers, unions, lawyers, economists, accountants, and administrators in order to understand that the establishment of rules for the use of safety equipment at work would be a decisive factor for the organization and mitigation of losses, especially in cases of death or permanent disability due to work accidents. It was an item whose public interest overlapped private interests, and the mere and false belief in individual freedom was not admitted as the best informer of this decision matrix.

In the 1990s, Brazil enacted Law 8,078/1990 and made it clear that in contracts involving consumer relations, there would be several rights and obligations that could not be ignored. Mass contracting could no longer neglect deadlines for returning products, responsibility for technical assistance, the duty of information, mandatory compliance with advertising, among other very relevant issues. It is not surprising that the first critics of this legislation saw an undue interference in contracts and private relations, still based on the argument of freedom and autonomy of the will. However, currently, there is no dissent regarding the importance that this Law represents in the search for balance in consumer relations and especially in the curbing of predatory or unfair practices often found in the market.

It is believed that the LGPD stands for the decade of 2020s as those Laws were for the previous decades. A challenge to cultural landmarks and a shift in the perception that the processing of personal data is an essential theme for the digital economy, but that goes beyond

its boundaries, being equally relevant to the conception of citizenship and democracy in the 21st century.

Conclusion

The creation of Brazilian legislation to regulate the treatment of data comprehensively, for any activity on and offline, inspired in the European regulation does not mean that we are inserted in a legal framework so distant from the Common Law sense of freedom. There are indeed conceptual differences to be taken into account, such as the principles of dignity and freedom were quickly addressed.

However, the consolidation of the Brazilian framework, which will leave behind its patchwork and have a broad systematization from the LGPD is seen as a positive point for the economy and companies that see it as an opportunity to create a real competitive advantage.

Beyond the difficulties of cultural homogenization, data regulation imposes a new way of thinking according to standards of good faith, clarity and transparency that have not always been seen in this way throughout our history, especially in the historical transition of the State Liberal for the Social Welfare State until we reach the intended maturity of the Democratic Rule of Law.

What we are facing, therefore, seems to be the traditional challenge of understanding post-positivist thinking through the interference of constitutional principles, especially that of the dignity of the human person, in concrete situations that exist between individuals. There is no doubt, in this sense, that the LGPD constitutes a significant and imponderable legislative advance in the contemporary world in order to bring greater objectivity and more solid bases for the development of new businesses between individuals and in their relations with the State. However, it is essential to highlight that the development of new businesses in this scenario of profound transformation brought about by contemporaneity and by the various

privacy laws, including sectoral and extraterritorial regulations, needs, even more, an in-depth mapping of their compatibility with the legal bases of LGPD to mitigate the risks of individual claims and class actions regarding moral damages for the violation of personality rights. However, it is essential to highlight that the development of new businesses in this scenario of profound transformation brought about by contemporaneity and by the various privacy laws, including sectoral and extraterritorial regulations, needs, even more, an in-depth mapping of their compatibility with the legal bases of LGPD to mitigate the risks of individual claims and class actions regarding moral damages for the violation of personality rights.

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Automated Decision-making And Data Protection Regulation: Alternatives Presented By The Brazilian General Data Protection Law

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Abstract

This text explores the alternatives adopted by the Brazilian Data Protection Regulation regarding the regulation of automated decision-making and its potential for violation of data subjects' rights. We will briefly introduce the risks of profiling and data mining and the shortcomings of an approach focused only on empowering the individual. Afterward, the regulation brought by the Brazilian law on the topic will be presented, where we argue that there is potential for both a collective protective system and tools for preemptive action to assure the rights and principles established by the law.

Key Words

Brazilian General Data Protection Law; Automated Decision-making; Profiling

Introduction: Data Protection Regulation in Brazil

Data protection laws and regulations were boosted by the European General Data Protection Regulation – known as GDPR – and today more than 120 countries have some data protection law enacted. In Brazil, the General Data Protection Law (Law 13.709/2018) – also known and referred to from here onwards as LGPD – brought important innovations to the Brazilian legal system. The law was directly influenced by the GDPR, providing a similar legal regime.

However, while the GDPR emerged as an evolution of regulations that already existed in the European scenario, notably Directive 95/46/EC, in the Brazilian case, before the LGPD there was no law that would comprehensively discipline data protection. Brazil counted only with sectoral laws, such as the Consumer Protection Code (Law 8.078/1990), the Positive Registration Law (Law 12.414/2011), for the credit sector, as well as the “Acess to Information Law” (Law 12.527/2011) and *Habeas Data*, both aimed at the oversight of the public power¹¹⁰.

Thus, the LGPD should be understood as a law that inaugurates and unifies a new data protection system in Brazil. As a consequence, broader rules and a focus on legal principles can be observed, especially when compared to the GDPR. Whether this can be considered as leading to a weaker data protection system is something to be observed in the coming years, as the law only came into force in August 2020. On the other hand, it should also be noted that the Brazilian law, although inspired by the GDPR, brought some innovations to the field of data protection, usually coming from other areas of Brazilian law, such as the collective process.

As we will seek to demonstrate throughout the text, these innovations may be important in fostering a collective dimension for

110 BIONI, Bruno. *Proteção de Dados Pessoais: a função e os limites do consentimento*. Rio de Janeiro: Forense, 2019.

data protection¹¹¹. In other words, we believe it is possible to argue that the LGPD no longer understands the rights it prescribes as solely individual rights, as it expressly provides for the exercise of collective actions for the protection of those rights. In addition, we argue that Brazilian law has promising instruments for combating discrimination generated by data processing activities.

We propose to develop these core ideas in the remainder of the text by studying the regulation of automated decision-making and the right to an explanation. There are several debates occurring in Europe regarding the existence or not of this right in the GDPR¹¹². We expect a similar debate to occur in the Brazilian scenario, and because of that some ideas and propositions will be presented.

In addition to the discussion of whether or not the right to an explanation exists, there is a broader debate about the legal safeguards that fall on automated decision-making, notably GDPR's Article 22 and Article 20 of the Brazilian Data Protection Law, and its effectiveness.

We start from the hypothesis that the exercise of the right to an explanation on an individual scale may not be the best instrument of protection when confronted with decisions that are often made (or at least have an effect) at a collective level¹¹³.

111 MANTELERO, Alessandro. Personal Data for Decisional Purposes in the Age of Analytics: From an individual to a collective dimension of data protection. *Computer Law & Security Review*, v. 32, n. 2, p. 238-255, 2016.; MITTELSTADT, Brent. From Individual to Group Privacy in Big Data Analytics, *Philosophy & Technology*, v. 30, n.4, Dec. 2019, p. 475-494.; TAYLOR, Linnet; FLORIDI, Luciano; VAN DER SLOOT, Bart (Eds.). *Group Privacy: New Challenges of Data Technologies*. Springer International Publishing, 2017.

112 GOODMAN, Bryce.; FLAXMAN, Seth. European Union Regulations on Algorithmic Decision-Making and a "Right to Explanation". *AI Magazine*, v. 38, n. 3, 2017, p. 50-57.; SELBST, Andrew D.; POWELS, Julia. Meaningful Information and the Right to Explanation. *International Data Privacy Law*. Oxford: Oxford University Press. v. 07, n. 04, Nov. 2017, p. 233-242.; WACHTER, Sandra MITTELSTADT, Brent, FLORIDI, Luciano. Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation, *International Data Privacy Law*, v. 7, n. 2, May 2017, p. 76-99.

113 MANTELERO, Alessandro. Personal Data for Decisional Purposes in the Age of Analytics: From an individual to a collective dimension of data protection. *Computer*

In the first part of the text, we will address some of the problems and rights violations that fully automated decision-making can cause, expecting to demonstrate that the understanding of these activities goes beyond the individual's boundary in a way that neither their regulation nor the exercise of data subjects rights can be restricted to the individual scale.

In the second part, we will provide an overview of safeguards on automated decision-making, focused on Article 22 of the GDPR, and then draw parallels with what the Brazilian law brings as alternatives, pointing out differences and similarities. We argue that although the LGPD provides a weaker regulation than the GDPR, some of its provisions, notably the possibility of exercising data subjects rights on a collective scale, the principle of non-discrimination and transparency, and the possibility of reversal of the burden of proof, appear as promising instruments in the regulation and control of automated decision-making.

1. Data Processing, Automated Decision-Making and its Threats.

1.1. Big Data and Profiling as a Supra-Individual Phenomena

A working definition of profiling was proposed by Hildebrandt as:

The process of 'discovering' correlations between data in databases that can be used to identify and represent a

Law & Security Review, v. 32, n. 2, p. 238-255, 2016.; ROUVROY, Antoinette. "Of Data and Men". *Fundamental Rights and Freedoms in a World of Big Data*. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR (2015)09REV, 2016, 2016, p. 1-37. EDWARDS, Lilian; VEALE, Michael. Slave to the Algorithm? Why a 'Right to an Explanation' Is Probably Not the Remedy You Are Looking For, *Duke Law & Technology Review*, v. 16, n.1, 2017, p. 18-84.

human or nonhuman subject (individual or group) and/or the application of profiles (sets of correlated data) to individuate and represent a subject or to identify a subject as a member of a group or category¹¹⁴.

This definition, though, does not highlight the ethical features that make these technologies relevant to the law. In that sense, we agree with Mittelstadt and others, when they claim that from an ethical perspective, it makes little sense to consider the abstract mathematical structure of the algorithm independent of how it is implemented or executed in software or applications¹¹⁵. Considering that profiling and data mining techniques just make sense for their predictions of concrete situations, it presents direct consequences for the subjects when they are exercising their rights or for the development of their personhood¹¹⁶. In that sense, the rules regarding the protection of data subjects' rights address big data technologies from their ethically and legally relevant uses.

The Brazilian General Data Protection Law (LGPD) does not bring a definition of profiling, however, this kind of data processing is indirectly mentioned in Article 12, Paragraph 2¹¹⁷, and Article 20¹¹⁸. When it comes to profiling, the LGPD focus is the possibility of

114 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 19.

115 MITTELSTADT, Brent *et al.* The ethics of algorithms: Mapping the debate. *Big Data & Society*, v. 3, n. 2, 2016, p 1-21.

116 MARTINS, Pedro, HOSNI, David. O Livro Desenvolvimento da Identidade Pessoal em meio digital: Para Além da Proteção da Privacidade?. In: POLIDO, Fabrício, ANJOS, Lucas, BRANDÃO, Luíza (Orgs.). *Políticas, Internet e Sociedade*. 1ed. Belo Horizonte: IRIS, 2019, p. 46-54.

117 "For purposes of this Law, the data used for formation of the behavioral profile of a given natural person, if identified, may also be deemed personal data." Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

118 "The data subjects are entitled to request a review, by a natural person, of deci-

behavioral prediction¹¹⁹ and its use in automated decision-making that can bring consequences to the interests and the rights of the subject¹²⁰.

Likewise, the GDPR defines profiling, in its Article 4(4) with emphasis on its uses for behavioral prediction and other socially relevant characteristics of the subject:

(4) ‘profiling’ means any form of automated processing of personal data consisting of the use of personal data to evaluate certain personal aspects relating to a natural person, in particular to analyze or predict aspects concerning that natural person’s performance at work, economic situation, health, personal preferences, interests, reliability, behavior, location or movements;

Another important point to note in the definition brought by GDPR is the fact that to be characterized as profiling, some automated processing must occur. However, this processing does not have to be fully automated. In other words, human participation in the process does not mischaracterize the phenomenon¹²¹.

sions made only based on the automatized processing of personal data that affects their interests, including of decisions designed to define their personal, consumption and credit profile or the aspects of their personality” Translated by: BELL, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

119 ZANATTA, Rafael. *Perfilização, Discriminação e Direitos: do Código de Defesa do Consumidor à Lei Geral de Proteção de Dados Pessoais*. Available at: <http://rgdoi.net/10.13140/RG.2.2.33647.28328>. Accessed 19 November, 2019

120 BIONI, Bruno. *Proteção de Dados Pessoais: a função e os limites do consentimento*. Rio de Janeiro: Forense, 2019.

121 ARTICLE 29WORKING PARTY (A29WP). *Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679*. (WP251rev.01). Brussels, 2018. Available at: http://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=612053. Accessed 21 May, 2018.

These definitions, as said, are not abstract and purely technical definitions, as they reflect and prioritize the ethical and legal features of the technology use.

Despite this attempt to highlight the ethical and legally relevant aspects, the referred legislation leaves out some of the more worrying aspects. Antoinette Rouvroy points out that analyzing the profiling activity as solely processing personal data to generate information about a specific person brings severe limitations. As the author claims:

The predictive models or supra-individual profiles assigned to individuals are based on infra-individual data deriving from a large number of individuals. In this process, data from any individual is just as valid as data from any other – your data is as good as your neighbors¹²².

Moreover, profiling can be made with anonymized data¹²³ and can be directed to a certain group instead of a specific person¹²⁴, contrary to what the definition of the GDPR presupposes when it says “*certain personal aspects relating to a natural person*”.

Another legally relevant aspect of the use of profiling left out by the presented legislation is group profiling and clustering. This concerns the use of big data and profiling techniques to create groups that are not yet known or cannot be known outside the processing logic of machine-learning¹²⁵.

122 ROUVROY, Antoinette. “Of Data and Men”. Fundamental Rights and Freedoms in a World of Big Data. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR (2015)09REV, 2016, 2016, p. 33.

123 MANTELERO, Alessandro. Personal Data for Decisional Purposes in the Age of Analytics: From an individual to a collective dimension of data protection. *Computer Law & Security Review*, v. 32, n. 2, p. 238-255, 2016.

124 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.

125 About machine learning, see SEAVER, Nick. Knowing Algorithms. In: VERSETI,

Antoinette Rouvroy points to a difference between individual profiling, which follows a traditional categorization logic, and clustering. She claims that in the traditional logic common features of a group are identified and subsumed to pre-existent categories¹²⁶. That is to say, the categories exist as significant social phenomena, like ethnic, religious, or national groups. To put individuals in these categories makes them see themselves as belonging in a way that they could create relationships of interdependence or solidarity. Differently, on clustering or group profiling the goal is to use the data processing to create or to find out new categories that do not yet exist, “*which are imperceptible (because they emerge only as the process unfolds), and most often without any possibility of [the subject] being aware of what is happening or recognizing themselves*”¹²⁷.

Clustering groups, then, do not present the social relations existent in the groups formed under traditional categorization, creating new, sometimes imperceptible, groups that could be vulnerable to bias or discrimination, making it harder to individuals to even know their rights are being violated. Mittelstadt identifies these groups constituted by means of clustering as *ad hoc* groups, since they are formed from a specific and volatile grouping process with a specific goal. The data subject might not know this group exists, even though he is part of it and could suffer its effects as a result. Under a collective protection

Janet, RIBES, David (Eds.) *digitalSTS: A Field Guide Study for Science & Technology Studies*. Princeton & Oxford: Princeton University Press, p. 412-422. Available at: https://digitalsts.net/wp-content/uploads/2019/11/26_digitalSTS_Knowing-Algorithms.pdf. Accessed 20 jan 2020. and VEALE, Michael. *Governing Machine Learning that Matters*. 2019. Doctoral thesis (Ph.D), 352 p., UCL (University College of London). Available at: <https://discovery.ucl.ac.uk/id/eprint/10078626/>. Accessed October 18, 2019.

126 ROUVROY, Antoinette. “Of Data and Men”. *Fundamental Rights and Freedoms in a World of Big Data*. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR (2015)09REV, 2016, 2016, p. 1-37.

127 ROUVROY, Antoinette. “Of Data and Men”. *Fundamental Rights and Freedoms in a World of Big Data*. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR (2015)09REV, 2016, 2016, p. 28.

perspective, as will be discussed below, there are doubts concerning how would the interests of this *ad hoc* groups be represented¹²⁸.

Thus, the constructed profile is not an exact representation of that person, but an attempt to predict their behavior for a specific goal made from a massive aggregation of data. Watcher claims that “*what matters is whether the user behaves similarly enough to the assumed group to be treated as a member of the group*”¹²⁹.

Hildebrandt cites a hypothetical example of a group of people that are left-hand and have blue eyes that has a correlation of the likelihood of developing a specific disease¹³⁰. From this, a group emerges of people with that characteristics and the increased likelihood of developing such a disease could be attributed to them. This reveals that, even without ever having consented to the collection of personal data or its processing, the risk classification based on common attributes can indirectly affect subjects who cannot object. Therefore, as not only personal data from a single subject is used to build a model, a limbo is created between the possibility of exercising individual rights to control a profile and the aggregated mass data used to form that profile.

1.2. Other Relevant Features of Automated Decision-Making Processes

In the previous topic, we identified the shortcomings of associating profiling with the identification or evaluation of a specific natural person, expecting to demonstrate that this technique causes

128 MITTELSTADT, Brent. From Individual to Group Privacy in Big Data Analytics, *Philosophy & Technology*, n. 04, 2017, p. 475–494.

129 WACHTER, Sandra. “Affinity Profiling and Discrimination by Association in Online Behavioural Advertising”, 2019, p. 13. Available at: <https://ssrn.com/abstract=3388639> Accessed May 25, 2019.

130 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.

consequences on a supra-individual scale. Now, we will show other threats posed by the technique regarding its discriminatory effects¹³¹.

Initially, it is important to note that correlations established by machine-learning techniques¹³² cannot be surely anticipated and, on the other hand, they do not explain the reasons behind the correlations it discovers¹³³. As, according to Hildebrandt, the correlations discovered by data mining and profiling processes do not establish the causes or the reasons for its existence or perpetuation. The algorithm works by finding the correlations existent between the variables and, when it is used to automated decision making, finding which is the best course of action considering the probability of these correlations to hold¹³⁴.

This classificatory nature of profiling and mining technologies allows us to raise a concern associated with them: the correlations and division of groups based on data related to ethical and legally relevant characteristics, such as skin color, ethnic origin, naturalness, gender, sexual orientation, socioeconomic condition, health condition,

131 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.; GOODMAN, Bryce.; FLAXMAN, Seth. European Union Regulations on Algorithmic Decision-Making and a “Right to Explanation”. *AI Magazine*, v. 38, n. 3, 2017, p. 50-57.; SCHERMER, Bart. Risks of Profiling and the Limits of Data Protection Law. In: CUSTERS, Bart.; CALDERS, Toon.; SCHERMER, Bart.; ZARSKY, Tal. (Eds.) *Discrimination and Privacy in the Information Society: Data Mining and Profiling in Large Databases*. Berlin: Springer-Verlag, 2013, p. 137-152

132 About machine learning, see SEAVER, Nick. Knowing Algorithms. In: VERSETI, Janet, RIBES, David (Eds.) *digitalSTS: A Field Guide Study for Science & Technology Studies*. Princeton & Oxford: Princeton University Press, p. 412-422. Available at: https://digitalsts.net/wp-content/uploads/2019/11/26_digitalSTS_Knowing-Algorithms.pdf. Accessed 20 jan 2020. and VEALE, Michael. *Governing Machine Learning that Matters*. 2019. Doctoral thesis (Ph. D), 352 p., UCL (University College of London). Available at: <https://discovery.ucl.ac.uk/id/eprint/10078626/>. Accessed October 18, 2019.

133 SCHERMER, Bart. The limits of privacy in automated profiling and data mining. *Computer law & security review*. n 27, 2011, p. 45-52.

134 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.

religious, political or philosophical belief, among others. Profiling based on these characteristics has enormous potential to deepen existing discriminatory issues or even to create new discriminatory practices.

A hastened solution to this problem might suggest that this data should be excluded from data processing, as determined by the GDPR in its Article 22, item 4, prohibiting automated decision making based on special category data. However, this solution brings other problems. First of them is the several exceptions made to the main rule, allowing the use of these sensitive data in two hypotheses: when the data subject gives his informed consent and when the data processing is necessary for reasons of substantial public interest (arts. 9 (2) (a) and (g)). This consent could be ineffective as a protective measure and its centrality is a shortcoming of this norm. (For more on the inadequacy of consent as a protective measure, see topic 3.1).

Other inadequacies of this protection based on the special category data are due to its definition, given by art. 9 of the GDPR, and includes, for example, data that reveals the ethnic or racial origin, political and religious opinions, biometric data, health data, sexual orientation, among others. However, other data that identifies vulnerable groups are not included, such as gender, financial income, place of residence, employment.

Another problem related to profiling and clustering is identified by Sandra Wachter, as the author points out the possibility of the use of *proxy data*. This kind of data does not directly link a data subject to a protected category (e.g. ethnicity), but only identifies an affinity of the subject with a particular group. It allows the data controller to try and escape the obligations related to processing special category data. This is the case with the targeting of advertising allowed by Facebook, in which advertisers could exclude certain groups with “ethnic affinities” from receiving their ads¹³⁵.

135 ANGWIN, Julia, PARRIS JR., Terry. *Facebook Lets Advertisers Exclude Users by Race*.

This discriminatory effect can appear in any stage of the technique development, as the algorithm design, the AI feeding and learning, or the current use of the algorithm in a social medium, where discriminatory practices are common, generating unwanted feedback¹³⁶.

However, the actual existence of unfair discrimination that violates the legal order in the process of profiling is not easy to verify. The technical difficulties are many, as well as what is considered a fair or unfair result¹³⁷. Although theoretically possible, the practical evaluation of the results and decision-making processes of algorithms, especially those based on machine learning, can be extremely complex even for specialists in the technology in question¹³⁸. Schermer also argues that removing sensitive data from automated processing bases may mean excluding means to verify, after processing, whether an algorithm has made a discriminatory decision¹³⁹.

This practical impossibility of obtaining a detailed technical evaluation of the processes limits the possibilities of evaluation, since “we often are bound to assess only the (un)fairness of its treatments from how it behaves with regard to actual individuals¹⁴⁰”, which certainly leads, sometimes, to incorrect evaluations.

Available at: <https://www.propublica.org/article/facebook-lets-advertisers-exclude-users-by-race>. Accessed January 10, 2020.

136 KUNER, Cristopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 1-2.

137 As an example, an article published on MIT Technology Review demonstrates in an interactive way, using the COMPAS database, the difficulties of defining fair and non-discriminatory methods for the algorithmic prediction. HAO, Karen, STRAY, Jonathan. *Can you make AI fairer than a judge? Play our courtroom algorithm game*. Available at: <https://www.technologyreview.com/s/613508/ai-fairer-than-judge-criminal-risk-assessment-algorithm/>. Accessed January 6, 2020.

138 CARMICHAEL, Laura, STALLA-BOURDILLON, Sophie, STAAB, Steffen. Data Mining and Automated Discrimination: A Mixed Legal/Technical Perspective. *AI and Web Science*. November/December, 2016, p. 51-55.

139 SCHERMER, Bart. The limits of privacy in automated profiling and data mining. *Computer law & security review*. n 27, 2011, p. 45-52.

140 CARMICHAEL, Laura, STALLA-BOURDILLON, Sophie, STAAB, Steffen. Data Min-

Beyond these risks inherent to the profiling technique is the fact that the subjects have no access to the knowledge used to classify the profiles¹⁴¹. This puts them in an extremely disadvantageous position related to the data controller. Schermer calls it an informational asymmetry between subject and controller, reinforced by the controller's proprietary protection of the data used in the process and of its outcomes. This asymmetry can raise serious problems on consumer markets, where not only the offer, but the price of the products can be conditioned based on these personal features, and also on democratic relations between citizens and governments:

In the context of the relation between government and citizens, information asymmetries can also affect individual autonomy. If data mining indeed yields information the government can act upon, the government will have more power. Moreover, the fear of strong data mining capabilities on the part of the government may 'chill' the willingness of people to engage in political activities, given the fear of being watched. For this fear to materialize, profiling does not even have to be effective¹⁴².

This problem cannot be overcome by a simple willful right to privacy, one that theoretically would protect us from unauthorized profiling and data mining processes, making these unbalanced relations lawful with a simple consent. Automated profiling based on big data has a much greater potential for damages and discriminations than traditional classification techniques. Hildebrandt points out

ing and Automated Discrimination: A Mixed Legal/Technical Perspective. *AI and Web Science*. November/December, 2016, p. 51.

141 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.

142 SCHERMER, Bart. The limits of privacy in automated profiling and data mining. *Computer law & security review*. n 27, 2011, p. 47.

that it could harm the subject's liberties, since the subjects cannot adequately anticipate the actions of those who have more information about him than himself. The economic and political power of the data controllers makes the relations even more unbalanced, with the interests of the controller overriding those of the subject, making it more difficult for subjects to exercise their rights when faced with these powerful controllers¹⁴³.

All these features and uses of the technologies of data mining and profiling must be kept in mind when we are to evaluate, next, the approach proposed by GDPR and LGPD to regulate automated decision-making based on these technologies.

2. Safeguards on Automated Decision-Making: The GDPR and LGPD

The Brazilian General Data Protection Law mentions automated decision-making only in its Article 20. There, it establishes the right to review decisions “*made only based on automated processing*”¹⁴⁴. In its first paragraph, it provides for the right to request information regarding the “*criteria and procedures used for the automated decision*”. Thus, under Brazilian law, for the right to review to be applicable, it is necessary that the decision was made without any human participation, even if that decision employs or uses the result of profiling techniques. On the other hand, the right to information brought by Article 20, Paragraph 1, does not require, at least literally, that the decision has been made solely through automated processing.

143 HILDEBRANDT, Mireille. Defining Profiling: A New Type of Knowledge? In: HILDEBRANDT, M.; GUTWIRTH, S. (Eds.) *Profiling the European Citizen: Cross-Disciplinary Perspectives*. Cham/SWI: Springer Science, 2008, p. 17-44.

144 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

The GDPR, by its turn, mentions automated decision-making several times throughout its text¹⁴⁵, regulating them and its required safeguards in more detail in its Article 22. Initially, this Article guarantees data subjects a right not to be submitted to decisions taken solely on the basis of automated processing. For now, it should be noted that this general prohibition also applies to profiling, even though profiling does not require a fully automated processing, as mentioned above (2.1).

From this perspective, the Brazilian law is stricter with data subjects' rights against automated decision-making, with the right to review only being applicable when the processing is fully automated.

Another point to note is that both the GDPR and the LGPD count on the oversight and actions of data protection authorities, recognizing that expecting individuals to overlook and exercise their rights is insufficient¹⁴⁶. They act not only as a law enforcement entity, but also have a role in establishing compliance and good practices guides.

However, with regards to automated decision-making, it is still not entirely clear how the regulations will be enforced, either reinforcing the individual rights provided to data subjects or by demanding previous impact assessments and certifications for data controllers.

A promising take on the latter is proposed by Kaminski and Malgieri, elaborating on how the GDPR demands an “algorithmic impact assessment” and a multi-layered explanation approach¹⁴⁷.

145 Automated Decision-making or processing is referred at the following GDPR Articles: 2(1), 4(2) and 4(4), 14(2)g, 15(1)h, 20(1)b, 21(5), 22(1), 35(3)a.

146 Danilo Doneda makes this observation using Viktor Mayer-Schönberger classification of four generations of data protection legislation. MAYER-SCHÖNBERGER, Viktor. General development of data protection in Europe, In: Phillip Agre; Marc Rotenberg. *Technology and privacy: The new landscape*. Cambridge: MIT Press, 1997. DONEDA, Danilo. *Da privacidade à proteção de dados pessoais*. Rio de Janeiro: Renovar, 2006.

147 KAMINSKI, Margot, MALGIERI, Gianclaudio. Algorithmic Impact Assessments under the GDPR: Producing Multi-layered Explanations. *U of Colorado Law Legal Studies*

Edwards and Veale, in another paper, also argue in favor of a systemic approach rather than one focused on individual action¹⁴⁸.

On the other hand, the effectiveness of the former approach is questionable, and at the very least, restrictive. The guarantee of individual rights as a way to combat discrimination generated in a systemic fashion by profiling techniques and automated decision-making is possibly ineffective due to this false empowerment. We will explore this premise from an evaluation of Article 22 of the GDPR and the right not to be subject to fully automated decision-making.

2.1. Safeguards Against Automated Decision-Making and its Limitations on the GDPR's Article 22

Article 22 of the GDPR can be seen as an important protection from risks arising from profiling and data mining. In this sense, the Article 29 Working Party considered this Article as a general prohibition on being subject to automated decisions, excluding the possible interpretation that this is an opt-out right¹⁴⁹. Therefore, the controller can only carry out the data processing activity if an exception applies to the situation. This opinion is followed by Mendoza and Bygrave, when they state that a contrary interpretation, where the rights guaranteed there would require actions by the data subject, would result in a clear weakening of the regulation, both from the point of view of privacy and data protection¹⁵⁰.

Research Paper N 19-28, 2019. Available at: <https://ssrn.com/abstract=3456224>. Accessed 5 October, 2019.

148 EDWARDS, Lilian.; VEALE, Michael. Enslaving the Algorithm: From a “Right to an Explanation” to a “Right to Better Decisions”? *IEEE Security & Privacy*, v. 16, n. 3, 2018, p. 46–54.

149 ARTICLE 29WORKING PARTY (A29WP). *Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679*. (WP251rev.01). Brussels, 2018. Available at: http://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=612053. Accessed 21 May, 2018.

150 MENDOZA, Isak.; BYGRAVE, Lee. A. The Right Not to be Subject to Automated Decisions Based on Profiling. In: SYNODINOU, T.; JOUGLEUX, P.; MARKOU, C.; PRA-

There is an expectation that the provision established on Article 22 will force controllers to provide human intervention in the decision-making process, inserting a human-in-the-loop, as a way to allow the data subject to express her point of view and/or contest the decision, a safeguard provided for in art. 22 (3)¹⁵¹. However, we believe that both in its elaboration and in its approach to the problem, Article 22 may not meet these expectations. Veale and Edwards point that the referred Article is filled with complications and exceptions that may hinder its effectiveness¹⁵². We will start with the latter.

After being placed so pre-emptively in Article 22, the right not to be subject to decisions based solely on automated processing can be overridden by three exceptions: 2(a) entering or performing a contract between the data subject and data controller; 2(b) authorization by Union or State Member law, with the suitable measures to safeguard the data subject's rights; and 2(c) based on the data subject's explicit consent. Despite being small in number, these exceptions are broad and based on a problematic criterion: the data subject consent.

Regarding the last exception, several authors have questioned the effectiveness of protecting the subject through his informed consent as a sufficient element to serve as an exception to the right not to be subject to fully automated decisions. Kuner and others question "*how can informed consent be obtained in relation to a process that may be inherently non-transparent (a 'black box')*"¹⁵³". The authors also ask

STITOU, T. (Eds.) *EU Internet Law: Regulation and Enforcement*. Cham/SWI: Springer, 2017, p. 77-98.

151 ARTICLE 29WORKING PARTY (A29WP). *Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679*. (WP251rev.01). Brussels, 2018. Available at: http://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=612053. Accessed 21 May, 2018.

152 VEALE, Michael.; EDWARDS, Lilian. Clarity, surprises, and further questions in the Article 29Working Party draft guidance on automated decision-making and profiling. *Computer law & security review*. n. 34, 2018, p. 398-404.

153 KUNER, Christopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 1.

whether, even in a situation that it is possible to explain an algorithmic process, it would be possible to do so in terms intelligible to the data subject and whether, in that logic, specific consent would be necessary for each situation in which a decision-making algorithm is applied, as in the case of financial, employment or medical contexts¹⁵⁴.

In view of these doubts, the authors state that it is difficult to understand how the requirements of Articles 13 and 15 of the GDPR can be satisfied, “*especially in cases where a machine learning process involves multiple data sources, dynamic development, and elements that are opaque, whether for technological or proprietary reasons.*”¹⁵⁵

Rubinstein, also claims that the GDPR relies excessively on informed consent, indicating that it ends up being empty due to the difficulty of reading privacy policies, either due to customs or for the reason that they are often ambiguous and difficult to understand. In this way, the regulation fails to tackle effectively the imminent big data tsunami¹⁵⁶.

Schermer makes an even more blunt criticism of this. The author states that not only is there a clear possibility that data subjects will not be able to adequately assess the risks arising from their consent to submit to automated decision-making, but the fact that such consent often generates some benefits to consumers, such as free services, while the risks involved are less tangible, raises doubts about the possibility of a free and informed consent¹⁵⁷. Therefore, it can be

154 KUNER, Christopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 1-2.

155 KUNER, Christopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 2.

156 RUBINSTEIN, Ira. Big Data: The End of Privacy or a New Beginning?, *International Data Privacy Law*, v. 3, n. 2, May 2013, p. 74–87.

157 SCHERMER, Bart. The limits of privacy in automated profiling and data mining. *Computer law & security review*. n 27, 2011, p. 45-52.

argued that relying only on the consent of the subject can weaken his legal protection.

In addition to this problem regarding the exceptions provided in Article 22(2), there are impasses about the construction and delimitation of the GDPR, in particular, the definition of the expressions “based solely on automated processing” and “which produces legal effects concerning him or her or similarly significantly affects him or her” and its vagueness. The same problem, as we shall see, is present in the Brazilian General Data Protection Law, as Article 20 conditions the right to revision to “*decisions made only based on the automated processing of personal data that affects their [data subject] interest*”¹⁵⁸.

On this matter, A29WP adopted the position that human participation in the decision-making process needs to be significant, with authority and competence to influence the result so that it is not considered fully automated. The “human in the loop” cannot just continuously endorse the result presented by the algorithm¹⁵⁹.

On the other hand, restricting the scope of protection to those based only on automated processing can end up rendering the protection meaningless. Veale and Edwards point out that, among the automated decision systems used today, “*few do so without what is often described as a “human in the loop”- in other words, they act as decision support systems, rather than autonomously making decisions.*”¹⁶⁰. Furthermore, Antoinette Rouvroy questions whether

158 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

159 ARTICLE 29WORKING PARTY (A29WP). *Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679*. (WP251rev.01). Brussels, 2018. Available at: http://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=612053. Accessed 21 May, 2018.

160 VEALE, Michael.; EDWARDS, Lilian. Clarity, surprises, and further questions in the Article 29Working Party draft guidance on automated decision-making and profiling. *Computer law & security review*. n. 34, 2018, p. 400.

even in recommendation systems, where the final decision is up to a competent human to oppose the recommendation, there would be a strong prescriptive force in the system algorithmic to consider it relevant, because to disregard a recommendation the human operator will have to use arguments that are as quantitatively measurable as the algorithmic predictions. In this case, all space for some personal conception of justice and fairness or even uncertainty is eliminated in favor of risk-averse predictive measurement¹⁶¹.

Another problem pointed out in Article 22 of the GDPR concerns the requirement that the automated decision has legal or “significantly similar” effects. A29WP argues that this definition would include any decision that “*significantly influence the circumstances, behavior or choices of the individuals concerned*” or that generates “*exclusion or discrimination*”¹⁶². It is important, at this point, to be aware of the fact that the word used is “influence” and not “cause”, being indicated by Veale and Edwards that this would even include situations where the behavior of the data subject is not directly caused by the decision, but merely influenced by it, as in the possibility of profiling changing the way the data subject choice options are arranged or generating differentiated prices, influencing their decision¹⁶³.

A third point of uncertainty regarding the scope of the right provided for in Article 22 of the GDPR concerns the definition of the persons to whom the significant effects relate. These must be of direct concern to the individual claiming the right or - as we have previously

161 ROUVROY, Antoinette. “Of Data and Men”. *Fundamental Rights and Freedoms in a World of Big Data*. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR(2015)09REV, 2016, p. 1-37, 2016.

162 ARTICLE 29WORKING PARTY (A29WP). *Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679*. (WP251rev.01). Brussels, 2018. Available at: http://ec.europa.eu/newsroom/article29/item-detail.cfm?item_id=612053. Accessed 21 May, 2018, p. 10.

163 VEALE, Michael.; EDWARDS, Lilian. Clarity, surprises, and further questions in the Article 29 Working Party draft guidance on automated decision-making and profiling. *Computer law & security review*. n. 34, 2018, p. 398-404.

highlighted by the possibility of collective effects from the profiling process - they can be effects that affect a community, even if it has not been generated directly with the plaintiff's data. An example can be instructive, in this case:

For example, an advert targeted to those with “black-sounding” first names, suggesting that the aid of a criminal defense lawyer may be needed, does little to harm the reputation of the particular black, Harvard security professor, Latanya Sweeney, that was investigating the phenomenon when it occurred to her, but may arguably create a penumbra of racial bias and expectations of illegal behavior around the entire group of black people, some of whom will be more vulnerable than our professor subject. (...) There is no reason why such decisions should not fall within art 22—it is the decision that concerns the data subject that triggers it, even if the data used to make the decision comes partly or wholly from elsewhere. In fact, such “peer-related” factors are the norm rather than the exception in machine learning¹⁶⁴.

In such cases, Schermer indicates that an analysis of merely individuals' problems can be useless, since, with a practically infinite amount of data, in individual cases, it is always possible to find an explanation about the respect of the determined decision that cover-up, or at least raise doubts about any discrimination¹⁶⁵. Mantelero, in a similar line, reinforces the importance of data protection authorities to

164 VEALE, Michael.; EDWARDS, Lilian. Clarity, surprises, and further questions in the Article 29 Working Party draft guidance on automated decision-making and profiling. *Computer law & security review*. n. 34, 2018, p. 402.

165 SCHERMER, Bart. Risks of Profiling and the Limits of Data Protection Law. In: CUSTERS, Bart.; CALDERS, Toon.; SCHERMER, Bart.; ZARSKY, Tal. (Eds.) *Discrimination and Privacy in the Information Society: Data Mining and Profiling in Large Databases*. Berlin: Springer-Verlag, 2013, p. 137-152.

deal with problems generated on a collective scale, suggesting a multi-stakeholder participation approach to risk assessment, supervised by data protection authorities. This risk assessment, according to the author, must be carried out by controllers who intend to work with big data analysis before engaging in data processing activities¹⁶⁶. Thus, restricting the effectiveness of Article 22 of the GDPR to only isolated cases of individual problems can, as in the case of the other problems mentioned, hinder the effectiveness of the provision.

It is necessary to mention the three safeguards listed in Article 22, item 3: the right to obtain human intervention in the decision-making process, the subject's right to express his / her point of view and the right to challenge the decision. The list is not exhaustive, due to the expression used that "at least" these three safeguards must be present in the case of the exceptions of the letters 'a' and 'c' of item 2 of the Article, which concern the signing of a contract or granting consent. It is possible to say, therefore, that the data subject cannot consent or negotiate waiver or exclusion of these three safeguards, as they are the result of legal determination. These safeguards are also subject to criticism and questioning, as pointed out by KUNER et al.¹⁶⁷ and Roig¹⁶⁸.

Regarding the right to obtain human intervention in the decision-making process, Kuner and others summarize the difficulties that the person responsible for this intervention would have, arguing that "*it may not be feasible for a human to conduct a meaningful review of a process that may have involved third-party data and algorithms (which may contain trade secrets), pre-learned models, or inherently opaque*

166 MANTELERO, Alessandro. Personal Data for Decisional Purposes in the Age of Analytics: From an individual to a collective dimension of data protection. *Computer Law & Security Review*, v. 32, n. 2, p. 238-255, 2016.

167 KUNER, Cristopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 1-2.

168 ROIG, Antoni. Safeguards for the right not to be subject to a decision based solely on automated processing (Article 22 GDPR). *European Journal of Law and Technology*. V. 8, n. 3, 2017.

*machine learning techniques*¹⁶⁹”. Furthermore, it is possible that for this intervention to be done in a meaningful way, it needs to be made by a professional specialized in the evaluation of statistical correlations developed by the algorithm¹⁷⁰.

Finally, on the data subject’s right to express his views, Roig again argues that it would be difficult to challenge an automatic decision without a clear explanation of how the result was achieved. He states that “*to challenge such an automatic data-based decision, only a multidisciplinary team with data analysts will be able to detect false positives and discriminations*”¹⁷¹.

These excessive uncertainties and speculations about Article 22 and its effectiveness make clear there are some weaknesses in the approach to the problem when it is taken from the perspective of individuals rights. This impression is especially strong when we consider that human participation tends to be reduced and difficult to overlap with the automated process. Also, what constitutes a legal or “significantly similar” effect is a point of contention, as well as the scope of which decisions fall within Article 22.

Given these questions raised by the GDPR approach, we will assess what novelties the Brazilian General Data Protection Law has brought in relation to European regulation and which we believe deserve some attention in further research and studies on data processing regulation and automated decision making.

169 KUNER, Cristopher. et. al. Editorial: Machine Learning with Personal Data: Is Data Protection Law Smart Enough to Meet the Challenge? *International Data Privacy Law*. Vol. 7, n. 1, 2017, p. 2.

170 ROIG, Antoni. Safeguards for the right not to be subject to a decision based solely on automated processing (Article 22 GDPR). *European Journal of Law and Technology*. V. 8, n. 3, 2017.

171 ROIG, Antoni. Safeguards for the right not to be subject to a decision based solely on automated processing (Article 22 GDPR). *European Journal of Law and Technology*. V. 8, n. 3, 2017, p. 6.

2.2. Perspectives and Alternatives offered by the Brazilian General Data Protection Law

In the final part of the text, parting from the initial evaluations regarding the legal protections against automated decisions at GDPR and the inadequacy of a system geared to individual protection, we will go into more detail about how the general Brazilian data protection law can present advances in the direction of a collective protective system within the scope of automated decision-making. The Brazilian General Data Protection Law, as highlighted in the introduction, has a more principled and less detailed character than the GDPR. Thus, it will be necessary to analyze how its provisions will be interpreted by courts and the Data Protection Authority in the coming years. Here we will make some initial notes on the final text of the law and how Brazilian authors have been interpreting it. The argument to be made is not that the LGPD presents a more robust protection system than the GDPR, but that, due to influences and particularities of other areas of Brazilian law, the Brazilian General Data Protection Law brings some solutions that deserve attention.

First, it is important to emphasize that there is not, as in art. 22 of the GDPR, a general right not to be subject to fully automated decisions, including profiling, which, despite the problems mentioned in the previous topic, gives GDPR a stronger protective character. However, the LGPD brings along its art. 20 data subjects' rights that fall specifically on automated treatments.

Article 20. The data subjects are entitled to request a review of decisions made only based on the automatized processing of personal data that affects their interests, including decisions designed to define their personal, consumption and credit profile or the aspects of their personality.

Paragraph 1 The controller shall provide, upon request, clear and adequate information on the criteria and procedures used for the automatized decision, observing the business and industrial secrets.

Paragraph 2 In the event of failure to offer the information set forth in paragraph 1 of this article based on the observance of business and industrial secrets, the supervisory authority may conduct an audit to confirm discriminatory aspects in the automatized processing of personal data¹⁷².

Alternatively, since there is no right not to be subject to fully automated decisions, there is an express right in this Article that grants data subjects a right to review fully automated decisions that affect their interest. These decisions include, but are not limited to, those related to the formation of behavioral profiles. It is noteworthy that the term “interest” gives greater coverage to this rule, and it is not necessary to verify a violation of a specific right so that Article 20 can be invoked. The mere fact that a fully automated decision affects the subject’s interests (which also includes threats to rights) is already sufficient for its application.

Therefore, by differentiating itself from GDPR, which restricts the incidence of its art. 22 for automated decisions that produce legal effects or, similarly, significantly affect the data subject, the LGPD makes preventive protection possible by the subject, even before any actual damage is characterized, avoiding the vagueness of these expressions of the European Regulation.

Thus, if there is a suspicion that decisions aimed at defining a data subject personal, professional, consumer and credit profile or

172 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020

aspects of their personality may cause her any damage, the subject, or organizations aimed at protecting the rights of vulnerable groups, as will be argued below, will have the possibility to anticipate themselves before this damage has occurred to request the profiling review. This right, in the original text of the LGPD, was even more robustly envisaged, as a right to human review, until Law 13.853/19 changed some of the original provisions of the LGPD and, through the presidential veto, the review no longer requires the involvement of a human.

In addition, Article 20, Paragraph 1 establishes the data subject's right to information, according to which the controller must “provide, upon request, clear and adequate information on the criteria and procedures used for the automatized decision, observing the business and industrial secrets¹⁷³”. Can this right, as established, be understood as a right to explanation? In order to take a position on this, it is necessary to open a parenthesis to briefly seek to understand which arguments stand out in the European debate.

Goodman and Flaxman were one of the first to strongly support the existence of a right to explanation in GDPR, despite not further exploring the claim. The basis for the argument of the authors would be GDPR Articles 13 and 14 requirements of “meaningful information about the logic involved” as an additional safeguard established by art. 22, applicable to profiling practices¹⁷⁴.

In an opposite direction, Wachter, Mittelstadt and Floridi argue in favor of the non-existence of this right to explanation. The authors argue that although art. 22 (3) of GDPR has provided safeguards for the data subject, if he/she is subjected to an automated decision, the right to explanation is not among them. The only express provision of the said “right to an explanation” is at Recital 71, which is not legally

173 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020

174 GOODMAN, Bryce.; FLAXMAN, Seth. European Union Regulations on Algorithmic Decision-Making and a “Right to Explanation”. *AI Magazine*, v. 38, n. 3, 2017, p. 50–57.

binding. Furthermore, the authors argue that arts. 13-14 establish only an *ex ante* duty to notify the subject about the “system functionality”. This, according to the authors, would mean that they cannot be used to claim an *ex post* right to explain a specific decision. However, Wachter and others admit that within the limits of the right of access provided for in art. 15 (1) (h) it is possible that the jurisprudence establishes a right to explain specific decisions¹⁷⁵.

A third way is adopted by Selbst and Powles, when arguing in favor of an extension of the concept of the right to explanation, without being attached to the moment when it can be exercised, that is, whether it may be required by *ex ante* or *ex post*, and whether it must be of a specific decision or concerning the whole decision-making system. The authors argue that, if in fact guaranteed, even a right to explanation that focuses only on the logic involved would allow the subject to infer how this applies to a specific decision. Therefore, for Selbst and Powles, the great concern that must be had in the realization of a right to explanation is whether it guarantees the data subject the means to understand the logic of the automated decision system to which they were submitted, and thereby exercise their rights¹⁷⁶.

Given these arguments, we defend that in Article 20, Paragraph 1 of the LGPD the theoretical and legal bases for a right to explanation are present. In the same sense as that argued by Selbst and Powles, it is not necessary for the law to establish rigid procedures and parameters for the fulfillment of this norm, provided that the data subjects, through the exercise of this right, actually have access and can understand the logic involved in the decision, thus enabling the exercise of other rights – either data subject’s rights provided for by

175 WACHTER, Sandra MITTELSTADT, Brent, FLORIDI, Luciano. Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation, *International Data Privacy Law*, v. 7, n. 2, May 2017, p. 76–99.

176 SELBST, Andrew D.; POWELS, Julia. Meaningful Information and the Right to Explanation. *International Data Privacy Law*. Oxford: Oxford University Press. v. 07, n. 04, Nov. 2017, p. 233-242.

the LGPD itself or broader fundamental rights brought by the entire legal system.

Renato Leite Monteiro further maintains that the principle of transparency and the consumer protection microsystem in credit relations¹⁷⁷ already created a right to explanation in this context. The Brazilian General Data Protection Law, then, for the author, reinforces and expands this right to any type of data processing activity¹⁷⁸.

However, the same debate regarding the explanation of specific decision *ex post*, versus an *ex ante* explanation of general functioning is possible for Brazilian law. The law still safeguards commercial and industrial secrets; however, it does not define its limits and must be observed on a case-by-case basis.

Article 20 Paragraph 2 has a provision of great importance and which cannot be neglected, regarding the measure and enforcement, which goes beyond the simple safeguard of obtaining human intervention in the decision-making process. The provision foresees the possibility that, if the information is denied on the basis of commercial and industrial secret, there may be interference by the Brazilian National Data Protection Authority to verify, through an audit, the presence of discriminatory aspects in the automated decision-making processes. Such a possibility may serve as a good reason for companies to provide the necessary information, but it is difficult to see how it could be realized both by the lack of government expertise and the difficulties generated by the decentralization and enormous international power of the internet giants, when they are the targeted controller.

Another relevant point brought by the LGPD can be observed with the combination of Article 20, Paragraph 1 and Article 12,

177 The Brazilian Consumer Defense Code (Law 8.079/1990) and the Positive Registration Law (Law 12.414/2011) provides safeguards and protections to consumers in credit relations.

178 MONTEIRO, Renato Leite. Existe um direito à explicação na Lei Geral de Proteção de Dados Pessoais?, Instituto Igarapé, *Artigo Estratégico nº 39*, Dezembro de 2018.

Paragraph 2. The latter establishes that anonymized data (which, as a rule, are not considered personal data), will be considered as personal if used “*for formation of the behavioral profile of a given natural person, if identified*¹⁷⁹”. This Article can still be the subject of controversy, because it conditions its incidence to a very specific and difficult to verify the situation, since the behavioral profile does not necessarily need to identify a person so that their interests are affected¹⁸⁰.

For this reason, Bruno Bioni argues that the identification of a given natural person concerns not the identification of them in a database in an abstract way, but their identification as a person who suffered the consequences of that data processing activity. Thus, according to the author, Brazilian law takes an approach in which “*the focus is not on the data, but its use – for the formation of behavioral profiles – and its consequent repercussion in the individual’s sphere*¹⁸¹”. For this same reason, these anonymized data used for the formation of the behavioral profile should be considered as personal data by the controller when explaining an automated decision, further expanding the obligations that fall on the rights provided for in Article 20.

So far it has been argued that protections against violations caused by automated decisions become stronger by incorporating a collective character. However, it should also be noted that some individual protections, notably the right to explanation, can fulfill another important role. The request for an explanation of the decision and the algorithmic accountability are important not only to prevent

179 Translated by: BELLÍ, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020

180 ROUVROY, Antoinette. “Of Data and Men”. *Fundamental Rights and Freedoms in a World of Big Data*. Council of Europe, *Directorate General of Human Rights and Rule of Law*. vol. T-PD-BUR(2015)09REV, 2016, p. 1-37, 2016.

181 BIONI, Bruno. *Proteção de Dados Pessoais: a função e os limites do consentimento*. Rio de Janeiro: Forense, 2019, p. 80. Translated by the authors from the original: “o foco não está no dado, mas no seu uso – para a formação de perfis comportamentais – e sua consequente repercussão na esfera do indivíduo”.

discrimination and errors. What is perhaps more important in these cases, is the fact that when seeking an explanation for the decision, the rules governing that decision-making process become explicit. That is, the variables considered, the objective of the categorization performed and why certain decision-making process is legitimate, opening the possibility to question the parameters adopted, and, in a broader sense, the possibility of critique¹⁸².

However, as another important legal tool to combat the possible shortcomings of the exercise of individual rights for problems on a collective scale, as demonstrated at the beginning of this work, the text of Article 22 of the LGPD is promising:

Article 22. The defense of the interests and rights of the data subject may be exercised in court, individually or collectively, in the form of the provisions of the applicable law, about the instruments of individual and collective protection¹⁸³.

By expressly stipulating that the rights of the data subjects, which includes the right to review and the right to an explanation, “may be exercised in court, individually or collectively”, decisions that affect groups, as previously mentioned, could be questioned through collective actions, giving greater effectiveness to legal protection

182 Antoinette Rouvroy defines critique as “a practice that suspends judgment and an opportunity to practice new values, precisely on the basis of that suspension. In this perspective, critique targets the construction of a field of occlusive categories themselves rather than on the subsumption of a particular case under a pre-constituted category”. The author argues that data-mining and profiling practices makes critique difficult. For further development of the argument, see ROUVROY, Antoinette. The end(s) of critique: data behaviourism versus due process. In: HILDEBRANDT, Mireille; DE VRIES, Katja (eds.). *Privacy, Due Process and the Computational Turn: the philosophy of law meets the philosophy of technology*. New York: Routledge, 2013, p. 143-167.

183 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020

and reducing the power asymmetry that exists between large data-controlling corporations and their consumers.

This possibility of collective action by interested parties, together with the possibility of taking preventive actions without the occurrence of rights having been harmed, as discussed in the comments to Article 20, Paragraph 1, would be a much more interesting option to deal with, for example, with the case of group discrimination mentioned in the previous section, referring to the advert targeted to those with “black-sounding” first names, suggesting that the aid of a criminal defense lawyer may be needed. If by GDPR those who have not had their data processed or even feel threatened to have their rights harmed would have to argue in favor of an implied collective protection, to act in defense of their interests, by the LGPD, any civil society organization that legitimately represents the interests of the harmed group, according to Brazilian law, or even a group of subjects who feel collectively harmed, could act preventively and collectively so that the interests of the group were respected as such, avoiding this biased and discriminatory targeting.

Another point of the LGPD to be opposed to the GDPR concerns the possibility of individuals, especially consumers, to prove the discriminatory potential of the processing given to the data or even to prove concrete damage suffered. Antoinette Rouvroy, in a study for the Consultative Committee of the Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data – an advisory committee of Convention 108 of the European Council – argues that the reversion of the burden of proof in cases where there is suspected discrimination generated, even if indirectly, by automated data processing activities in the decision-making process, would be an important measure to guarantee the fundamental rights and guarantees of the subjects. Thus, the author suggests that the data controller is the one who should prove that this automated treatment did not generate discriminatory effects. We argue here that the Brazilian General Data

Protection Law allows this reversion of the burden of proof, at least in legal proceedings, according to Article 42 Paragraph 2, in parameters similar to those defended by the study mentioned above:

Article 42. (...)

Paragraph 2 The judge, in a civil proceeding, may reverse the burden of proof in favor of the data subject whenever, in the judge's opinion, the allegation is likely, there is a lack of assets for purposes of production of evidence, or the production of evidence by the data subject shall be exclusively burdensome for such data subject¹⁸⁴.

In addition, the same Article that brings this prediction, also emphasizes once again the collective nature of the protections brought by the law, admitting property and moral damages, individually or collectively, as well as collective actions to repair collective damages:

Article 42. Any controller or processor that, in connection with the performance of the activity of personal data processing, causes any property, moral, individual or collective damage to any third party, in violation of the personal data protection law, shall be required to indemnify it.

Paragraph 3 Actions for indemnification of collective damages intended to establish liability, as provided for in the main provision of this article, may be collectively conducted in court, with due regard for the provisions of the applicable law.

184 Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

Finally, the principles brought by the LGPD must be emphasized. As mentioned before, the LGPD has a much more principled character than the GDPR. However, this does not necessarily mean less protection for data subjects, but rather that more interpretative and regulatory work is needed to understand and define the obligations that fall on processing activities.

In addition to privacy protection, Brazilian law lists privacy, informational self-determination, the free development of personality and human rights as some of its foundations¹⁸⁵. In Article 6, 10 general principles are provided, among them the principle of transparency¹⁸⁶ and non-discrimination¹⁸⁷ stands out. The latter, contrary to the European regulation, is expressly provided for in Brazilian law.

Therefore, when employing automated decision-making and profiling techniques, the controller must take steps to ensure that all of these principles are respected. We defend that there are, accordingly, prior obligations to ensure that the techniques employed are not discriminatory, to ensure that the data subject can be informed and understand the nature of the treatment carried out on him, as well as

185 Article 2: The regulation of personal data protection is grounded on: I.- respect for privacy; II. – informational self-determination; VII. – human rights, free development of personality, dignity and exercise of citizenship by the individuals. Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

186 Article 6 VI: transparency: guarantee, to the data subjects, of clear, accurate and easily accessible information on the processing and the respective processing agents, subject to business and industrial secrets. Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

187 Art 6° IX: non-discrimination: impossibility of processing data for discriminatory, unlawful or abusive purposes. Translated by: BELLI, Luca; LORENZON, Laila; FERGUS, Luã. *The Brazilian General Data Protection Law (LGPD): Unofficial English Version*. CyberBRICS Project at FGV Law School. Available at: <https://cyberbrics.info/brazilian-general-data-protection-law-lgpd-unofficial-english-version/>. Accessed 25 January 2020.

to have the power to influence that treatment, whether by correcting erroneous information or complementing those deemed insufficient.

In the same pace, Rafael Zanatta argues that Article 20 of the LGPD creates a dialogical obligation between the controller and the subject:

In this sense, the action of “labeling a person”, based on his personal data and anonymized data, into a social profile and inferring something about her implies obligations of three natures: (i) informational, related to the obligation to inform about the existence of the profile and guarantee its maximum transparency, (ii) anti-discriminatory, related to the obligation of not using parameters of race, gender and religious orientation as determinants in the construction of the profile, and (iii) dialogical, related to the obligation to engage in a “dialogic process” with the people affected, ensuring an explanation of how the profiling works, its importance for certain purposes and how decisions are made¹⁸⁸.

This dialogical obligation, in combination with the possibility of collective actions to combat systemic harms and discriminations, the reversion of the burden of proof, and the solid principiology adopted

188 ZANATTA, Rafael. *Perfilização, Discriminação e Direitos: do Código de Defesa do Consumidor à Lei Geral de Proteção de Dados Pessoais*. Available at: <http://rgdoi.net/10.13140/RG.2.2.33647.28328>. Accessed 19 November, 2019, p. 22. Translated by the authors from the original: “Nesse sentido, a ação de “encaixar uma pessoa”, a partir de seus dados pessoais e dados anonimizados, em um perfil social e *inferir algo sobre ela* implica em obrigações de três naturezas: (i) *informacional*, relacionada à obrigação de dar ciência da existência do perfil e garantir sua máxima transparência, (ii) *antidiscriminatória*, relacionada à obrigação de não utilizar parâmetros de raça, gênero e orientação religiosa como determinantes na construção do perfil, e (iii) *dialógica*, relacionada à obrigação de se engajar em um “processo dialógico” com as pessoas afetadas, garantindo a explicação de como a perfilização funciona, sua importância para determinados fins e de como decisões são tomadas”.

can make the LGPD, if enforced in such a manner, a data protection legislation with promising proposals regarding the regulation of automated decision-making.

Conclusion

Automated decision-making systems and profiling techniques operated by machine-learning are phenomena that emerge and cause consequences on a supra-individual scale and pose a threat for its discriminatory potential. Thus, we hope to have demonstrated that the regulation of these data processing activities must be addressed on a collective scale by data protection laws. GDPR's Article 22 and its right not to be subject to fully automated-decision-making is an important rule, however, it has its limitations, especially when seen as a right to be demanded by the data subject. We have not explored how this and other rules present on the GDPR can support a preemptive protective system; however, promising works on the field were indicated on topic 3.

Finally, we presented a framework of the Brazilian General Protection Law regarding the regulation of automated decision-making and argued that it provides important alternatives that deserve to be further studied, with a possibly vast array of front of tools and principles for subjects, social organizations and the Data Protection Authority to dispose of.

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Artificial Intelligence And Data Protection: Possible Impacts Of The European Model Regulation On Innovation

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Introduction

Data protection has become a major issue on the agenda of businesses and governments in an increasingly relevant way, even though it has been for many years the subject of debate and even regulation in several countries. Currently, it is difficult to think of companies that do not collect and/or use data from their customers for any purpose. By the same token, governments in different countries have developed systems for processing citizens' data to improve public policies.

In addition to the current trend of large-scale data collection and processing, the recent Cambridge Analytica scandal has warned the world about the risks of data traffic and processing. According to news published by the media, Cambridge Analytica misused data collected from Facebook, being accused of manipulating the presidential elections in the United States of America in favor of then-candidate Donald Trump, as well as the pro-Brexit vote, in the context of the United Kingdom European Union membership referendum.

Against this background, the General Data Protection Regulation (GDPR) entered into force on 25 May 2018 in the European Union, repealing the former Directive 95/46/CE. The entry into force

of this regulation further intensified the discussion on data protection and several countries vigorously took up the debate on national regulation on the subject. In this context, Brazil published, in August 2018, the Federal Law n. 13,709/2018 (Brazilian General Data Protection Law - BGDPL).

Given the recent enthusiasm for data protection regulations, it is questionable whether these regulations – which play a key role in ensuring the data subject security – might curb the incentive for innovation, especially regarding artificial intelligence systems. This questioning can be briefly explained by the fact that the so-called “artificial intelligence” systems use a vast amount of data to elaborate solutions – the outputs – which often correspond to innovative products, much superior to those that human capacity could achieve.

Thus, the present article aims to analyze whether the European model of data protection regulation has the potential to discourage investment in artificial intelligence systems. In order to do so, some specific aspects of the European regulation will be analyzed, considering that this regulation is the most notable in terms of data protection and has the potential to influence worldwide legislation.

In this article, some aspects of the GDPR will be compared to the BGDPL, in order to draw a parallel between these two norms.

1. Artificial Intelligence (AI)

First and foremost, it must be emphasized that this essay does not aim to cover all the types and functionalities of artificial intelligence systems¹⁸⁹. For this article, it is important to keep in mind that artificial intelligence corresponds to “*automation of activities that*

189 For a thorough reading of artificial intelligence Jerry Kaplan is recommended: KAPLAN, Jerry. *Artificial Intelligence: What everyone needs to know*. Oxford: Oxford University Press, 2016.

*are associated with human thinking, such as decision making, problem-solving and learning*¹⁹⁰.

Considering the scope of this work, the aforementioned definition of artificial intelligence has been chosen, since it contains indications of how an intelligent system relates to data processing¹⁹¹. That is, once the system is fed with a satisfactory amount of data it becomes able to make decisions, solve problems and learn, and it often does it without any human intervention.

Just to name a few of the applications of artificial intelligence, besides profiling for targeting consumers, one could mention the following: a) voice recognition; b) diagnosis of diseases; c) simultaneous translation; d) financial investment; e) drafting of contracts and other legal documents; among many others.

2. Importance Of Personal Data Protection

Based on the “personal data” definition adopted by the GDPR¹⁹² and BGDPL^{193 - 194}, the discussion on the relevance of its protection

190 Bellman, R. E. (1978). *An Introduction to Artificial Intelligence: Can Computers Think?* Boyd & Fraser Publishing Company apud RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. ed. New Jersey: Prentice-Hall, 2010. p. 2

191 It should be noted that there are several other definitions of “artificial intelligence”. For a complete reading about the definitions of artificial intelligence Stuart J. Russel is recommended: RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. 3. ed. New Jersey: Prentice-Hall, 2010.

192 Article 4 of the GDPR: “‘personal data’ means any information relating to an identified or identifiable natural person (‘data subject’); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person”. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: < <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT> > Access: 30 jun 2019;

193 Article 4 of the BGDPL: “‘Dado pessoal: informação relacionada a pessoa natural identificada ou identificável” BRASIL. Lei Federal nº 13.709 de 14 de agosto de 2018. Available at <http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2018/Lei/L13709.htm>. Access: 30 jun 2019

194 According to Bruno Bioni, “o conceito de dado pessoal é um elemento chave. Ele

follows next. To do so, data protection is going to be analyzed under the legal and economic perspectives.

Given that the European regulation on data protection will be dealt with in the next topics, it is important to bear in mind that Article 8 of the Charter of Fundamental Rights of the European Union provides for data protection as a fundamental right¹⁹⁵. Thus, the European Union has always observed intense normative activity regarding the subject of data protection, and its most recent step was the publication of GDPR.

To draw a parallel between the European Union and Brazil, the Brazilian Federal Constitution of 1988, in Article 5, Item X, guarantees the fundamental right to privacy. In the Brazilian context, the right to data protection is a derivative of the right to privacy. In this sense, Danilo Doneda states that this equation does not encompass all the complex problems surrounding this relation (privacy x personal data), but it is a starting point to illustrate how the protection of personal information has been found in our legal system: as a derivative of the protection of the right to privacy¹⁹⁶.

filtra o que deve estar dentro ou fora do escopo de uma lei de proteção de dados pessoais, demarcando o terreno a ser por ela ocupado. Diferenças sutis em torno da sua definição implicam em consequências drásticas para o alcance dessa proteção. BI-ONI, Bruno. Xequê-Mate: o tripé de proteção de dados pessoais no xadrez das iniciativas legislativas no Brasil. Grupo de Estudos em Políticas Públicas em Acesso à Informação da USP – GPOAI, São Paulo, 2015, p. 17. Available at: https://www.academia.edu/28752561/Xequê-Mate_o_trip%C3%A9_de_prote%C3%A7%C3%A3o_de_dados_pessoais_no_xadrez_das_iniciativas_legislativas_no_Brasil Access: 30 jun 2019.

195 Article 8 of the GDPR: “Everyone has the right to the protection of personal data concerning him or her. 2. Such data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law. Everyone has the right of access to data which has been collected concerning him or her, and the right to have it rectified. 3. Compliance with these rules shall be subject to control by an independent authority”. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: < <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?URI=CELEX:32016R0679&from=PT>> Acces: 30 jun 2019.

196 “[...]. Esta equação nem de longe encerra toda a complexa problemática em torno dessa relação, porém pode servir como ponto de partida para ilustrar como a proteção das informações pessoais passou a encontrar guarida em nosso ordenamento jurídi-

Still on the subject of data protection in Brazil, before the publication of the BGDPL, there were only scattered laws, providing data protection in specific situations¹⁹⁷. As an example, the medical sector already had its rules regarding personal data protection, as well as the financial sector¹⁹⁸.

In addition to the status of data protection as a fundamental right in the European Union and other countries - therefore its legal importance - data protection has acquired a very significant economic dimension. The current conditions of automated data processing have allowed companies to extract extraordinary financial profits, either through profiling - and thus the targeting of commercial strategies - or through the creation of new technologies with disruptive potential.

The term “profiling” has the following definition in the GDPR:

[A]ny form of automated processing of personal data consisting of the use of personal data to evaluate certain personal aspects relating to a natural person, in particular to analyze or predict aspects concerning that natural person’s performance at work, economic situation, health,

co: como um desdobramento da tutela do direito à privacidade. DONEDA, Danilo. A proteção dos dados pessoais como um direito fundamental. Espaço Jurídico, Joaçaba, v. 12, n. 2, p. 91-108, jul./dez. 2011. p. 94. Available at file:///C:/Users/juliar/Downloads/Dialnet-AProtecaoDosDadosPessoaisComoUmDireitoFundamental-4555153.pdf. Access: 30 jun 2019.

197 For a thorough reading on data protection in Brazil the following article is recommended: POLIDO, Fabrício B. Pasquot. ANJOS, Lucas Costa dos, BRANDÃO, Luíza Couto Chaves, MACHADO, Diego Carvalho, OLIVEIRA, Davi Teófilo Nunes. GDPR e suas repercussões no direito Brasileiro. Primeiras Impressões de análise comparativa. Available at: <http://irisbh.com.br/wp-content/uploads/2018/06/GDPR-e-suas-repercuss%C3%B5es-no-direito-brasileiro-Primeiras-impress%C3%B5es-de-an%C3%A1lise-comparativa-PT.pdf>

198 Examples of Brazilian laws that regulate data protection in certain sectors: Federal Law n. 12,737/2012 (Crimes); Federal Law n. 9,504/97 (Financial); CFM Resolution n. 1,821/07 (Health).

personal preferences, interests, reliability, behavior, location or movements;¹⁹⁹

According to Article 29 Working Party²⁰⁰ profiling depends on three elements, to wit: (i) the data processing system must be automated; (ii) the data must be personal, that is, related to individuals; and (iii) the purpose of processing should be to evaluate elements of personal life extracted from the data²⁰¹.

The result of the profiling process is tracing and targeting behavioral types, interests, abilities, among other personal aspects. Accordingly, with this information companies can draw business strategies, plan advertising and sales policies. Thereby, profiling undoubtedly has the power to increase the financial gains of companies that use these tools.

Therefore, personal data have become a valuable commodity in the “data capitalism era”²⁰². Thus, bearing in mind the collection and processing of mass data and the use of these in new business models and public administration, the concerns about exposure, improper and abusive use of data are increasing²⁰³.

199 Article 4 (4) of the GDPR. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?URI=CELEX:32016R0679&from=PT>> Acces: 30 jun 2019.

200 Article 29 Working Party was an advisory body made up of representatives from the data protection authority of each EU Member State. It was extinct in the date when GDPR entered into force.

201 ARTICLE 29 WORKING PARTY (A29WP). Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679. (WP25us1rev.01). Bruxelas, 2018. p. 7.

202 “Data capitalism is a system in which the commoditization of our data enables an asymmetric redistribution of power that is weighted toward the actors who have access and the capability to make sense of information. It is enacted through capitalism and justified by the association of networked technologies with the political and social benefits of online community, drawing upon narratives that foreground the social and political benefits of networked technologies”. FLYVERBOM, M., DEIBERT, R., MATTEN, D. Data Capitalism: Redefining the Logics of Surveillance and Privacy. Business & Society West, 2017. Available at < <http://journals.sagepub.com/doi/abs/10.1177/0007650317718185?journalCode=basa>> Access: 30 jun 2019.

203 DONEDA, Danilo. A proteção dos dados pessoais como um direito fundamental. Espaço Jurídico, Joaçaba, v. 12, n. 2, p. 91-108, jul./dez. 2011.p. 92.

On one hand, one may observe the distrust on the indiscriminate use of data through systems with full capacity to carry out its processing on a large scale. On the other hand, in some legal systems, data protection stands as a fundamental right and, therefore, must be an object of wide legal protection. These factors combined make it evident that in some countries there is an urgent need for specific legislation on the issue of data protection subject. Therefore, the importance of the GDPR comes to light.

Nevertheless, data processing also plays a decisive role in the development of new technologies. This is because, as already mentioned, artificial intelligence systems consume data, not only for profiling but also for problem-solving and decision-making culminating in important applications that imply large benefits for society.

Ultimately, data processing also has the potential to bring benefits to society in terms of convenience and development. It is from this point of view that, in the next topic, the GDPR shall be analyzed under magnifying lenses, to verify if its provisions can curb the technological advance, as a side effect to the data subject protection.

3. General Data Protection Regulation (gdpr) Main Features

On 25 May 2018, Regulation (EU) No. 2016/679, known as the General Data Protection Regulation - GDPR, came into force in the European Union.

This regulation, published in 2016 with a two-year *vacatio legis*, repealed Directive 95/46/CE, which applied to the same subject. Although the current regulation replicates several rules already provided for in the Directive, GDPR had worldwide repercussion, since it is a regulation capable of substantially altering relations between companies and their consumers.

This is due, in the first place, to the context in which it came into force. As already elucidated in the previous topic, nowadays, data processing is highlighted by being carried out on a large scale and by the greatest companies in the world, which use Big Data systems to maximize data processing²⁰⁴. Additionally, large-scale and high-speed data processing is accompanied by uncertainty about its use, which is justified, for example, by recent scandals such as the Cambridge Analytica case.

According to Item (9) of the “Whereas” of the Regulation, there is a “legal uncertainty or a widespread public perception that there are significant risks to the protection of natural persons, in particular with regard to online activity”.

Doneda, attuned to the “whereas” mentioned above, states that the processing of personal data is a risky activity, explained by the fact that data could be processed improperly or abusively, as well as in an inaccurate manner²⁰⁵. Still, according to the author, the existence of risks in data processing requires the establishment of mechanisms that allow the data subject to know and control their data - which, in essence, are a direct expression of their personality²⁰⁶.

204 According to Mayer-Schönberger and Cukier: “One way to think about the issue today—and the way we do in the book—is this: big data refers to things one can do at a large scale that cannot be done at a smaller one, to extract new insights or create new forms of value, in ways that change markets, organizations, the relationship between citizens and governments, and more”. MAYER-SCHÖNBERGER, Viktor; CUKIER, Kenneth. *Big Data*. 2. ed. Boston/New York: Eamon Dolan/Houghton Mifflin Harcourt, 2014.

205 DONEDA, Danilo. A proteção dos dados pessoais como um direito fundamental. *Espaço Jurídico*, Joaçaba, v. 12, n. 2, p. 91-108, jul./dez. 2011, p. 92.

206 “O tratamento de dados pessoais, em particular por processos automatizados, é, no entanto, uma atividade de risco. Risco que se concretiza na possibilidade de exposição e utilização indevida ou abusiva de dados pessoais, na eventualidade desses dados não serem corretos e representarem erroneamente seu titular, em sua utilização por terceiros sem o conhecimento deste, somente para citar algumas hipóteses reais. Daí resulta ser necessária a instituição de mecanismos que possibilitem à pessoa deter conhecimento e controle sobre seus próprios dados - que, no fundo, são expressão direta de sua própria personalidade. Por este motivo, a proteção de dados pessoais é considerada em diversos ordenamentos jurídicos como um instrumento essencial

Secondly, GDPR is notable because it has innovated in its heavy fines imposed on those who break its rules. The administrative fines can reach up to EUR 20,000,000, or in the case of an undertaking, up to 4% of the total worldwide annual turnover of the preceding financial year, whichever is higher²⁰⁷.

In addition to the above, it is important to bear in mind that GDPR applies exclusively to data of natural persons, excluding legal entities from the data protection. This option reflects the European culture of protection of citizens' fundamental rights, according to the first "whereas" of the regulation²⁰⁸.

Other important aspects of GDPR are related to its geographical scope and the potential for worldwide replication of its guidelines in local policies. The first aspect concerns the fact that the Regulation applies to any responsible (or its subcontractor) for the data processing of a natural person residing in the European Union. This means that any individual, legal entity, government body or agency²⁰⁹ in the world dealing with data of persons residing in the European Union, not necessarily a citizen of the European Union, is subjected to GDPR.

para a proteção da pessoa humana e como um direito fundamental". DONEDA, Danilo. A proteção dos dados pessoais como um direito fundamental. Espaço Jurídico, Joaçaba, v. 12, n. 2, p. 91-108, jul./dez. 2011, p. 92.

207 Article 83 (5) of the GDPR. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>> Access: 30 jun 2019.

208 "The protection of natural persons in relation to the processing of personal data is a fundamental right". Article 8(1) of the Charter of Fundamental Rights of the European Union. CHARTER OF FUNDAMENTAL RIGHTS OF THE EUROPEAN UNION (2000/C 364/01). Available at: <https://www.europarl.europa.eu/charter/pdf/text_en.pdf> Access: 30 jun 2019.

209 Article 4 (7) of the GDPR: "controller" means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law; [...]" Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <> Access: 30 jun 2019.

Moreover, the Regulation, like the revoked European Directive, only allows data processing outside the territory of the Union without specific authorization if the country to which the data is transferred has an equivalent level of data protection to that of the European Union²¹⁰. This provision, to a certain extent, forces countries that deal with the European Union to comply with GDPR's data protection standards. Thus, it is expected that in the upcoming years, several countries will adopt rules to similar GDPR, in a true exponential and capillary effect of the European regulation.

4. GDPR Provisions With The Potential To Restrain Innovation

Having set out some of GDPR's main guidelines, the following topics shall focus on the analysis of the GDPR provisions that could restrain innovation, more specifically, the advancement and improvement of artificial intelligence systems.

At this point, it is important to note that, when analyzing the possible negative impacts of GDPR on innovation, it is not the intention of this study to downplay the importance of personal data protection, nor to question the consistency of its regulation in the European Union. These possible negative impacts should be understood as an adverse effect of a regulation that promises to overcome challenges for the effective protection of the citizens and to guarantee their fundamental rights²¹¹.

210 Article 45(1) of the GDPR: "A transfer of personal data to a third country or an international organisation may take place where the Commission has decided that the third country, a territory or one or more specified sectors within that third country, or the international organisation in question ensures an adequate level of protection. Such a transfer shall not require any specific authorisation". Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>> Access: 30 jun 2019.

211 However, GDPR is not exempt from criticism as to its efficiency in protecting the data subject rights.

5. Right To Object To An Automated Individual Decision Making

According to GDPR Article 22:

[T]he data subject shall have the right to object, on grounds relating to his or her particular situation, at any time to processing of personal data concerning him or her which is based on point (e) or (f) of Article 6(1), including profiling based on those provisions.²¹²

The right of the data subject to object to an exclusively automated decision making, which is known as “the right of a human in the loop”, reflects the aspiration for fair decisions that protect the dignity of the data subject²¹³.

Article 29 Working Party interprets Article 22 as the need for a human to effectively oversee the decisions of the system, and not merely to validate, in a protocolar manner, the automated decision. If it is verified that the supervision is being done recklessly, the decision will remain to be considered as a purely automated decision. Furthermore, according to the advisory body, the supervisor must have the powers to alter the decision and he/she must analyze all the data involved in the decision-making process²¹⁴.

212 Articles 22 of the GDPR. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>> Access: 30 jun 2019.

213 For a thorough reading on “the right of a human in the loop” Meg Leta Jones is recommended: JONES, Meg Leta. *The right to a human in the loop: Political constructions of computer automation and personhood*. 2 Ed. Sage Publications, Vol. 47, 2017, p 216-239.

214 “The controller cannot avoid the Article 22 provisions by fabricating human involvement. For example, if someone routinely applies automatically generated profiles to individuals without any actual influence on the result, this would still be a decision based solely on automated processing. To qualify as human involvement, the controller must ensure that any oversight of the decision is meaningful, rather than just a token gesture. It should be carried out by someone who has the authority and

What is perceived from this rule is that it makes data processing more costly and potentially less efficient. The onerousness comes from the fact that keeping people with the authority to review the decisions made by the algorithms means having human resources expenditures. Besides, this requirement seems to be a contradiction: automation precisely aims at optimizing the allocation of human and financial resources and time.

Regarding efficiency, it is emphasized that, although it is often impossible to evaluate the criteria considered by the system for decision making, these decisions are usually more accurate and objective than human decisions²¹⁵. This is because, among other factors, artificial intelligence systems are not affected by exclusively personal conditions, such as mood swings. Thus, the judgment of the system tends to be less biased and more accurate than a human's.

Considering all of the foregoing, it is concluded that, besides being contrary to the rationality of more objective decisions, the right to object to an automated individual decision making places a burden on data controllers, given the need to allocate capable staff to fully review automated decisions. Therefore, it is assumed that this factor may discourage the option for investments in artificial intelligence, since these become more expensive and less useful.

competence to change the decision. As part of the analysis, they should consider all the relevant data". ARTICLE 29WORKING PARTY (A29WP). Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679. (WP251rev.01). Bruxelles, 2018. p. 21.

215 "[Andrew] McAfee reviews years of studies of algorithms vs. human judgment by various experts and concludes that we should not rely on experts anymore: 'The practical conclusion is that we should turn many of our decisions, predictions, diagnoses, and judgments—both the trivial and the consequential— over to the algorithms. There's just no controversy any more about whether doing so will give us better results.'" <https://www.forbes.com/sites/gilpress/2014/01/31/big-data-debates-machines-vs-humans/#e292a903d040>. Access: 30 jun 2019.

6. Right To Explanation Of The Logic Involved In Automatic Personal Data Protection

In the same line of the non-automated decision-making right, Articles 13 to 15 of the GDPR provide that the data subject is entitled to obtain the following information:

Meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject²¹⁶

According to this provision, the data subject has the right to know the logic adjacent to the automated system that performs the data processing, including when the system is used for profiling.

Article 29 Working Party states that the growth and complexity of machine learning, a type of artificial intelligence, can make the understanding of the system's logic challenging²¹⁷. More than challenging, it is believed that sometimes it may not be possible to identify the logic behind an algorithm.

It is the so-called “black box system”, in which it is possible to recognize the inputs, that is, the data that are inserted in the system, and the outputs, the result of the data processed by that system, without knowing the processing method that reached such results. It is like inserting data into a black box that will respond to the stimulus,

216 Articles 13(2)(f); 14, (2)(g) and 15,(1)(h) of the GDPR. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>> Access: 30 jun 2019.

217 “The growth and complexity of machine-learning can make it challenging to understand how an automated decision-making process or profiling works”. ARTICLE 29WORKING PARTY (A29WP). Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679. (WP251rev.01). Bruxelles, 2018. p. 25

being impossible to see how it got the answer due to the opacity of the box.

This was the motto of the paper entitled “European Union Regulations on Algorithmic Decision-making and the Right to Explanation”, published in 2016, by Goodman and Flaxman. In this publication, the authors defended the impossibility of interpreting the decisions obtained through machine learning algorithms:

[...] many of the most powerful contemporary algorithms instead relied on ‘models exhibiting implicit, rather than explicit, logic, usually not optimized for human-understanding’— thereby rendering the logic underlying their decision-making an uninterpretable ‘black box.’²¹⁸

In 2018, Casey, Farhangi, and Vogl published another paper in dialogue with the above, but with a new interpretation on the right of explanation, according to which data controllers must be able to provide information on the underlying logic of automated decision-making.

In the most recent text, the authors argue that companies may not have to “open their black boxes” to decipher the logic behind the decision. However, considering the broad power granted by the GDPR to the supervisory body, the companies will be subjected to an intense audit related to the automated decisions and, thus, they

218 “Goodman and Flaxman observed that the algorithms of past decades tended to rely on explicit, rules- based logic for processing information—an architecture that typically made explaining the system’s underlying decision-making relatively straightforward. But, crucially, the scholars noted that many of the most powerful contemporary algorithms instead relied on ‘models exhibiting implicit, rather than explicit, logic usually not optimised for human-understanding’—thereby rendering the logic underlying their decision-making an uninterpretable ‘black box’”. CASEY, B. FARHANGI, A.; VOGL, R., Rethinking Explainable Machines: The GDPR’s ‘Right to Explanation’ Debate and the Rise of Algorithmic Audits in Enterprise Berkeley Technology Law Journal, 2018. p. 19. Available at:<<https://ssrn.com/abstract=3143325>> Access: 30 jun 2019.

should be prepared to meet the expectations and requirements of the supervision:

[The right to explanation] does require that they evaluate the interests of relevant stakeholders, understand how their systems process data, and establish policies for documenting and justifying key design features throughout a system's life cycle.²¹⁹

Given the two interpretive currents of the right to explanation, the GDPR may have assigned an obligation to the data controller that will not always be possible to be met, given the difficulty or even the impossibility of decoding the logic of a complex algorithm. Even when decoding is possible, companies will have to make high investments to fulfill the obligations to provide information to the data subject, at the risk of being penalized in audits carried out by the supervisory body, imbued with notorious power and authority granted by GDPR.

Faced with either of the two possibilities mentioned in this topic, the potential damage to the technological advancement due to the data controller's obligation to provide the data subject with the algorithmic logic underlying the data processing remains evident.

7. Right To Erasure And The Right To Be Forgotten

Article 17 of the GDPR provides for some cases in which the data subject has the right to request the data controller to erase his or her data.

This rule may be understood as the right of individuals to cease having their data processed, and have them deleted when they

219 CASEY, B. FARHANGI, A.; VOGL, R., Rethinking Explainable Machines: The GDPR's 'Right to Explanation' Debate and the Rise of Algorithmic Audits in Enterprise Berkeley Technology Law Journal, 2018. p. 39. Available at: <https://ssrn.com/abstract=3143325>. Access: 30 jun 2019.

are no longer necessary for legitimate purposes. Also, the GDPR provides, unlike Brazilian law, the right to de-index the data of a particular search engine (right to be forgotten).

From the computational point of view, it is possible to raise some questions about the effectiveness and problems of the right-to-erasure provisions related to the functioning of artificial intelligence systems.

According to Villaronga, Kieseberg and Li, dealing with the human memory and the algorithmic memory as if they were equal reflects ignorance on the workings of artificial intelligence. Consequently, these authors state that the European regulation failed to express algorithmic reality in its provisions on the right to be forgotten²²⁰.

It is believed that the erasure of data from a particular processing system may generate unwanted effects to the algorithms. The fundament for this statement is that some algorithms revisit data, inserted in the system for years, for its learning and decision making. Thus, it may be that erasing data from the system, especially if done on a large scale, may lead to inaccurate and unwanted results from the artificial intelligence program.

In 2016, the article *The Right to Be Forgotten: Towards Machine Learning on Perturbed Knowledge Bases*²²¹ was published as a result of a survey carried out by SBA Research²²² and the Holzinger Group –

220 “Our current law appears to treat human and machine memory alike – supporting a fictitious understanding of memory and forgetting that does not comport with reality”. VILLARONGA, Eduard Fosch, KIESEBERG, Peter, and LI, Tiffany. *Humans Forget, Machines Remember: Artificial Intelligence and the Right to Be Forgotten* Computer Security & Law Review, 2017. Available at <<https://ssrn.com/abstract=3018186>>. Access: 30 jun 2019

221 KIESEBERG, P., MALLE, B., FRUHWIRT, P., WEIPPL, E., HOLZINGER, A. *The Right to Be Forgotten: Towards Machine Learning on Perturbed Knowledge Bases*. F. Buccafurri et al. (Eds.): CD- ARES 2016, LNCS 9817, pp. 251–266. 2016.

222 More information on SBA Research can be found at: <https://www.sba-research.org/about/>. Access: 30 jun 2019.

HCI-KDD²²³. These researchers performed some experiments of data erasure of a system, in order to verify the effects of this elimination for the system operation. The authors state:

Within a modern information infrastructure, several layers of data storage and processing might be affected by the right to be forgotten²²⁴

[...]

Significant problems are to be expected when executing selective data erasure on statistical databases or knowledge bases prepared for machine-learning²²⁵.

Although the authors acknowledge that the test was done under limited sampling and that further experiments would be required for the conclusion to be more accurate, the prior conclusion that deletion of data from a system may adversely affect an artificial intelligence system is another indication that the European regulation may place obstacles to innovation.

8. Data Minimization Principle

The principle of data minimization provided for in Article 5 of the GDPR, as well as the right to erasure, prevents data controller from processing data, as long as the data is unnecessary for a specific and legitimate purpose.

223 Holzinger Group HCI-KDD (Human-Computer Interaction & Knowledge Discovery / Data Mining) is a research institute linked to the Institute for Medical Informatics, Statistics and Documentation, located in Austria. More information on Holzinger Group HCI-KDD can be found at: <https://hci-kdd.org/about-the-holzinger-group/>. Access: 30 jun 2019.

224 KIESEBERG, P., MALLE, B., FRUHWIRT, P., WEIPPL, E., HOLZINGER, A. The Right to Be Forgotten: Towards Machine Learning on Perturbed Knowledge Bases. F. Buccafurri et al. (Eds.): CD- ARES 2016, LNCS 9817, pp. 251-266. 2016. p. 252.

225 Id. Ibid.

In the words of GDPR Article 5 (1) (c), data processing should take place only if it is “*adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed*”²²⁶.

This provision indeed reflects an important right of the data subject to provide only the necessary data for a specific purpose. On the other hand, it is known that according to the artificial intelligence systems functioning, the more data the system has, the more accurate its results will be. In this way, it is questioned whether the limitation of the data supply to the minimum necessary would not impoverish the pool of data available for the efficient learning of a system.

In fact, if the lack of data compromises the operation of an AI system, it is possible that the investment in this type of technology becomes less attractive, given the impediment to machine learning, in the event of insufficient data. Furthermore, the data controller does not always know the purpose of the data processing, as it is argued below.

9. Obligation To Disclose a Specific Purpose For The Data Processing

The GDPR established the need to disclose a specific purpose for the data processing as one of its principles. More specifically, according to the Article. 5 (1) (b), personal data must be “*collected for specific, explicit and legitimate purposes and cannot be further processed in an incompatible way with the original purposes*”²²⁷.

226 Article 5 (1) of the GDPR. Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>> Access: 30 jun 2019.

227 Article 5 (1)(b) of the GDPR: “Personal data shall be [...] collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes; further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes shall, in accordance with Article 89(1), not be considered to be incompatible with the initial purposes (‘purpose limitation’);”. Regulation (EU) 2016/679 of the European parliament

What happens is that the data controllers do not always know at first the purpose of the data prospection and this does not necessarily imply prejudice to the data subject. According to Bioni, if we consider that the Big Data systems are technologies that allow reusing the same database for different purposes, then its use would be incompatible with the normative dynamics centered on specific consent.²²⁸

Likewise, the Information Commissioner's Office - ICO, UK's independent authority to defend data and information rights, has stated in the Policy Paper titled "*Big Data, Artificial Intelligence, Machine Learning and Data Protection*" that the peculiarity of artificial intelligence is that they do not linearly analyze data, as they were originally programmed to do. Instead, intelligent systems learn from the new data inputs to respond independently and adapt the outputs according to their learning²²⁹.

In other words, it may be difficult for data controllers to establish, at the outset, the purpose of data processing, as well as challenging for them to program the system so it only delivers outputs that take into consideration the original goals of the data processing.

Facing the difficulty of guaranteeing the full compliance with the requirement set forth in Article 5 (1) (b) of GDPR, and considering the heavy fines imposed by this regulation in case of non-compliance with its rules, it is necessary to take into account the discouragement that these provisions may generate in terms of investment in new technologies.

and of the council of 27 April 2016. Available at: <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=PT>>. Access: 30 jun 2019.

228 BIONI, Bruno. Xequê-Mate: o tripé de proteção de dados pessoais no xadrez das iniciativas legislativas no Brasil. Grupo de Estudos em Políticas Públicas em Acesso à Informação da USP - GPOPAI, São Paulo, 2015.

229 "But the difference is that AI programs don't linearly analyse data in the way they were originally programmed. Instead they learn from the data in order to respond intelligently to new data and adapt their outputs accordingly". ICO, Information Commissioner's Office. Big data, artificial intelligence, machine learning and data protection. UK. Available at: <https://ico.org.uk/media/for-organisations/documents/2013559/big-data-ai-ml-and-data-protection.pdf>. Access: 30 jun 2019.

10. Fines

Lastly, although already mentioned in topic 4.1, it is stressed at this point how the fines provided for in the GDPR can be burdensome for the controllers and operators for data processing.

According to GDPR Article 83 (4) and (5), some regulation infringements shall be subjected to administrative fines of up to EUR 20,000,000, or in the case of an undertaking, up to 4% of the total worldwide annual turnover of the preceding financial year, whichever is higher.

If the largest companies in the world will already pay an expensive account in case of non-compliance with the regulation, given the extremely high fines imposed, smaller companies may be discouraged from even starting to research and develop intelligent systems.

On April 19, 2018, the online platform of the British newspaper The Guardian published some considerations about GDPR, which at that time was about to come into force. The title of the news is How Europe's 'breakthrough' privacy law takes on Facebook and Google²³⁰.

According to Olivia Solon, technology columnist for the Guardian US San Francisco and writer of the article, to avoid the rigors of GDPR, Facebook would be changing the "terms and conditions" of its users located outside the United States, Canada and the Union European Union, whose data were governed by the rules of the parent company in Ireland. According to these alterations, these users would be governed by more lenient data protection regulation from other countries, since Ireland would soon be subjected to GDPR.

Next, the columnist makes the following provocation: "What about startups that do not have the same resources?" For this inquiry,

230 42How Europe's 'breakthrough' privacy law takes on Facebook and Google. Available at: <https://www.theguardian.com/technology/2018/apr/19/gdpr-facebook-google-amazon-data-privacy-regulation>. Access: 30 jun 2019.

the answer was that for companies that do not have the same features as Facebook and Google to suit GDPR would be much more costly.

This review mentioned a survey by PricewaterhouseCoopers, which indicates that 68% (sixty-eight percent) of US companies were expecting to spend between \$ 1 million and \$ 10 million to comply with the new regulation. These figures indicate that, in addition to the fines, adjusting the business to GDPR could already be too costly for smaller companies.

Thus, it is believed that small companies cannot possibly meet the costs, either to comply with GDPR or to pay fines, in case of non-compliance with the regulation. In this way, the stipulation of these fines can culminate in a technology market even more restricted to a limited group of companies.

Conclusion

The object of this article was to reflect on the antinomy between the right to personal data protection and the indispensability of this data for the development of new technologies based on artificial intelligence systems.

This analysis is presented in a context in which it is especially arduous to ponder on the pros and cons of the opposing sides of the balance. This is due, on one hand, to the realization that there are great bets on what artificial intelligence is capable of offering. In this sense, robust investments are being made in this type of technology²³¹. In fact, the applications of artificial intelligence systems have been increasingly present in people's daily lives, and the prospect of future

231 For some statistics on the investments and growth of AI the following is recommended: McKinsey's State Of Machine Learning And AI. Available at: <https://www.forbes.com/sites/louiscolumbus/2017/07/09/mckinseys-state-of-machine-learning-and-ai-2017/#35bbd4d975b6>. Access: 30 jun 2019.

technologies is generating euphoria among people, especially to those that display disruptive potential.

On the other hand, personal data, which in various legal systems is worthy of ample protection, has become an increasingly valuable commodity and thus its processing becomes the target of the largest companies in the world. In this scenario, the sensation of loss of control over the data and insecurity about the purpose of its use is intensifying.

Given this shared feeling among people, the urge to give protection to personal data is raised. This necessity had as a starting point the publication of GDPR and the rising of other legislative initiatives on data protection in the world.

Knowing the data misuse scandals and being aware of the vulnerability of the data subject, abandoning protectionist discourse to launch a look at innovation is not an easy task. However, it is a necessary one. Thus, the article intended to pinch some GDPR provisions and observe them under magnifying glasses, to verify if their rules have the potential to curtail investment in artificial intelligence systems, reflecting negatively on the technological development.

Analyzing the GDPR articles on the (i) right to object to an automated individual decision making; (ii) right to an explanation of the logic involved in automatic personal data processing; (iii) right to erasure and right to be forgotten; (iv) data minimization principle; (v) obligation to name a specific purpose for the data processing; and (vi) fines, it has been recognized that there are at least indications that GDPR can generate negative impacts on the increasing investments in artificial intelligence, which could even entail competitive losses for the European Union.

This is due, in particular, to the high costs that companies will incur, either to comply with GDPR rules or to pay fines for non-compliance with the regulation. Furthermore, in technical terms, compliance with certain GDPR principles - such as the specific

purposes of data processing and the minimization of data - can lead to damage to artificial intelligence systems, or make them less useful and accurate. Moreover, it is possible that a limited group of companies, with booming revenues, such as the case of technology giants (Google, Facebook, Samsung, among others), can adapt to GDPR without having a significant impact on their operations. However, for emerging artificial intelligence companies, GDPR's strict rules can mean an irremediable blow to their progress, representing entry barriers to new companies in the technology market.

Although evidence has been found that GDPR may impact the development of new technologies, making an absolute statement regarding this regulation only after approximately one year of its coming into force would be excessively daring for this article. What can be rightly stated is that it is difficult to set the balance between data protection and artificial intelligence functionalities.

In light of the mentioned above, the application of the GDPR and other GDPR's modeled regulations will face the challenge of keeping a healthy dialogue between protection and innovation. Therefore, it is expected that the side effects of data subject protection don't jeopardize the Artificial Intelligence growing market, which has been providing great positive development in society.

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Commercial Collaboration Contracts, Incompleteness And Artificial Intelligence

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Abstract

Considering that collaboration contracts are long-term, contracts between parties that allocate strategically the identified risks, these are naturally incomplete pacts. Thus, the authors intend to analyze how artificial intelligence is supposed to help reducing incompleteness in these contracts according to their characteristics. This issue will be analyzed in the pre-contractual phase, with emphasis on the causes of incompleteness. Thereafter, some impacts will be examined during the contract performance to provide solutions to problems arising from incompleteness. Finally, the authors' conclusion and their impressions about the future of the theme will be presented.

Keywords

Artificial intelligence. Incomplete contracts. Commercial contracts. Collaboration contracts.

Introduction

Artificial Intelligence (“AI”) has targeted many aspects of human life, increasingly reaching human relations. Among those relations, AI affects contracts: nowadays, there are websites and online platforms that offer contractual drafts generated from certain information that parties to an agreement input in the system, regarding their objectives with said contract. Given that AI grows at a much faster pace than Law can keep up with, it is necessary to try and anticipate some of the new scenarios that will soon come to reality, especially regarding more complex matters.

In this scenario, it is very adequate to use commercial collaboration contracts as a background to address how AI can contribute to its development and evolution. After all, they are long term contracts executed among companies, which are free to allocate risk, and, notwithstanding their interests, share a common goal, hence the need to collaborate. All these nuances make this kind of contract incomplete by its own nature, resulting in consequences that, most of the time, set the parties apart from their primitive cooperation scope.

Therefore, we intend to discuss a few impacts caused by AI in the economic theory of contracts incompleteness, specifically regarding commercial collaboration contracts. Accordingly, this papers’ goal is to answer the following questions: (i) how will AI act to solve the causes for commercial collaboration contracts incompleteness’, especially regarding transaction costs and informational asymmetry?; (ii) regarding problems created by said incompleteness, how will AI

help contractual revision?; and, consequently and conclusively, (iii) can AI make commercial collaboration contracts complete?

The chosen methodology for this paper was to analyze commercial collaboration contracts' characteristics, especially through the economic theory for contract incompleteness' lens. Thus, verifying in which way the axioms and predictions already set for AI impacts this scenario, focusing on incompleteness' main causes and consequences.

1. Collaborative Commercial Contracts And Their Natural Incompleteness

Commercial contracts²³², understood as those agreed upon between business parties²³³, have been the object of analysis for a long time by Brazilian doctrine. Most of the approaches, however, reflected only the typical contracts provided by the Commercial Code of 1850 and in special legislation²³⁴, thus concentrating the examination on

232 Also called commercial contracts, as this is the nomenclature of Title IV of the 1850 Commercial Code, or commercial contracts. In the present work, all these expressions will refer to the same institute: contracts signed between business parties. From the legislative point of view, the recent Law of Economic Freedom (Law nº 13.874/2019), which inserted art. 421-A in the Civil Code of 2002 and expressly mentioned "civil and commercial contracts", in order to conclude that there are two different legal natures.

233 The doctrine is not uniform as to the definition of commercial contract. Paula Forgioni, for example, argues that it is necessary that "[...] the link be established exclusively between companies" (FORGIONI, Paula A. *Contratos Empresariais: teoria geral e aplicação*. 2. ed. rev., atual., e ampl. São Paulo: Editora Revista dos Tribunais, 2016, p. 28. Em sentido diverso, Haroldo Verçosa entende que o contrato mercantil pode ser configurado desde que uma das partes seja empresária e a outra não seja consumidora (VERÇOSA, Haroldo Malheiros Duclerc. *Contratos Mercantis e a Teoria Geral dos Contratos: o Código Civil de 2002 e a Crise do Contrato*. São Paulo: Quartier Latin, 2010, pp. 24-25).

234 In the Commercial Code of 1850, contracts for commercial mandate, commercial commission, commercial purchase and sale, barter or exchange, commercial lease, commercial loan, commercial surety, mortgage and commercial pledge and commercial deposit (Titles VI to XIV) were typified. In the special legislation, we highlight the Commercial Representation Law (Law No. 4,886 / 1965), the Commercial Concession Law between producers and distributors of motor vehicles by land (Law No. 6,729 /

the peculiar characteristics of each species, without devoting to the development of a general theory of commercial contracts.²³⁵

The legislation, whereas, cannot keep up with the dynamics of business life. In fact, it is impossible to issue a specific law that regulates each type of contract arising from the new activities, given that certain contracts are hybrids and contemplate characteristics of several types of business. In addition, innovative ventures must, first - and in their great majority -, submit themselves to the approval of the market itself, in order, in case they survive, to comply with the Law.

Recently, however, the doctrine has started to look at the particularities of commercial contracts and the development of a general theory that, based on their logic and economic operation, establishes its basis for the interpretation and integration of this type of agreement, which must be treated in light of its economic function and the context (market) in which they are inserted, respecting the distribution of risks agreed upon among the contractors.²³⁶

The treatment of general issues is still incipient, especially in relation to commercial contracts of a hybrid nature, which, in a line of extremes, are between the classic exchange contracts (at one end) and the partnership contracts (at the opposite end), sometimes presenting characteristics of one, sometimes of the other.²³⁷

On the one hand, the needs of adequacy and survival of the economic agent in the market made the business of mere exchange and immediate enforcement insufficient for long-lasting relationships. That is because it was verified that agreeing on successive contracts of

1979), the Business Franchise Law (Law No. 8,955 / 1994) among others.

235 For all, the analysis of the classics of Fran Martins and Waldirio Bulgarelli demonstrates the greater dedication to the special part of the commercial contracts than to the general part. Cf. MARTINS, Fran. *Contratos e obrigações comerciais*. 6. ed. Rio de Janeiro: Forense, 1981, e BULGARELLI, Waldirio. *Contratos Mercantis*. 5. ed. São Paulo: Atlas, 1990.

236 In this sense, see Paula Forgioni's work *Teoria geral dos contratos empresariais*. São Paulo: Editora Revista dos Tribunais, 2010.

237 WILLIAMSON, Oliver E. *The Mechanisms of Governance*. Oxford: Oxford University Press, 1996.

this nature, separately, would not satisfy the interests of the parties. On the other hand, despite the urgency of establishing a long-term relationship between the parties, such long term relationship did not change the hierarchy and rigidity typical of company contracts, which would deprive the contracting parties of the patrimonial autonomy to contract with third parties at their own risk.²³⁸

In this context, collaboration agreements have arisen, in which the parties do not necessarily have opposing interests so that the increase in the economic advantage of one party leads to a decrease in the benefit of the other - as occurs in exchange agreements - and they do not share the elements for the association contract pursuant to Article 981 of the Brazilian Civil Code, especially those in which the parties choose to support the risk by all or some of the partners. They represent long-term relationships and, consequently, cooperation between the parties, in which immediate opportunistic behaviors tend to give way to planned strategic actions aimed at greater future benefits. The concept adopted is the diction of Article 456 of the Senate Bill No. 487/2013, that amends the Commercial Code of 1850, *in verbis*: “In business collaboration contracts, one party (collaborator) assumes the obligation to create, consolidate or expand the market for the product manufactured or marketed or for the service provided by the other party (supplier)”. For example, the types contemplated by the Brazilian legal system are distribution, commercial representation, concession, and franchising.²³⁹

238 This is the reasoning put forward by Paula Forgioni, who adds: “the closer the hybrid contract is to that of the exchange, the greater the degree of independence of the parties and the lesser the collaboration between them. As we move gradually towards societies, the greater the degree of stability of the bond and collaboration.” (FORGIONI, Paula A., *op. cit.*, pp. 174-175).

239 These are some of the collaboration contracts thus classified by Senate Bill 487/2013, which amends the 1850 Commercial Code, pending before the Federal Senate. The Project also provides definition for collaborative contracts in its art. 456, *in verbis*: “Art. 456. In business collaboration contracts, an entrepreneur (employee) assumes the obligation to create, consolidate or expand the market for the product manufactured or marketed or for the service provided by the other entrepreneur

Collaborative contracts are categorized as hybrid also due to their peculiar characteristics of the economic interdependence of the parties deriving from specific investments²⁴⁰, but maintaining contractors' property, legal, management and administration autonomy, as well as the differences between their activities and risks taken in the business.

In addition, the collaboration agreements are, in their majority, of long duration, concluded for an indefinite term. In fact, the contracting parties, supported by cooperation, do not establish only rules for exchange, but also rules that define the relationship between the parties. In the contractual instrument, therefore, “[...] the foundations are laid for future collaborative behavior, rather than the specific order of determined obligations”²⁴¹.

As they are dealt with successively, cooperation contracts are, in essence, incomplete.²⁴² In truth, incompleteness is a characteristic to which any long-term contract is subject, given the impossibility of foreseeing all future situations and allocating all the risks to which the parties would be subjected from the moment the bond is formed. And

(supplier).” (BRASIL. Senado Federal. Projeto de Lei nº 487/2013, que altera o Código Comercial. Available at: <http://www.senado.leg.br/atividade/rotinas/materia/getPDF.asp?t=141614&tp=1>. Access on: 02.27.2016).

240 From an economic perspective, the interdependence between the parties is said to arise from specific (or idiosyncratic) investments because “[...] it is a consequence of the specificity of the assets involved in a transaction, since the interruption of a relationship implies costs to those who have invested in such assets” (FARINA, Elizabeth Maria Mercier Querid; AZEVEDO, Paulo Furquim de; SAES, Maria Sylvia Macchione. *Competitividade, mercado, Estado e organizações*. São Paulo: Singular, 1997, p. 82).

241 FORGIONI, Paula A.. *Contrato de distribuição*. São Paulo: Editora Revista dos Tribunais, 2005, p. 71.

242 “Given their time-delayed characteristic, collaboration contracts usually do not provide discipline for all the problems that may be experienced by the parties during their execution. This is because at the time of the conclusion of the pact, it is impossible to foresee all situations and to hold all information relating not only to the negotiation, but to the counterpart and the market conjectures.” (BEZERRA, Andréia Cristina; PARENTONI, Leonardo Netto. A reconsideração da personalidade jurídica nos contratos mercantis de colaboração. *Revista de Direito Mercantil, Industrial, Econômico e Financeiro*, São Paulo, ano L, n. 158, p. 189-210, April/June. 2011, p. 197).

even if it was possible, there would be many contingencies to foresee and then to describe contractually, increasing the respective costs.

This characteristic led economists to focus, from the 1970s onwards, on studies of contractual incompleteness, looking from their causes to possible solutions to achieve greater efficiency. The theory of incomplete contracts starts from the premises already established by Ronald Coase's theory of firm and transaction costs²⁴³ and had already found its basis in the works of Oliver Williamson, who analyzed the *ex post* inefficiencies created by the bargaining between the parties and the incentives for *ex ante* realization of specific investments in the relationship to be entered into.²⁴⁴

It is, however, Oliver Hart and his co-authors to whom it is attributed the basis for developing the theory of incomplete contracts²⁴⁵, a consequence of the high transaction costs involved in indicating precise actions that each party should take in every conceivable eventuality.²⁴⁶

Ian Ayres and Robert Gertner note that, for the first incompleteness theorists, the parties leave gaps because the costs of forecasting and writing all the contract terms outweigh the benefits envisioned from the start. However, Ayres and Gartner articulate a second cause for the omissions in contracts, concerning the asymmetry of information: when one party has more knowledge of the business

243 Cf. COASE, Ronald H. The nature of the firm. *Economica*, New Series, v. 4, n. 16, pp. 386-405, Nov., 1937.

244 Cf. WILLIAMSON, Oliver E. The Vertical Integration of Production: Market Failure Considerations. *American Economic Review Papers and Proceedings*, n. 61, pp. 112-123, 1971; WILLIAMSON, Oliver E. *Markets and Hierarchies*. Nova Iorque: The Free Press, 1975; WILLIAMSON, Oliver E. Transaction-Cost Economics: The Governance of Contractual Relations. *Journal of Law and Economics*, n. 22, p. 233-271, 1979.

245 É o que conclui a revisão de bibliografia sobre a obra de Oliver Hart e Bengt Holmström, elaborada por ocasião de sua láurea com o Prêmio Nobel de Economia de 2016 (THE ROYAL SWEDISH ACADEMY OF SCIENCES. *Oliver Hart and Bengt Holmström: Contract Theory: Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2016*. Estocolmo, 2016, p. 17).

246 HART, Oliver; MOORE, John. Incomplete contracts and renegotiation. *Working paper department of economics, Massachusetts Institute of Technology*, n. 367, p. 1-44, Jan., 1985, p. 1.

than the other, the first party can decide not to disclose it (motivated by a lack of time, lack of conditions to make it available, or even because it does not bring benefits to it). The party could also choose to have certain circumstances in the contract in a deliberate way, such as avoiding the imputation of penalties in certain future situations, which would be known to cause damages²⁴⁷. The other party, in turn, may accept to run the risk of entering into an incomplete contract because the transaction costs involved in obtaining the information in the pre-contractual phase are high, leaving the execution to resolve any issues that arise.

According to Paula Bandeira, when examining contractual incompleteness from the perspective of an economic analysis of law, an incomplete contract does not regulate the effects that possible contingencies, if implemented, could immediately generate in the business, which allows an “[...] opening of the contractual regulation, which, due to changes in the economic environment, would be submitted to the subsequent definition of missing elements”²⁴⁸. Once the supervening fact not foreseen by the parties is verified, the objective of renegotiating may emerge firmly, which might lead to opportunism.

And how can opportunistic behaviors be restrained in the face of (and from) the incompleteness that has now been pointed out? The author points out that one of the economic functions of contractual law is to prevent opportunism from parties²⁴⁹. Just as the level of omissions will depend on the risks and costs involved in

247 AYRES, Ian; GERTNER, Robert. Filling gaps in incomplete contracts: an economic theory of default rules. *The Yale Law Journal*, v. 99:87, n. 1545, p. 87-130, 1989, p. 127. Available at: http://digitalcommons.law.yale.edu/fss_papers/1545. Access on: 09.07.2017.

248 BANDEIRA, Paula Greco. O Contrato Incompleto e a Análise Econômica do Direito. *Revista Quaestio Iuris*, Rio de Janeiro, vol. 08, n. 04, 2015, pp. 2696-2718, p. 2705.

249 Ibidem, p. 2703.

making the contract more complete, it will also be influenced by the rules of interpretation that will apply to it.

Paula Forgioni, in defense of the development of the dogma to erect the autonomous legal discipline of commercial contracts, in addition to contributing with vectors and limits for the interpretation of this category of legal arrangements²⁵⁰, reports some solutions for the integration of gaps in incomplete contracts²⁵¹. Among them, the author lists: i) resorting to uses and practices²⁵² and *bona fide*; ii) the adaptation of the agreement by the parties, through hardship and renegotiation clauses in case of events not contemplated in the contract²⁵³; and iii) the attribution of decision power to third parties with technical competence to complete the agreement, i.e. the Judiciary or arbitration.

250 FORGIONI, Paula A. *Teoria geral dos contratos empresariais*. São Paulo: Editora Revista dos Tribunais, 2010. Para vetores de funcionamento dos contratos mercantis, confira-se o Capítulo II, pp. 55-150. Para interpretação, Capítulo IV, pp. 215-246.

251 The author points out that, while interpreting, the text starts to unfold its meaning, in the integration, of the lack of express prediction about the treatment that should be given to a supervening fact, the interpreter can complement the agreement. (FORGIONI, Paula A. *Contratos empresariais: teoria geral e aplicação*. 2. ed. rev., atual. e ampl. São Paulo: Editora Revista dos Tribunais, 2016, pp. 268-280).

252 Referring to revoked Article 133 of the 1850 Commercial Code, which provided: “Art. 133 - If the clauses necessary for its execution are omitted in the wording of the contract, it must be assumed that the parties have subjected themselves to what is of use and practice in such cases among traders, instead of the execution of the contract.”

253 Common in international contracts, the hardship clauses authorize the parties to request changes in the face of supervening events that disturb the balance of the contract, as extracted from art. 6.2.3 of UNIDROIT Principles: “In case of hardship the disadvantaged party is entitled to request renegotiations” (UNIDROIT. UNIDROIT Principles of International Contracts. Unidroit: Roma, 2010. Available at: <http://www.unidroit.org/english/principles/contracts/principles2010/integralversionprinciples2010-e.pdf>. Access on: 09.08.2017). Pode-se até estipular que a empresa onerada suspenda o adimplemento da obrigação até a solução do impasse: “[...] nowadays it seems to be undisputed that, wherever the right to claim performance would undermine the obligor’s exemption, performance cannot be demanded as long as the impediment exists.” (SCHWENZER, Ingeborg. Force Majeure and Hardship in International Sales Contracts. *Victoria University of Wellington Law Review*, v. 39, p. 709-725, 2008, p. 720).

Sticking out, regarding collaboration contracts, is the solution of having, in the contractual instrument, clauses that oblige the parties to negotiate or even to adapt the clause in case events that alter the balance of the business occur. This is because, although collaborative contracts are premised on solidarity between the parties; they are still commercial contracts, guided by their own principle which presupposes diligence prior to the agreement to identify and define future risks.

In studying the duty of cooperation in long-term contracts, Giuliana Schunk concludes that, in situations of contractual incompleteness, the parties are practically obliged to renegotiate some terms due to the contingencies and subsequent situations which the parties were unaware of or did not foresee in the instrument.²⁵⁴

Anderson Schreiber strongly defends the need to recognize a duty to renegotiate unbalanced contracts in Brazilian law, as a constitutional expression of the value of social solidarity and the resulting infra-constitutional rules, such as the general clause of objective *bona fide*.

In his view, considering the attached duties generated by the general clause of objective *bona fide* and the imposition of a standard of conduct on both contractors of reciprocal cooperation to achieve the practical result that justifies the contract entered into, the duty to renegotiate is derived from it - even if there is no express clause - and there is no need for a specific rule in Brazilian law establishing the duty to renegotiate:

In this sense, one cannot fail to notice that both the duty to promptly warn the counterpart about the contractual imbalance identified and the duty to engage in renegotiation aiming to obtain the rebalancing of the

254 SCHUNK, Giuliana Bonanno. *Contratos de longo prazo e dever de cooperação*. Thesis (Doctorate in Civil Law) -University of São Paulo's Law School, São Paulo, 2013, p. 49.

contract, constitute behavioral duties which, although instrumentalized to recover the contractual balance, derive, strictly speaking, from the need for the parties to cooperate with each other to achieve the contractual scope. Thus, it must be concluded that the recognition of the duty to renegotiate, between us [Brazilians], finds normative basis in the general clause of objective *bona fide*, more specifically in Article 422 of the Civil Code.²⁵⁵

In summary, the duty of renegotiation, by not being confused with the duty to review the contract extrajudicially, is divided into two stages: (i) the duty to promptly inform the other party of the imbalance or incompleteness identified; and (ii) the duty to bring about a renegotiation that enables the rebalancing of the contract or to respond seriously to the proposal.²⁵⁶

Requiring the parties to renegotiate the contract when random situations occur is not a settled matter, not even in foreign doctrine. Ewan McEndrick, an English author, questions how difficult

255 SCHREIBER, Anderson. Construindo um dever de renegociar no Direito brasileiro. *Revista Interdisciplinar de Direito. Faculdade de Direito de Valença*, v. 16, n. 1, p.13-42, jan./jun. 2018, p. 34/35.

256 Ibidem, p. 38. he author best exemplifies some of the behaviors expected of the parties in these two stages: “(...) (a) prompt and detailed communication to the counterpart about the contractual imbalance, substantially indicating the presence of its assumptions; (b) response of the counterparty in a reasonable time to this communication, promptly and substantially informing if those assumptions are not present; (c) any proposal, as well as a counter-proposal for an extrajudicial review of the contract, must be presented in a detailed and justified manner, avoiding the logic of “taking it or leaving it”; (d) in the course of renegotiation, each party must provide the other with all information useful to assess the opportunity and the content of any possible extrajudicial revision of the contract; (e) the parties must also maintain a reservation on data and information obtained in the course of the renegotiation, avoiding its disclosure to third parties; (f) neither party should unreasonably refuse to maintain renegotiations or interrupt them abruptly and without reason; and (g) the failure of the renegotiation should not be considered by either party as a reason to refuse to analyze proposals for a consensual solution within the scope of any subsequent judicial or arbitration proceedings.” (Ibidem, p. 41/42).

is it to accept that trust based on the notion of *bona fide* serves to support the existence of a duty to bargain²⁵⁷. In fact, it is necessary to avoid the trivialization of *bona fide* as a remedy for all ills, under the excuse of seeking contractual justice²⁵⁸ and substantial equality in relations among business parties.

Predictability is important, but adaptation is also essential due to the long duration of collaboration contracts. Hence contractual incompleteness. Thus, it must be recognized strategically, and the parties must agree on governance mechanisms that give them the comfort to promote adjustments throughout the relationship²⁵⁹. And when such governance mechanisms are (if not already) so evolved that they may affect both the pre-contractual phase and the enforcement of the contract? How can the advancement of technology help contractors dealing with contractual incompleteness and its

257 “It is difficult to accept the reliance which is here placed upon notions of ‘good faith’ to support the existence of such a bargaining duty. The fundamental difficulty which is produced lies in seeing how a party can be in bad faith on the ground that she has refused to give up the rights which she enjoys under the contract. Of course, where the disadvantage which has been produced by the unforeseen event is extreme, then the contract may be held to be frustrated and, in such case, the court will be called upon to identify the rights of the parties under the discharge of the contract. But the situation is altogether different where the contract remains on foot, but one party is alleged to be in bad faith because she has refused to give up her contractual right to demand that the contract be performed according to its original terms.” (MCKENDRICK, Ewan. *The regulation of long-term contracts in English Law*. In: BEATSON, Jack; FRIEDMANN, Daniel (Coord.). *Good faith and fault in contract law*. Oxford: Clarendon Press, 2001, p. 315). In favor of mandatory renegotiation clauses, see: SPEIDEL, Richard E. Court-imposed price adjustments under long-term contracts. In: *Northwestern University Law Review*, 1981, 369, p. 404.

258 Fernando Noronha teaches that contractual justice is “[...] the equivalence relation that is established in the exchange relations, in such a way that neither party gives more or less of the value it received.” (NORONHA, Fernando. *O direito dos contratos e seus princípios fundamentais: autonomia privada, boa-fé, justiça contratual*. São Paulo: Saraiva, 1994, p. 214).

259 FRAZÃO, Ana. *Os contratos híbridos*. São Paulo: Associação dos Advogados de São Paulo, 18 mai. 2017. *Anais eletrônicos do 7º Congresso Brasileiro de Direito Comercial*. Available at: <http://www.congressodireitocomercial.org.br/site/anais-eletronicos>. Access on: 08.07.2017.

controversies, reducing them? This is what we are trying to outline in the following paragraphs.

2. Ai's Impacts On Contractual Incompleteness Causes

In an attempt to analyze how AI can reduce contractual incompleteness, we first seek to verify its impacts on the causes of this phenomenon, so that solutions can be sought to make contracts increasingly complete. As seen, the two main causes of incompleteness are transaction costs and information asymmetry, observed in the pre-contractual phase. In this way, these causes are analyzed in this Section 2, as well as how they can be mitigated, consequently reducing the gaps in contractual instruments.

2.1. Possible Reduction Of Transaction Costs

According to the *Theory of the Firm* developed by Ronald Coase, transaction costs are those incurred by economic agents when making decisions in their relationships, even though there are no financial expenditures, as they derive from the set of measures taken to carry out a transaction.²⁶⁰ According to the author, even in the presence of active and efficient markets, economic agents organize their activities in the form of a company to reduce these costs.

In long-term contracts, there are *ex ante* and *ex post* transaction costs. *Ex-ante* costs are those related to the initial definition of the contract and the safeguards to be adopted in case of future events. Along these lines, Raquel Sztajn and Haroldo Malheiros Verçosa point out that “[...] if the contract distributes risks - benefits and burdens - between the parties, it is clear that unforeseen future events may affect the initially adjusted distribution, a fact that does not occur in instantly

260 COASE, Ronald H. The nature of the firm. *Economica*, New Series, v. 4, n. 16, p. 386-405, Nov., 1937, p. 392.

enforceable contracts, which, from this perspective, are complete”.²⁶¹ The *ex post* costs, by their turn, are those related to renegotiation to adjust the business relationship to the events, to the cost of settlement of disputes and to the cost of ensuring compliance with obligations, and, due to their specificities, will be examined in a separate section.

When the costs of predicting and writing all the contractual specificities exceed the benefits expected by the parties, to begin with, the transaction costs are high, causing incompleteness in the pact to be executed. Possible solutions to reduce these costs would be specific investments in information and due diligence efforts capable of making the parties aware of the maximum number of possible situations that may occur in the long-term relationship so that they can previously stipulate clauses in this regard.

And it is in the reduction of transaction costs involved with contractual incompleteness that AI will impact such form of agreement, granting the parties greater predictability in specifying future circumstances and the consequences they may generate. In this context, Avery Katz focuses on proposals that the parties, with the help of their lawyers, can work to reduce the gaps, such as *ex ante* investments (before the contract is signed) to reduce the cost of subsequent complementation, such as further studies and analysis of the business conditions to avoid gaps.²⁶²

In fact, one cannot deal with the issue at hand without addressing the impacts that AI has had on legal activities, especially those developed by lawyers, such as the drafting of contracts. Some authors even discuss and call this phenomenon the “uberization” of the legal industry,²⁶³ foreseeing drastic changes to the future of lawyers.

261 SZTAJN, Raquel; VERÇOSA, Haroldo Malheiros Duclerc. A incompletude no contrato de sociedade. *Revista de Direito Mercantil, Industrial, Econômico e Financeiro*, São Paulo, ano XLII, n. 131, p. 7-20, jul./set. 2003, p. 13.

262 KATZ, Avery W. Contractual incompleteness: a transactional perspective. *Case Western Res. Law Review*, v. 56, p. 169-186, p. 177.

263 SKAPINKER, Michael. *Technology: Breaking the Law*, Financial Times, April 2016. Available at: <http://www.ft.com/cms/s/0/c3a9347e-fdb4-11e5-b5f5-070dca6d0a0d.html#axzz4DhLnvXou>. Access on: 07.20.2018.

The drafting of contracts, traditionally a responsibility for lawyers, has the potential to be absorbed by AI, as it is already the case with templates, contractual clauses and even full contracts of less complexity.²⁶⁴ In this sense, Irene Ng, when analyzing how AI and contract drafting can go together, points out that these tools allow corporations and clients to avoid the cost of legal advice from lawyers, while the lawyers will have to join their practice to AI in order not to be surpassed by it.²⁶⁵ The author states that the advent of contract drafting software in the market already allows access to standard contract and legal solutions for the fraction of the price charged by a lawyer for the same service.²⁶⁶ Initially, there is no prohibition for the party itself, not being a lawyer, to draft its contract, as long as it does not give legal advice to any other person.

The use of AI in the drafting of contracts can be divided into two categories, according to Irene Ng: (i) using software to assist in the drafting process already existent among lawyers, making it more efficient; and (ii) using software to completely replace lawyers in the drafting process, which would be fully performed by AI, from scratch.²⁶⁷

264 Companies and start-ups that mix technology with the legal market and offer alternatives to the eminently humane contractual elaboration, in a faster, easier and more efficient way, that avoids failures such as the lack or excess of certain clauses in the contract. Examples are Contractually, Clausehound, LegalZoom, and Dragon Law. Among them, Clausehound offers Playbook, where the party gives the information, such as what is essential in the contract, fills out some forms to indicate your will and the site delivers the contract prepared (<https://www.clausehound.com/playbooks/>). This plan is free, and the risks about the adoption of certain types of clauses are informed to the parties with notices on the site, legal articles and comments from users to guide their decisions. Other more complex plans involve advice from lawyers during the lawsuit, or even the revision of the contract by a lawyer (Available at: <https://www.clausehound.com/signup>. Access on: 07.20.2018).

265 NG, Irene. The Art of Contract Drafting in the Age of Artificial Intelligence: A Comparative Study Based on US, UK and Austrian Law. *Stanford-Vienna TTLF Working Paper*, n. 26, 2017, p. 5/6.

266 Ibidem, p. 9.

267 Ibidem, p. 17.

For the present study, both categories outlined are of interest, and no distinction will be made between them. After all, all these situations include, to a greater or lesser extent, the use of AI. The author recalls that the ability to draw up contracts is a skill that takes time to improve. Considering that the learning time of AI is much shorter than what takes a human being to perform the same task, the machine's performance in the elaboration of contracts may be *hors concours*.

On the subject, Dana Remus states that the likely path for legal AI will be shaped by two propositions: (i) for the machine to automate the task of a lawyer, it will be necessary to model the processing of information of this professional in a set of instructions, which will only serve for structured tasks that follow a pattern and can be covered by machine learning; and (ii) the AI models that use machine learning will have difficulties in processing contingencies that differ significantly from the data for which they were trained, what reveals difficulties mainly in predicting situations never before occurred in the history of the party.²⁶⁸

The first proposition can be illustrated by the example of an AI that is nurtured by inputs from various contract templates and, from the processing of the sentence blocks, paragraphs and clauses of these legal instruments, can arrange those that best fit the purpose for which it is programmed, forming a new contract. When the standard is simple, with simple clauses, so will AI activity be. Another example is already offered by the Clausehound start-up, which provides the service of pointing out gaps in the contractual draft sent by the counterparty from comparisons to the database of contracts that the party has nurtured the AI, setting standards for identifying missing or excess clauses²⁶⁹. This situation reduces contractual incompleteness

268 REMUS, Dana; LEVY, Frank S., *Can Robots Be Lawyers? Computers, Lawyers, and the Practice of Law*. November, 2016. Available at: <https://ssrn.com/abstract=2701092>. Access on: 07.20.2017, p. 48.

269 NG, Irene. *The Art of Contract Drafting in the Age of Artificial Intelligence: A Com-*

from a static point of view, i.e. the clauses that parties' practice have already shown to be necessary, but does not contribute much to reducing incompleteness from a dynamic point of view, i.e. by examining what future situations may occur from the input standards, and which human beings have not yet been able to foresee.

The second proposition gains emphasis on more complex situations. Therefore, by analyzing the main activities of lawyers and measuring how the progress of AI can impact them, Dana Remus identifies as moderate the impact that AI can have on the drafting of contracts and other documents. For more complex situations, along with contractual drafting, human legal advice will be required, which is an activity that will be little impacted by AI according to the author.²⁷⁰

In more dense phatic assumptions, such as in business collaboration contracts, the database to be absorbed and digested by AI is larger. Consequently, the contracting party demands more than a mere statistical forecast: it requires its lawyer to understand its objectives, interests, and all the meta legal aspects involved, aspects that are essential to be considered when drafting a contract.

Thus, no matter how much AI partially reduces transaction costs in commercial contracts, it will not eliminate them, since, in this complex type of relationship, other factors must be considered to reduce incompleteness and the consequences generated by it.

On another take, one can also dwell on whether the development of AI in the design of contracts with data analysis and predictability of standards needing to be regulated by the agreement in the pre-contractual phase cannot also increase transaction costs by redirecting them towards the best solution offered by AI. In other words, instead of reducing the parties' costs, AI supplements would

parative Study Based on US, UK and Austrian Law. *Stanford-Vienna TTLF Working Paper*, n. 26, 2017, p. 18.

270 REMUS, Dana; LEVY, Frank S., *Can Robots Be Lawyers? Computers, Lawyers, and the Practice of Law*. Novembro, 2016. Available at: <https://ssrn.com/abstract=2701092>. Access on July, 2017, p. 22.

be so beneficial that there would be a race to find the machine that provides more strategic advantages in data analysis and proposing solutions to potentially controversial issues that may arise in the future.

A lesser cost with lawyers may result in an additional cost with AI, and the latter may even be higher depending on the complexity of the collaboration commercial contract and the amount of data to be analyzed. At this point, Kevin Kelly's provocation stands out: it is not necessarily AI that will grow exponentially, but the inputs to it, i.e., data provision. This is why the results of acceleration of technology will give origin to an extra-human, and not to a super-human, who will have abilities beyond the human possibility,²⁷¹ such as analysis, processing and learning of collected data (machine learning) in order to offer concrete solutions in unfeasible time for the human being.

2.2. The Decrease In Information Asymmetry

As we have seen, data collection and its processing and learning by AI are embedded in the very functioning of this type of technology. The question is how AI can help with collecting and analyzing data, especially in contexts where the information made available to the parties is completely asymmetric, generating distortions in the relations to be created, such as incomplete contracts.

From a contractual point of view, information asymmetry arises in the context where one party holds more information about its business than the other party, as well as about its performance in relation to the other party's performance. The limitation of the availability of data in the pre-contractual phase may occur due to several factors, ranging from the limited rationality of the agent, by

271 KELLY, Kevin - *The Myth of a Superhuman AI*. Wired, April, 2017. Available at: <https://www.wired.com/2017/04/the-myth-of-a-superhuman-ai/>. Access on: 07.20.2018.

not being able to predict all future contingencies,²⁷² to the lack of time or conditions to make them available, and even the opportunism of the parties to strategically hide them because disclosure does not bring them benefits.²⁷³

In order to circumvent the limited rationality and thus reduce information asymmetry, it is important that the AI predictability system has a sufficiently strong level of accuracy to overcome human limitations and be more efficient. To this end, the AI system needs to be programmed with the ability to collect data and learn from the environment in which it is inserted so that its results are better evaluated.

Here, a basic principle applies, when using statistics to make predictions: predictions are more accurate when the sample size at which the test is done is larger. Similarly, in the case of AI: the greater the amount of data collected, the greater the accuracy of the result offered by the system.²⁷⁴

In case of asymmetry of information, that might be generated by the difficulty of one of the parties to study all the information/documentation provided for analysis, an AI system that surpasses the human capacity to digest and refine all this database on time, to propose results and alert about the existing risks, would be very welcome. This would end the strategy of burying the counterpart in

272 In Oliver Williamson words, limited rationality “[r]efers to behavior that is indendedly rational but only limitedly so; it is a condition of limited cognitive competence to receive, store, retrieve, and process information. All complex contracts are unavoidably incomplete because of bounds on rationality.” (WILLIAMSON, Oliver E. *The Mechanisms of Governance*. Oxford: Oxford University Press, 1996, p. 377).

273 AYRES, Ian; GERTNER, Robert. Filling gaps in incomplete contracts: an economic theory of default rules. *The Yale Law Journal*, v. 99:87, n. 1545, p. 87-130, 1989, p. 127. Available at: http://digitalcommons.law.yale.edu/fss_papers/1545. Access on: 09.07.2017.

274 NG, Irene. The Art of Contract Drafting in the Age of Artificial Intelligence: A Comparative Study Based on US, UK and Austrian Law. *Stanford-Vienna TTLF Working Paper*, n. 26, 2017, p. 22.

many documents in the pre-contractual phase, aware that there will not be time to refine all the information just with human effort.

The accuracy of results provided by AI would also depend on the purpose for which it was programmed. Thus, in addition to data collection and processing, it would be necessary for the AI system to have, as its clear scope, the identification of parties' standards on the object of the contract, which would later be critically examined in the drafting of the clauses - by the lawyers or by the machine itself, which is more complex, as seen above.

In terms of commercial contracts, it should be remembered that the parties, because they exercise business activity, are aware (even if limitedly, as shown) of the risks and must take all the necessary precautions and diligences to safeguard their interests. Thus, AI's assistance would be immense in reducing the distances caused by asymmetry of information. However, it is still essential to be guided by the main scope of the commercial contracts under consideration here: collaboration. Thus, before there are systems of AI optimized enough to examine the information provided by the counterparty, reducing the asymmetry in this respect, it is of paramount importance that the parties provide the information.

In the context of collaborative contracts, considering the purpose for which they are entered into, reflected in the very name of such arrangements, it is reasonable to require transparency and cooperation from the parties from the pre-contractual stage, which can legally be inferred from the principle of objective *bona fide*.²⁷⁵ On the other hand, it should not be forgotten that the cut-off point of this analysis is commercial contracts, where strategic behavior is a characteristic of the business and cannot be demonized, as it is part of the game.

275 SCHUNK, Giuliana Bonanno. *Contratos de longo prazo e dever de cooperação*. Thesis (Doctorate in Civil Law) –University of São Paulo's Law School, São Paulo, 2013, p. 49.

In fact, the problem continues to arise when information is not made available, which, in circumstances where the parties do not avail themselves of the AI, a conflict arises between the duty of transparency and the possibility of strategic and opportunistic action by the party with such information.

In this case, AI's contribution would be through the examination of indirect data, obtained through the context and the environment, which is sometimes very difficult to achieve. An example would be the collection of data in lawsuits in which the contracting party has appeared with other parties on the same or similar topics. Examination of this data may allow the AI system to inflect patterns and predict results, as well as inform its level of accuracy. Given the results, it would ultimately be up to the entrepreneur to decide whether or not to contract.

The lack of information would have to be resolved in advance between the parties to generate the obligation to make it available. The AI system could not only rely on contract templates available free of charge on the Internet to feed its database. In fact, to be more precise, the most appropriate contract drafts to feed the system are those provided by the parties themselves, mainly by the supplier, who holds the market share that will be expanded, and who most likely has more experience in hiring this type of contract than the other party. The issue should be better analyzed, notably to avoid that AI is used as an opportunistic domination mechanism by the supplier, even though the dependence created between the parties is a possible element in collaborative commercial contracts.²⁷⁶

Still, on this cause of incompleteness, it is necessary to point out that asymmetry of information is a natural part of commercial contracts and is part of the parties' risk. When contracting, they are

276 In this sense, cf. COELHO, Fábio Ulhoa. As obrigações empresariais. In: COELHO, Fábio Ulhoa (Coord.). *Tratado de direito comercial: obrigações e contratos empresariais*. V. 5. São Paulo: Saraiva, 2015, pp. 13-20.

aware of this. Thus, any failure by AI to verify the information cannot have an impact on the contract itself, but only on the relationship between the party that used the AI to assist it and the developer/producer/supplier, which goes beyond the limits of this paper and refers the reader to this compilation's chapters on tort law.

And when both parties use the same AI system to collect and analyze data to prepare the contract? In this hypothesis, the informational asymmetry, which would be strategic in normal situations for commercial contracts, would move to the second plain, giving way to effective collaboration, since the parties would be, from the beginning, willing to use a mechanism to reduce incompleteness of the contract to be signed and possible future problems.

3. Impacts On The Solutions To Problems Generated By Incompleteness: Contractual Revision

Avery Katz already suggested in 2005 that the parties invested in systems that generate information about the performance of the contract while it is in progress, based on the common inspection clauses in freight & shipping contracts. These early warning systems allow for the identification of potential difficulties while they can still be corrected or mitigated.²⁷⁷

Such a solution, added to the evolution of AI as a whole, can be of great value in combating opportunistic situations that arise during the enforcement of the long-term contract, generated by its incompleteness. The AI system that monitors contract enforcement will be able, from the analysis of the data and its processing through machine learning, to make predictions of patterns that will guide the

²⁷⁷ KATZ, Avery W. Contractual incompleteness: a transactional perspective. *Case Western Res. Law Review*, v. 56, p. 169-186, p. 178.

parties to renegotiate clauses or better specify potentially conflicting situations.²⁷⁸

This hypothesis would follow the same logic as the inferences made by AI systems from “likes” of social network users and their main interactions. In the execution of the contract, the “likes” would be the parties’ acts in compliance or noncompliance with the stipulated obligations, and the comparison of the actions and omissions with the content of the clauses already agreed upon and with the scope of the business would lead the AI to suggest proposals for renegotiations to fill the identified gaps.

The collaborative nature of the commercial contracts that are the subject of this paper must be kept in mind, which makes this type of system even more ideal. However, as already discussed above, some problems arise from this circumstance, such as the obligation to renegotiate the contract. As seen, the principle of party autonomy prevents the parties from being forced to revise the agreement, but nothing prevents them from being contractually stimulated to try to negotiate. In this sense, Giovanni Ettore Nanni notes that the consensual adequacy of the contract, when a result of the successful use of renegotiation clauses, is always more satisfactory and efficient for contractors.²⁷⁹

From the point of view of contractual imbalance, Anderson Schreiber defends that renegotiation has become frequent in business practice, so that, before filing any lawsuit or initiating arbitration proceedings, the aggrieved contractor tries with the counterparty

278 Or, as explained by Irene Ng: “The AI system assesses information that is fed into it, and subsequently makes inferences based on the data it has received by attempting to make connections and relationships amongst the different data that it receives. Upon making the relevant inferences, the AI system will then attempt to predict outcomes.” (NG, Irene. *The Art of Contract Drafting in the Age of Artificial Intelligence: A Comparative Study Based on US, UK and Austrian Law. Stanford-Vienna TTLF Working Paper*, n. 26, 2017, p. 22).

279 NANNI, Giovanni Ettore. A obrigação de renegociar no direito contratual brasileiro. *Revista do Advogado*, São Paulo, v. 116, 2012, p. 96.

a consensual solution based on contractual clauses that provide for “renegotiation in good faith”, or even in their absence.²⁸⁰

In fact, the social utility of legitimately entered into business and the need to avoid transaction costs that burden the parties led the operators of law to seek remedies that privilege rebalancing or supplementing the contract and maintaining the contractual relationship, “[...] breaking the dogma of preference for solutions that lead to the termination of the bond between the parties (cancellation/ resolution)”,²⁸¹

However, these remedies have been less and less sought by the parties in judicial litigation. If before the intervention of the Judiciary was already reticent and judicious in contractual revision, with changes more focused on the modification of price readjustment indexes or the extension of compliance deadlines,²⁸² currently, with the effectiveness of the Economic Freedom Act (Law No. 13.874/2019) and the changes made in the Brazilian Civil Code regarding the minimum judicial intervention and the exceptionality of contractual revision, it is imagined that the search for extrajudicial renegotiation solutions will be even more intense.²⁸³

280 SCHREIBER, Anderson. Construindo um dever de renegociar no Direito brasileiro. *Revista Interdisciplinar de Direito. Faculdade de Direito de Valença*, v. 16, n. 1, p.13-42, jan./jun. 2018, p. 13/14.

281 Ibidem, p. 13/14.

282 Ibidem, p. 16.

283 The Economic Freedom Act (Law no. 13.874/2019) added to art. 421 of the Civil Code the sole paragraph, in the following sense: “Sole paragraph. In private contractual relations, the principle of minimum intervention and the exceptionality of contractual revision shall prevail”. In addition, he added art. 421-A on the subject, in verbis: “Art. 421-A. Civil and commercial contracts are presumed to be parity and symmetrical until the presence of concrete elements that justify the removal of such presumption, subject to the legal regimes provided by special laws, also guaranteed that: I - the negotiating parties may establish objective parameters for the interpretation of the business clauses and their revision or resolution assumptions; II - the allocation of risks defined by the parties must be respected and observed; and III - the contractual revision will only occur in an exceptional and limited manner”. The doctrine, however, warns that the subject was already dealt with by jurisprudence and by scholars long ago, in order to define the outlines of the revision and its application models (RODRIGUES JR., Otavio Luiz; LEONARDO, Rodrigo Xavier; PRADO, Augusto

And, especially considering the context of the commercial contracts analyzed herein, there is much greater resistance to judicial review of the contract,²⁸⁴ so that the study of the duty to renegotiate is even more necessary.²⁸⁵

And why not try to negotiate with the help of an AI system which, looking at the past, might suggest alternatives for the future?

However, once the reflection takes the form of making it compulsory for the parties to adopt the solution found by the IA, the discussion completely changes focus. This is because it goes beyond the merely negotiating and collaborative plan, which is the subject of the commercial contracts under consideration, to hetero-compositional solution, i.e., the election of a third party to resolve the conflict. Initially, the methods of dispute resolution officially admitted are the Judiciary and Arbitration. Considering that the examination of the feasibility of developing AI, in this sense, necessarily involves the analysis of its appropriateness in these two branches, this question is left for future work, in order not to compromise the scope of the present one.

In any case, the AI system intended for suggesting contractual revision will have, from the beginning, a standard aimed at obtaining greater economic efficiency for both parties, since this is a collaborative commercial contract. Thus, based on the data collected, it will elaborate suggestions for specific rules for each specific case, which will be triggered in time for the renegotiation and communicated to the

César Lukascheck. *A liberdade contratual e a função social do contrato – alteração do art. 421-A do Código Civil*: Art. 7º. In: MARQUES NETO, Floriano Peixoto; RODRIGUES JR., Otávio Luiz; LEONARDO, Rodrigo Xavier (Coord.). *Comentários à Lei da Liberdade Econômica*: Lei 13.874/2019. São Paulo: Thomson Reuters Brasil, 2019, p. 234.

284 The Superior Court of Justice has already established the understanding that, in business contracts, judicial control should be more restricted, due to the parity of economic agents and the greater prestige given to private autonomy in this field. In this sense, we trust: BRAZIL, Superior Court of Justice. Special Appeal n. 1,409,849/PR. Rapporteur: Min. Paulo de Tarso Sanseverino. Trial Date: 26.04.2016. Publication Date: 05.05.2016.

285 For further details, specifically in the light of the contractual balance, see: SCHREIBER, Anderson. *Equilíbrio contratual e dever de renegociar*. São Paulo, Saraiva, 2008.

parties, analogous to the reasoning of the micro directives suggested by Anthony J. Casey and Anthony Niblett.²⁸⁶

Therefore, the problems caused by contractual incompleteness could be mitigated, leading parties to visualize more precisely the points of conflict and the solutions that maximize contractual enforcement.

Conclusion

As already identified by João Baptista Villela since the 1960s, the new theory of contracts is built on cooperation between parties, which develops where competition previously flourished in an unrestricted way, from the eighteenth-century individualism to the always antagonistic position between creditor and debtor.²⁸⁷ Thus, since cooperation is inherent in contracts and, above all, in collaboration contracts, it is necessary to consider it when applying solutions proposed by economists for contractual incompleteness, especially in the context permeated by artificial intelligence.

From the brief analysis carried out, it should be noted that, either to prevent the occurrence of gaps in commercial contracts in the pre-contractual phase, or to combat the problems generated by them and avoid their recurrence from the renegotiations, AI comes as an aid to cooperation between the parties. This is of extreme value, especially for collaboration contracts, where there has always been tension between the business character - which allows for risk allocation and opportunistic action to a certain extent - and joint efforts between the parties aimed at a common goal, in a cooperative manner.

286 CASEY, Anthony J.; NIBLETT, Anthony. The Death of Rules and Standards. *Indiana Law Journal*, v. 92, n. 4, p. 1401-1447, 2017.

287 VILLELA, João Baptista. Por uma nova teoria dos contratos. *Revista de Direito e Estudos Sociais*, Coimbra, ano XX, nºs. 2-3-4, p. 313-338, abr./dez. 1975, p. 336.

Even though the use of AI in the drafting of contracts is nothing new, it is clear that the solutions that exist today cannot yet completely replace human activity in the drafting and legal advice around a complex, long-term contract, such as collaborative commercial contracts.

For the time being, in fact, AI is unable to complete contracts, but the scenarios presented show that there are no limits to the extent to which, one day, the aid from the machine will be such as to reduce or even completely mitigate the causes of contractual incompleteness, making this economic theory a further part of history.

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'Credit Markets And Lenders' Access To Consumer Data: How To Promote Competition Through Financial Regulation

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Abstract

This paper demonstrates how competition, financial regulation and innovative technology converge in the Brazilian lending market. We (i) assess the state of innovation-driven technology in the financial sector; (ii) study how the problem of information asymmetry constitutes a relevant barrier to entering the lending market, since it prevents entrants from acquiring financial data on their potential customers; (iii) relativize the traditional premise that more competition in the financial market equals more instability and systemic risk; (iv) appoint the role of financial authorities – focusing on the Central Bank of Brazil – in promoting competition in the credit market; and (v) demonstrate how regulatory regimes which mandate data sharing between financial institutions (such as credit bureaus and open banking) enhance new lenders' capacity to compete, especially by enabling artificial intelligence systems to identify those financial consumers with the highest profitability and lower risk of default.

Keywords

Regulation. Competition. Central Bank of Brazil. Innovative technology.

Introduction

The Brazilian credit market has signs of a sub-optimal competitive process: (i) degrees of market concentration above the world average, which indicate the exercise of market power (five financial conglomerates hold over 80% of all loans); (ii) the average lending spread is the 2nd highest in the world, behind only Madagascar; (iii) the total credit profitability earned by the big banks is also above the world average (surpassing all banks listed on New York stock exchanges); and (iv) the big banks' "one-stop shop" models and monopoly on their clients' financial information impose high switching costs and lock-in effects that effectively discourage consumers from searching for credit products from other players, even if they are displeased with the products currently acquired from their banks (even more aggravated by operational hurdles to leave financial institutions)²⁸⁸.

288 For the specific studies concerning/ratifying said evidences and issues, please refer to (1) BARBOSA, Klênio; ROCHA, Bruno; SALAZAR, Fernando. *Assessing Competition in Banking Industry: a multiproduct approach*. Journal of Banking & Finance, vol 50, p.340-362. Amsterdã: Elsevier, January 2015; (2) JOAQUIM, Gustavo; VAN DOORNIK, Bernardus. *Bank Competition, Cost of Credit and Economic Activity: evidence from Brazil*. Working Paper Series n° 508. Brasília: Central Bank of Brazil, October 2019; (3) ORNELAS; José Renato Haas, SILVA, Marcos Soares; VAN DOORNIK, Bernardus Ferdinandus Nazar. *Informational Switching Costs, Bank Competition and the Cost of Finance*. Working Paper Series n° 512. Brasília: Central Bank of Brazil, January 2020; (4) ALENCAR, Leonardo; ANDRADE, Rodrigo, BARBOSA, Klenio. *Bank Competition and the Limits of Creditor's Protection Reforms*. XII Annual Seminar on Risk, Financial Stability and Banking. São Paulo: Central Bank of Brazil, 2017; and (5) STANDARD & POOR GLOBAL RATINGS. *Ruptura tecnológica nos bancos de varejo: bancos brasileiros à altura do desafio* (free translation: Technology rupture at retail banks: Brazilian banks up to the challenge). São Paulo: Standard & Poor's Financial Services LLC, February 2020.

These factors represent a relevant economic incentive for entrants to enter the lending market and contest bank profits. In the last few years, technological innovation and pro-competition regulatory measures from the Central Bank of Brazil (the “*Central Bank*”) have decreased the credit markets’ traditionally high barriers to entry, thus allowing the insurgence of fintechs – financial technology startups focused on building new products for lending costumers.

Credit fintechs have been growing at an astounding rate in Brazil, as evidence by the yearly increase of originated loans and the massive volumes of investments received from both local and foreign venture capitalists²⁸⁹. Naturally, the emerging pattern of innovation in the financial market brings the role of financial regulation into play.

This paper goes against common sense in a way that it does not go on about how regulation should cope with (or stay out of the way of) innovation. Rather, *we argue why and how a financial authority – the Central Bank of Brazil – may actively spur innovative entrants to enter the credit market and contest the incumbent banks*. Out of a multitude of ways through which such stimuli are possible, we focus here on how regulation can make sure that entrants have access to adequate streams of data from the lending markets – all in order to feed their artificial intelligence systems for credit analysis and gain empowerment to assess customer creditworthiness.

1. Technology And Innovation In The Financial System

Both the concept and relevance of innovation may be extracted from the works of Joseph Schumpeter – one of the authors considered to be its patriarchs in modern literature. According to Schumpeter, a capitalist economy is composed of “circular flows”, each embodying an economic activity taking place in the market²⁹⁰.

289 PWC BRASIL; ABCD. *Nova Fronteira do Crédito no Brasil* (free translation: New Credit Frontier in Brazil). Pesquisa Fintechs de Crédito, 2019.

290 As an example, we may consider how a farmer reaps his harvest, an industrialist

Metaphorically, we may call the union of these flows a symphony played indefinitely throughout time – each market agent acting as a musician in a grand orchestra. But the melody renews itself. Instead of becoming monotone as time goes on, it is continually influenced by *disturbances to the rhythm*, which are classified by Schumpeter as spontaneous and discontinuous, changing the symphony produced by the past flows.

These disturbances to the market rhythm are precisely the innovations – ideas put into practice by economic agents by creating new products and services to offer on the capitalist economy. Such creation disturbs the melody of the market and aggregates a new sound to it, as the entrepreneur responsible for the innovation becomes a new musician, and the orchestral symphony goes on, always renewing itself – a true *cacophony*.

This is where Schumpeter’s central idea comes in – the larger the number of disturbances to the symphonic rhythm of an economy, the most efficient its economic development. This opinion is sustained by academia to this day – market innovation generates growth, wealth, and customer welfare.

Generally speaking, Schumpeter proposes five different kinds of innovation: (i) a new good or service previously unknown (i.e., Microsoft/Apple’s personal computer, social media, smartphones); (ii) a new process or managerial strategy (i.e., Fordism, toyotism, the lean startup method²⁹¹); (iii) discovery of a new target market ripe for exploration (i.e., Uber to the lower classes); (iv) creation/discovery of a new raw material for the production of new goods (i.e., an active

buys his goods and processes them into a consumer good, a distributor buys this consumer good in large quantity, resells it to retail stores, and, finally, the end consumer buys this good for himself and his family. This chain of events is a series of circular flows which repeats itself sequentially throughout time to satisfy the market’s socio-economic needs.

291 RIES, Eric. *The Lean Start up*: how today’s entrepreneurs use continuous innovation to create radically successful businesses. New York: Crown Publishing Group, 2011.

ingredient from a plant for medicinal purposes); and (v) a new arrangement of industries (i.e., creation of break-up of a monopoly, like telecommunication and oil)²⁹².

It is exquisite how all five of Schumpeter's innovations are employed by the tech companies that have been dominating society along the transition to the 21st century. We speak of what is often called the "digital revolution" or the "fourth industrial revolution", entailing a massive transition of all aspects of life and economy to the internet digital plane (and data economy). From this wave arise countless entrepreneurs²⁹³, their startups²⁹⁴, and even the largest companies of today's world – the famous big techs²⁹⁵. Advanced economies, such as the United States, European Union, China, and others²⁹⁶, lean on constant tech development as essential elements since the 80s²⁹⁷.

292 SCHUMPETER, Joseph. *The Theory of Economic Development: an inquiry into profits, capital, credit, interest and the business cycle*. Cambridge: Harvard University Press, 1934.

293 According to Joseph Schumpeter, an entrepreneur is an economic agent bent on innovation capable of finding new resources (or new ways of combining old resources) to build a new product for the market. This process is defined as the destruction of the established economic order – the creative destruction. In SCHUMPETER, Joseph. *The Theory of Economic Development: an inquiry into profits, capital, credit, interest and the business cycle*. Cambridge: Harvard University Press, 1934.

294 Unlikely as it may be that the reader is not familiar with the term "startup", since it is defined in many ways across different works, we establish here that we shall follow the concept set forth by Eric Ries: a startup is a human institution which, under conditions of extreme uncertainty, generates innovation – in products or processes – and transforms it in a wieldable competitive advantage in its market. In RIES, Eric. *The Lean Start up: how today's entrepreneurs use continuous innovation to create radically successful businesses*. New York: Crown Publishing Group, 2011.

295 FROST, Jon; GAMBACORTA, Leonardo, HUANG, Yi, SHIN, Hyun Song; ZBINDEN, Pablo. *BigTech and the changing structure of financial intermediation*. Bank for International Settlements. BIS Working Papers n° 779.

296 JENG, Leslie; WELLS, Philippe. *The determinants of venture capital funding: evidence across countries*. Journal of Corporate Finance, v.6. Amsterdã: Elsevier, 2000, p. 241-289.

297 As an example, Silicon Valley startups has fostered extensive economic growth, job creation and all-around wealth for the United States. In LE MERLE, Matthew; LE MERLE, Louis. *Capturing the Expected Angel Returns of Angel Investors in Groups: less in more – diversify*. Fifth Era, 2015, p. 5.

Developing economies are equally called upon to elevate their tech innovation industries as a means to conquer growth and keep up with their more advanced peers²⁹⁸.

It is equally exquisite how many economic sectors have begun to invest massively in technology and innovation since the beginning of the “digital revolution”. Notwithstanding, *this is not the case in banking sectors* – banks have not “begun” to invest in tech innovation. Rather, they already invest in it since centuries ago²⁹⁹. This generations-long saga has been recently remembered as the result of three different ages by the chairman of the Bank for International Settlements³⁰⁰ (as cataloged by researchers from the University of Hong Kong Faculty of Law)³⁰¹.

1.1. First Era: From Analog To (traditional) Digital (1866-1967)

The first age of financial technology was contemporary to the telegraph, railroads, canals and steamships. Up until World War I, banks were (i) financing the development of these technologies, either as investors or debtors; and (ii) adopting these technologies to guarantee rapid transmission of financial information, transactions and payments around the world. After World War I, rapid tech development was slowed up until the end of World War II, after which a

298 YE, Huojie; ZHONG, Shuhua. *Business Accelerator Network: a powerful generator of strategic emerging industries*. Ontario International Development Agency (“OIDA”). International Journal of Sustainable Development, vol. 4, n° 6. Ontario: OIDA, 2012, p. 16.

299 Please note, however, the scope of this paper relates only to tech innovation, and not financial innovation (which would include new financial instruments, such as derivatives, collateralized debt instruments, and the like).

300 HERNÁNDEZ, Pablo Cos. *Financial technology: the 150-year revolution*. Basel Committee on Banking Supervision (18.11.2019).

301 ARNER, Douglas; BARBERIS, Janos; BUCKLEY, Ross. *The Evolution of Fintech: a new post-crisis paradigm?* Research Paper N° 2015/047. Sydney: University of New South Wales, 2017.

relevant innovation wave was launched during the 50s and 60s – mostly credit cards by Bank of America, Diners Club and American Express, followed by the constitution of the Interbank Card Association, which later become Mastercard³⁰².

1.2. Second Era: Development Of Traditional Digital Services (1967-2008)

The second age of financial technology began with the famous automatic teller machines (ATMs), which, while originally launched by Barclays, quickly expanded across the globe. The ATMs were the first popularized transition of financial operations to a digital environment, reducing the need for clients to physically travel to banking agencies and treat with bank employees – a facility which financial companies *still* quite enjoy use as advertisement to this day when launching new digital products and services. Overall, the banking sector was able to improve products and services with continuous technology, turn its infrastructure leaner with automation and restructure completely certain markets with new techniques of sharing data (i.e., securitization, derivatives and secondary market for loans)³⁰³. By 1998, most banks in the United States started setting up their websites to become the foundations of today’s internet banking³⁰⁴.

302 Id, p. 8.

303 REZENDE, Luiz Paulo Fontes. *Inovação Tecnológica e a Funcionalidade do Sistema Financeiro*: uma análise de balanço patrimonial dos bancos no Brasil. Center of Regional Development and Planning of Economic Sciences University – UFMG. PhD thesis in Economics. Belo Horizonte: UFMG/Cedeplar, 2012, p. 51.

304 ZIMMERMAN, Eilene. The Evolution of Fintech. *New York Times* (April 6th, 2016). Available in: <<https://www.nytimes.com/2016/04/07/business/dealbook/the-evolution-of-fintech.html>>. Access on February 2nd, 2020. 16.03.2020.

1.3. Third Era: Modernization/democratization Of Digital Services (2008-present)

The third age of financial technology began with the most recent financial crisis, and, thus, marked by both a surge of entrants to financial markets around the world and by imposed limitations to the banks' ability to compete. Everything occurred through a perfect storm between (i) post-crisis effects, as seen by the deterioration of traditional banks' images before the public, labor markets with an excess of educated personnel left without jobs; the rise of regulatory burdens imposed to banks (as in Basel III and Dodd-Drank Act), political support to innovative entrants in the economy and favorable economic conditions for startups³⁰⁵; and (ii) the technological innovations proposed by the “*digital revolution*” to consumers from practically every sector of the economy.

As such, the greatest merit of the third age of innovative financial technology was to permit the rise of startups in the financial systems around the world – these are called fintechs³⁰⁶. We shall use to our advantage how many authors have tried to box their activities in closed definitions over the years to deliver three separate (and complementary) definitions: (i) fintechs employ digital innovation to generate new applications/processes/products/business models for financial consumers³⁰⁷; (ii) fintechs adopt digital means to reach

305 ARNER, Douglas; BARBERIS, Janos; BUCKLEY, Ross. *The Evolution of Fintech: a new post-crisis paradigm?* Research Paper N° 2015/047. Sydney: University of New South Wales, 2017, p. 15.

306 Even if today it is used as quite a flexible term, the word “fintech” was originally coined by Citibank in the 90s to name its open innovation project called *Financial Services Technology Consortium*. Nowadays, the word is used to describe the most varied of activities. “[Several] companies have used the word ‘Fintech’ in their names. Some capitalized the ‘t’, some didn’t. They included a trader of distressed debt, a software firm serving the oil and gas and manufacturing markets, and a South African electronics company. Whatever fintech means now or in the future, I doubt another company will be able to claim the word as its own again”. In HOCHSTEIN, Marc. *Fintech (the word that is) evolves*. *American Banker* (October 5th, 2015).

307 FINANCIAL STABILITY BOARD. *Fintech and Market structure in financial services: market developments and potential financial stability implications* (published in Feb-

consumers, relativizing the importance of branches for financial distribution and disintermediating financial relations³⁰⁸; and **(iii)** fintechs adopt agile methodologies to create/test/implement new technology and focus on improving the consumer experience³⁰⁹.

All of the above is true and applicable to most fintechs in the known world, notwithstanding how different their businesses are and how they are all distributed throughout each segment across financial markets. To name a few, there are hundreds of fintechs in payments, crowdfunding, financial planning, wealth management, trading, insurance, data analytics, blockchain, cybersecurity, and – of course – lending. In this paper, we intend to phase out all other segments and focus exclusively on fintechs that employ artificial intelligence to offer loan products in the Brazilian credit market.

2. Credit Fintechs In Brazil: Business Models And Technology

Credit fintechs represent 10% to 20% of the total existing number of fintechs in Brazil³¹⁰ and abroad³¹¹, and they were officially endorsed by the Central Bank's executive board in 2018 as able to promote efficiency gains, lower costs in banking system transactions and offer credit to a public that is not yet fully reached by the

ruary 14th, 2017), p. 21.

308 CARMONA, Alberto; LOMBARDO, Agustín; PASTOR, Rafael; QUIRÓS, Carlota; GARCÍA, Juan; MUÑOZ, David; MARTÍN, Luis. *Competition issues in the area of financial technology (FinTech)*. European Parliament. Policy Department for Economic, Scientific and Quality of Life Policies. Directorate-General for Internal Policies, 2018, p. 17.

309 HODER, Frank; WAGNER, Michael; SGUERRA, Juliana; BERTOL, Gabriela. *Revolução Fintech: como as inovações digitais estão impulsionando o financiamento às MPME na América Latina e Caribe*. Oliver Wyman, 2016.

310 FINTECH LAB. 8^a edição do Radar Fintechlab registra mais de 600 iniciativas. *FinTechLab Radar* (June 12th, 2019).

311 BASEL COMMITTEE ON BANKING REGULATION. *Sound Practices: implications of fintech developments for banks and bank supervisors*. Bank for International Settlements (February 2018).

traditional banking system³¹² (much like fintechs have accomplished in the Indian and Chinese financial markets³¹³). According to a report by Goldman Sachs financial conglomerate about Brazilian financial technology, entrants are well-positioned to grow in the local lending market³¹⁴:

The average annual lending rate in Brazil is 32% but can reach up to 15% per month for certain personal loans. Part of this is driven by the limited amount of information borrowers and lenders have on each other, as well as shortcomings in distribution. Companies are using internet and mobile-based platforms, along with innovative business models, to bridge the gap between savers and borrowers, both within and outside the financial system.

Indeed, according to the Brazilian Digital Credit Association (ABCD), credit fintechs were able to grow their lending activities by an annual 300% over the past few years³¹⁵. Much of this growth is associated with not only the consumer-friendly digital products and lower interest rates than incumbent banks', but also with tailor-made strategies to attend to niches of underserved segments of the populace. For reference, there are 45 million Brazilians virtually excluded from the banking and credit system nowadays (who have transacted

312 Vote EMI nº 00040/2018-BACEN-MF, dated October 4th, 2018. The vote was publicized by the Brazilian Central Bank in Request nº 00077000032201930 under the Public Access to Information Law (the "*Lei de Acesso à Informação*"), on January 4th, 2019.

313 CARMONA, Alberto; LOMBARDO, Agustín; PASTOR, Rafael; QUIRÓS, Carlota; GARCÍA, Juan; MUÑOZ, David; MARTÍN, Luis. *Competition issues in the area of financial technology (FinTech)*. European Parliament. Policy Department for Economic, Scientific and Quality of Life Policies. Directorate-General for Internal Policies, 2018, p. 27.

314 GOLDMAN SACHS. *Future of Finance Fintech's Brazil Moment*. Goldman Sachs Global Investment Research, 2017, p. 24.

315 FRABASILE, Daniela. Não é questão de ser fintech ou banco: todos terão de ser digitais. *Época Negócios* (December 2nd, 2019).

around R\$ 817 billion in 2018)³¹⁶. As such, several fintechs have risen to provide credit to individuals with difficulties in acquiring loans from traditional banks³¹⁷ (for example, *Banco Maré*, a fintech from Rio de Janeiro that offers banking products to underserved residents of the local community).

However, perhaps the most economically relevant strategy from credit fintechs has been to reach out to Brazilian small and middle enterprises (the SMEs). Since they do not often have sophisticated management models, are very different from each other, have unknown growth prospects and are less capable of providing adequate collateral, loans to SMEs tend to have unfavorable interest rate, maturity and volume in the traditional banking system. In Brazil, as per the International Finance Corporation (IFC), more than 50% of Brazilian small businesses have null/inadequate access to credit, and only 10% claim to have full access³¹⁸⁻³¹⁹. Such deficiency contributes to lesser productivity from these SMEs in comparison to their peers from developed markets. As such, according to the Central Bank's executive board, one of the current key roles in their agenda to stimulate fintechs is precisely to facilitate Brazilian SME's access to credit³²⁰.

This is where these fintechs' access to data and artificial intelligence come in. Instead of relying on traditional credit analysis to ascertain the risk of each borrower (which would require a robust

316 PWC BRASIL; ABCD. *Nova Fronteira do Crédito no Brasil* (free translation: *New Credit Frontier in Brazil*). *Pesquisa Fintechs de Crédito*, 2019, p. 8.

317 *Id.*, p. 6-7.

318 IFC Enterprise Finance Gap Database. *International Finance Corporation*, 2018.

319 Overall, in Latin American countries, only 12% of credit goes to small companies (for reference, in OECD member countries, this percentage goes up to 25%). In HODER, Frank; WAGNER, Michael; SQUERRA, Juliana; BERTOL, Gabriela. *Revolução Fintech: como as inovações digitais estão impulsionando o financiamento às MPME na América Latina e Caribe*. Oliver Wyman, 2016.

320 Vote n° 97/2018-BCB, dated April 23rd, 2018. The vote was publicized by the Brazilian Central Bank in Request n° 1860000942201821 under the Public Access to Information Law (the "*Lei de Acesso à Informação*"), on May 3rd, 2019.

operational structure and probably still phase out small enterprises, much like traditional banks), credit fintechs build autonomous algorithms to analyze each potential client's financial background and decide whether or not to grant them a loan, and, if positive, on which interest rate, maximum volume and maturity dates. To function appropriately, these software applications require vast amounts of data on the clients to make the right decisions – and financial data in Brazil has historically been lacking.

2.1. The Importance Of Data For Credit Fintechs (and Their Artificial Intelligence Algorithms) To Compete With Incumbent Banks

When a credit institution cannot adequately glimpse the financial information behind a customer who wants to borrow money (that is, in almost any case in the real world, since a borrower always knows more than the bank about his own financial health)³²¹, there is *information asymmetry* – a concept demonstrated for the first time by George Akerlof as a market failure inherent to the economy (and treated today as one of the foundations of economic literature)³²².

321 Credit Scoring Knowledge Guide. *International Finance Corporation (IFC)*, 2012, p. 4.

322 Conceptually, as Akerlof analyzed, there are many markets where the buyer evaluates the statistics to decide whether to buy a product. In these statistics, the probability of a product being of a lower quality than claimed by the seller is considered. In other words, if the market for a certain product has many “lying” sellers, and it is not possible to verify the product quality 100% before purchase, buyers may decide that the risk of buying a product with hidden defects is high in that market and that you shouldn't buy it. To illustrate the concept, Akerlof describes an example that has become famous in the literature, which is the used car market. In this market, there are used cars that work well and there are used cars that work poorly, the latter called “lemons”. Anyone who buys a used car does so without knowing if it is good or if it is, secretly, a lemon. It then becomes a matter of probability, as the consumer cannot verify at the time of purchase whether the car is good or not, he will decide to buy if the risk of the product being a lemon is low. The buyer is forced to make this hidden defect risk assessment because the seller of the product has more information about the product than the buyer, including whether or not the product is a lemon. It was

Information asymmetry is a very real issue in the credit market, since borrowers naturally know more about their ability to perform than lenders. In turn, credit institutions need *financial information* about borrowers to determine their risk of default, i.e., risk of the borrower not paying the loan on its maturity date(s). In accordance with each borrower's risk of default, the lender determines at which rate, volume and maturity conditions the loan may be given - the lower the risk, the better the conditions that the credit institution generally offers.

However, entrants to the credit market have often suffered from information asymmetry high enough to be considered a relevant barrier to entry, since consumers' financial information and credit history were generally held only by the banks with whom each customer had a previous relationship. In other words, traditionally, credit institutions acquire information on consumers through relationships, especially the client's background, and, as the relationship goes on, the history of banking operations between them (past loans, deposits, account movements, etc.). Such data acquired through relationships is called soft information.

In a scenario where only borrowers' information is only held by the bank that sells them financial products, (i) only this bank has the necessary subsidies to determine the risk of default by the customer, and, from that point, determine loans' interest rates, total volume and maturity dates, and (ii) in a grand scale, each bank has an *ex post monopoly* on its customers' financial data - thus the barrier to entry against entrants who do not have the information necessary to form an adequate portfolio of active transactions.

this data gap between two economic agents that George Akerlof called information asymmetry. In AKERLOF, George A. *The Market for "Lemons": quality uncertainty and the market mechanism*. Quarterly Journal of Economics, Vol. 84, N° 3, Cambridge: August 1970, pp. 488-500.

The practical result of the *ex post* information monopoly is that “good” borrowers are likely to receive more advantageous credit conditions from their home banks (risk-based pricing), while “bad” borrowers will try to look for alternatives in the entrants³²³. This, in short, is the phenomenon of *adverse selection*, also explained by Akerlof as a consequence of informational asymmetry in his work on the “lemon” market.

In short, we concur that the barrier to entry represented by information asymmetry and (consequently) adverse selection are so imposing because an entrant without data to calculate the risk of default represented by its potential clients (*i*) will not have enough data to distinguish “good” borrowers from “bad” borrowers as readily as incumbent banks do; (*ii*) may be more sought after by “bad” borrowers looking for loans from entrants because they did not achieve good loan conditions from incumbent banks (which do have the data on such bad borrowers); and (*iii*) in an adverse situation scenario, the high number of defaults will increase the entrants’ operational costs arising from defaults (the so-called “*custos de inadimplência*”, which are partially responsible for the high-interest rates in the Brazilian lending market)³²⁴.

As constantly evangelized by regulatory agencies and economists all over the world, and as we ultimately defend in Chapter 4 of this paper, the best tool to reduce information asymmetry effects

323 See (1) the vote by Cade commissioner Cristiane Alkmin Junqueira Schmidt in the Concentration Act n° 08700.02792/2016-47, which approved with restrictions the joint venture of Itaú Unibanco, Bradesco, Santander, Banco do Brasil and CEF to establish a credit bureau (called “Quod”), on November 14th, 2016; (2) the vote by Cade commissioner César Mattos in Concentration Act n° 08012.011736/2008-41, which approved the acquisition of Banco Nossa Caixa by Banco do Brasil on August 4th, 2010; and (3) VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 75-76.

324 CENTRAL BANK OF BRAZIL. *Report on Banking Economy 2018*. Publish in May 2019, p. 80.

on credit markets would be to *enforce sharing information from credit institutions over their consumers*³²⁵.

Though not exactly a new recommendation, the exchange of financial information on customers is currently receiving relevant technology boosts and regulatory incentives all over the world. From a *technological* point of view, the ongoing “digitization” of credit markets generates increasingly more standardized/marketable data, dubbed *hard information* (as opposed to soft information, which is information gained merely through relationship banking). From a *regulatory* point of view, financial authorities may determine that incumbents must share the financial data they have on their clients with competitors through specific/secure channels, thus allowing credit institutions to proactively compete for the best customers.

We believe that data sharing among lenders enforces the competitive process and generates consumer welfare since it can foster (i) erosion of the *ex post* monopoly of incumbents over their clients’ data, reducing the barrier to entry imposed by information asymmetry; (ii) competition between the incumbent banks themselves, instigating them to fight over the best clients they garnered over the decades; and (iii) disciplinary effect over credit consumers, allowing for reductions in the costs of default currently composing interest rates³²⁶. It has been demonstrated that competition increases resulting from sharing

325 Entrants who have access to information sources on borrowers are able to compete for the best clients of the incumbent banks, in addition to mitigating their portfolio risks, transaction costs, and expanding the credit offer to low risk borrowers (including individuals and SMEs) companies not fully served by the traditional banking system. In Credit Scoring Knowledge Guide. *International Finance Corporation (IFC)*, 2012, p. 5.

326 See (1) VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 19; (2) ORNELAS; José Renato Haas, SILVA, Marcos Soares; VAN DOORNIK, Bernardus. *Informational Switching Costs, Bank Competition and the Cost of Finance*. Working Paper Series n° 512. Brasília: Central Bank of Brazil, January 2020, p. 45; e (3) GOLDMAN SACHS. *Future of Finance Fintech’s Brazil Moment*. Goldman Sachs Global Investment Research, 2017, p. 28.

of data entices reduction in countries' interest rates³²⁷, not to mention that, in the wake of the so-called “*digital revolution*”, data itself has become one of the world's most valuable resources³²⁸.

In this paper, we defend that the Central Bank of Brazil is the best-suited authority to compel incumbent institutions to share their data on financial consumers, thus stimulating competitive pressure from fintech and other innovative entrants in the Brazilian lending market.

3. The Role Of Regulation In Stimulating Competition Through Fintech

Before demonstrating how *effective* might be a pro-competition stance from the Central Bank of Brazil, we should first decide whether it would *desirable* from a systemic point of view – in other words, if prudential regulation that favors competition between financial institutions might jeopardize stability and facilitate banking crises. Since we aim to address the potentially positive effects of artificial intelligence fintechs in the Brazilian credit market, the preliminary debate on stability may not be turned away from, less we leave this paper open to criticism. Therefore, even if it is not the central scope of our work, and in order to avoid our final remarks to be taken with a grain of salt (*cum grano salis*), we briefly set forth certain considerations about competition's potential harm to innovation.

Historically, academia has adopted the traditional view that bank competition fragilizes the financial system; and, as such, pro-competition policies should not be implemented in the banking environments³²⁹. Most recently, such a classic view has been

327 GOLDMAN SACHS. *Future of Finance Fintech's Brazil Moment*. Goldman Sachs Global Investment Research, 2017, p. 28.

328 THE ECONOMIST. The world's most valuable resource is no longer oil, but data. *The Economist* (May 6th, 2017).

329 YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais*. 1st ed. Rio de Janeiro:

strengthened in the wake of the financial crisis from 2008³³⁰. However, this potentially flawed/superficial premise has been questioned over the years by many an author, according to whom a concentrated and low-competition banking environment is just as toxic from a financial soundness point of view.

To take sides in this debate, one must first understand why banking stability is (correctly) such a delicate matter and so worthy of concern. The financial intermediation activity – i.e., lending and deposits – generates two relevant impacts in macroeconomy and monetary policy. *First*, the “*banking multiplier*” phenomenon – banking activity stirs an effect equal to generating more currency in the economy, since the banking institution receives a deposit and generally lends it away (the bank ceases to possess said deposit), but, at the same time, the depositor still holds the deposited value against the bank with short-term liquidity³³¹. In other words, such an amount exists in duplicity – both as a liability before the depositor as an asset against the borrower. One can see how that might generate a problem if the depositor decides to withdraw his deposit (as we shall see below).

The *second* impact to monetary policy, derived from the first, is the banks’ ability of “*maturity transformation*”. Deposits and loans do not have matched maturity dates. Deposits generally represent short-term debt or on-demand debt (like checking accounts), whereas loans generally represent comparatively long-term debt³³². The resulting maturity mismatch, as it is called, renders depositary institutions extremely vulnerable to liquidity shocks. As such, banks are fragile by default and generate severe social costs if they ultimately fail³³³.

ro: Elsevier, 2007, p. 185.

330 THE ECONOMIST. Deliver us from competition. *The Economist* (June 25th, 2009).

331 YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais*. 1st ed. Rio de Janeiro: Elsevier, 2007, p. 75.

332 DRECHSLER, Itamar; SAVOV, Alexi; SCHNABL, Philipp. *Banking on Deposits: maturity transformation without interest rate risk*. National Bureau of Economic Research. Nova York: New York University Stern School of Business, 2018, p. 1.

333 YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais, op. cit.*, p. 176.

As a result of these two impacts, financial institutions live permanently exposed to the risk of suffering a sudden and unexpected liquidity demand by its depositors, which may result in devastating consequences. The bank may, for instance, be forced to sell its assets at extremely low costs to generate emergency liquidity (fire sales), or, if the local prudential authority believes it to be on the verge of causing a systemic collapse, suffer an intervention or forced liquidation³³⁴.

These liquidity crises set forth by multiple depositor requests, and generally motivated by a negative view regarding the bank's financial health, are the (in) famous *bank runs*. The most recent theories indicate that bank runs are driven by (i) insolvency-related problems turned public (which represent material deficiencies in its balance sheet); and/or (ii) liquidity-related problems derived from coordinated actions between depositors, whom, motivated by panic ("herd behavior"), see other depositors withdrawing funds from the bank and join the fray³³⁵. According to this vision (economically based on game theory), not only deteriorated banks are subject to runs, but also completely solvent banks that fall victim to panic-driven depositors³³⁶.

Adding to the banking system's roots of fragility, there is a very dense degree of interconnectedness between financial institutions in the modern world. Most banks operate loans and deposits between themselves (in Brazil, these operations are typically interbank deposits or repos, also called "*compromissadas*")³³⁷. When

334 VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 38.

335 Id., p. 39.

336 Nowadays, bank runs are no longer materialized by long lines of anxious depositors in front of a bank agency, but rather the non-renewal of interbank deposits or withdrawal of large amounts of funds by institutional investors. In VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*, op. cit., p. 106.

337 CARLETTI, Elena; SMOLENSKA, Agnieszka. *10 years on from the Financial Crisis: cooperation between competition agencies and regulators in the financial sector*. OCDE, Directorate for Financial and Enterprise Affairs, Competition Committee. Paris, OECD, 2017, p. 9.

one of these institutions suffers an intervention or liquidation, the effects of this failure go well beyond the institution's own private sphere and reverberate throughout the financial web all the way to the other end – especially to creditor banks (a contamination effect). Due to the recent advancement of financial technology, such a problem of interconnectedness has been exponentially aggravated by allowing banks from different regions and countries to access each other with progressively less operational and informational hurdles. All in all, technology has elevated the risk of contagion by bank failures, since now there are more transmission lines between financial institutions than ever³³⁸.

Considering such propensity to failure, it is not surprising that financial systems around the world have been the stage of symptomatic and devastating crises. The most recent of those was the crisis of 2008, which was originated in the United States from the (i) negligent issuance of derivatives with underlying risky mortgages – the so-called “*subprimes*”; (ii) agency ratings that appointed these assets as low-risk and high grade, notwithstanding the elevated risks; (iii) progressive deregulation in the financial system as a tool to stimulate economic growth³³⁹; and (iv) politic incentives on both democrats and republicans to, without duly caution, expand real estate credit as a tool to win over voters³⁴⁰. After being born in the United States, the crisis of 2008 reaped across most of the world, breaking some banks (emblematic case of Lehman Brothers) and driving others to be bailed out by taxpayer's money.

After the destruction suffered by the global economy in the crisis' wake, the role of financial regulation has since returned to the spotlight, reinvigorating prudential authorities as responsible for

338 See (1) YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais*, op. cit., p. 175; and (2) VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 15.

339 GERDING, Erik F. *Bank Regulation and Securitization: how the Law improved transmission lines between real estate and banking crises*. Georgia Law Review, vol. 50:1. Atenas, University of Georgia, 2015.

340 VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 17.

adjusting market failures in the highly-interconnected, technology-driven financial systems – especially addressing the social cost generated by failing banks (much like social costs derived from environmental damages, nuclear industry and public health. In other words, financial authorities have become (re)empowered to (i) internalize social costs in the financial institutions themselves, minimizing the risk of spillovers that damage depositors, creditors and the local economy as a whole³⁴¹; (ii) aligning the executives' incentives to drive away excessive risk-taking; (iii) eliminating the negative feedback loop between banking balance sheets and economies (i.e., preventing banking crises from becoming economic crises)³⁴²; and, specifically addressing the subprime problems from 2008, eliminating the transmission lines between bank markets and real estate markets³⁴³.

3.1. Addressing The Preliminary Issue: Does Innovative Competition Harm Financial Stability?

As previously stated, some traditionalists fear that the competition process weakens banks, atomizes financial institutions, and generates incentives for them to take more risks with the objective to succeed against their many rivals. According to Professor Otávio Yazbek himself, the promotion of rivalry and repression against monopolies in the financial systems should not be primary concerns since these policies would come at the cost of soundness³⁴⁴.

341 YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais*, op. cit., p. 176.

342 CARLETTI, Elena; SMOLENSKA, Agnieszka. *10 years on from the Financial Crisis: cooperation between competition agencies and regulators in the financial sector*. OCDE, Directorate for Financial and Enterprise Affairs, Competition Committee. Paris, OECD, 2017, p. 7.

343 GERDING, Erik F. *Bank Regulation and Securitization: how the Law improved transmission lines between real estate and banking crises*. Georgia Law Review, vol. 50:1. Atenas, University of Georgia, 2015.

344 YAZBEK, Otávio. *Regulação do Mercado Financeiro e de Capitais*. 1st ed. Rio de Janeiro:

Notwithstanding such opinions, the reality is that is high degrees of concentration and market power in the banking system are also extremely prone to systemic risk³⁴⁵. Big banks with market power may (i) become “*too big to fail*”, generating incentives for excessive risk-taking due to the explicit and implicit guarantees by the government (that they will be bailed out in case of a failure); (ii) build complex structures that difficult monitoring and regulating; (iii) employ market-based activities (those not reliant on loans and deposits, such as trading) on a greater risk basis³⁴⁶. As such, the benefits brought on by more competition in the financial sector should not be ignored for prudential stability in itself, since the absence of competition is just as capable of inviting systemic disaster. On the subject, Professor Rory Van Loo³⁴⁷:

Future crises are unpredictable. The main point is that competition policy can be a valuable ally for financial stability in the fintech era. Ignoring competition policy can lead to missed opportunities for reducing familiar risks in the short term and can create new threats in the long term.

As a result of this more modern view of competition and prudential regulation as allies, most prudential and competition authorities nowadays are readdressing their previous misconceptions

ro: Elsevier, 2007, p. 184-185.

345 See (1) FINANCIAL STABILITY BOARD. *Fintech and Market structure in financial services: market developments and potential financial stability implications* (publicado em 14.02.2017), p. 4; and (2) CARLETTI, Elena; SMOLENSKA, Agnieszka. *10 years on from the Financial Crisis: cooperation between competition agencies and regulators in the financial sector*. OCDE, Directorate for Financial and Enterprise Affairs, Competition Committee. Paris, OECD, 2017, p. 10-11.

346 VIVES, Xavier. *Competition and Stability in Banking: the role of Regulation and competition policy*. Princeton: Princeton University Press, 2016, p. 118-119.

347 VAN LOO, Rory. *Making Innovation More Competitive: the case of fintech*. U.C.L.A. Law Review, vol. 65, 2018, p. 232-279. Los Angeles: U.C.L.A., p. 260.

and stimulating rivalry in their banking systems³⁴⁸. In 2015, the *Bank for International Settlements* questioned prudential authorities in 33 jurisdictions and concluded that approximately: **(a)** 8 authorities consulted the competitive agency before granting an operating license; **(b)** 16 authorities consulted the competition agency during the development of standards; **(c)** 9 authorities consulted the competitive agency before intervening in a financial institution; and **(d)** 11 authorities shared complaints and market studies with the competitive agency³⁴⁹.

To sum up this digression, we believe there are enough arguments to support that an optimum degree of competition in the financial system may be reached to promote consumer welfare, all while still preserving stability and soundness. As such, we part rely on the premise that incremental increases in the Brazilian credit market's competition do not represent relevant systemic risk – and this applies to competition brought on by innovative technology.

348 A few examples are in order. First, the Central Bank of Brazil's own new, pro-competitive stance, which is studied in Chapter 3.2. Second, in the United Kingdom, the *Financial Services and Markets Act, 2000* determines that the *Prudential Regulation Authority* (PRA) must promote financial competition while performing its main regulatory functions. In practice, this has been translated into policies from the English prudential authority to reduce barriers to entry and design of proportional regimes (i.e., a program called “*New Bank Startup Unit*” designed to ease entrants into the financial market). Third, reflecting the German central bank's stance on the subject around 2019, a director from *Deutsche Bundesbank* publicly defended the benefits of competition and cooperation between incumbent and incoming banks in Germany, while also stressing the need to ensure *fair competition* in the sector. See (1) BASEL COMMITTEE ON BANKING SUPERVISION. *Range of practice in the regulation and supervision of institutions relevant to financial inclusion*. Bank for International Settlements (January 2015), p. 25; (2) BALZ, Burkhard. *Fintech and bigtech firms and central banks – conflicting interests or a common mission?* German Embassy in Singapore, November 11st, 2019, p. 1; and (3) England's Chapter 2, section 2.H, *Financial Services and Markets Act, 2000*.
349 BASEL COMMITTEE ON BANKING SUPERVISION. *Range of practice in the regulation and supervision of institutions relevant to financial inclusion*. Bank for International Settlements (January 2015), p. 25.

3.2. Why The Central Bank Of Brazil Should (continue To) Promote Competition

Having established the premise that stimulating competition in the Brazilian credit market would not expose its relevant systemic risk, we now proceed to argue why such initiatives should be (and are being) led by none other than the Central Bank of Brazil, with special attention to data sharing.

First of all, spurring competition is a valid way to stimulate reductions in the interest rates in the Brazilian credit market, as pointed out during the Introduction. As a general rule, high-interest rates have an effect of (i) incentivizing businesses to reduce investments in economic activities, employ fewer personnel and pay lower wages; and (ii) force families to reduce the consumption of goods and services (due to less access to credit and aforementioned conditions of unemployment and low wages)³⁵⁰. As such, by employing policies that spur innovative competition and lower prices, the Central Bank may generate relevant social value. Relevant examples that have already begun to bear fruit must be remarked here, even if outside the scope of this paper.

First, and most notably, the payments sector has seen a deluge of new innovative entrants like PagSeguro and Stone (movement started in 2012 by Law n° 12,865, which effectively opened the market to competition) after a lifetime of domination by incumbent banks. Accordingly, the Central Bank issued several regulations aimed to foster competition in this segment, emblematically changing it for the better – the market share of entrants in payments grew from 1% to over 28% in the last eight years. According to Professor Sérgio Werlang, prices in the sector have since been reduced by nearly *half*

350 See (1) JOAQUIM, Gustavo; VAN DOORNIK, Bernardus. Bank Competition, Cost of Credit and Economic Activity: evidence from Brazil. Working Paper Series n° 508. Brasília: Central Bank of Brazil, October 2019; e (2) MIAN, Atif; SUFI, Amir; VERNER, Emil. How do Credit Supply Shocks Affect the Real Economy? Evidence from the United States in the 1980s. National Bureau for Economic Research. Working Paper N° 23802. Cambridge: NBER, 2017.

– all due to increased competition and innovation³⁵¹. As a direct result and example of benefits to consumers, Itaú Unibanco and Santander have reduced to practically zero all fees charged from businesses that were paid by costumers through credit and debit cards, showing how the competitive pressure from fintechs and their technologies were able to generate consumer welfare (even to the point of originating claims of anti-competitive claims in Cade, which are quite outside the scope of this paper)³⁵².

Second, fintechs in the sector of foreign exchange/remittance (cross-border) have social value essentially linked they are to the migration of populaces around the globe. It was verified by the *World Bank* that, when an immigrant community can receive larger volumes of remittances from their home countries, it can achieve significant socioeconomic consequences, such as increases in levels of health, education, technological advancement, entrepreneurship, financial inclusion, disaster recovery and reducing child labor³⁵³.

In 2011, with this in mind, the leading G20 countries agreed to reduce transaction costs for international remittances, dedicating the *Global Partnership for Financial Inclusion* (GPFI, G20 group) a few years later to monitor countries' progress in this regard³⁵⁴. In 2016, these objectives were harmonized with the *United Nations Agenda 2030*, which aims to reduce the average cost of international remittances to 3%, and a total limit of 5%³⁵⁵. In Brazil, the Central Bank is employing efforts to carry out this agenda (i.e., Letter nº 3,914, dated 2018, which

351 Lecture by Sérgio Werlang, ex-executive of Economic Policy in Central Bank of Brazil, ex-general executive in Itaú Unibanco and professor at Fundação Getúlio Vargas,, in the event “*Fintechs e Blockchain: oportunidades para os mercados financeiros*”, organized by FGV EPGE on November 9th, 2019.

352 REUTERS. Cade pede explicações ao Itaú Unibanco após Rede zerar taxa da antecipação de recebíveis. *Reuters* (April 18th, 2019).

353 WORLD BANK GROUP. *Greenback 2.0 Jhor Bahru Report: migrant workers' remittances from Malaysia*. Knowledge and Research, June 2017, p. 11.

354 CENTRAL BANK OF BRAZIL. *Report on Banking Economy 2018*. Issued in May 2019, p. 106.

355 CENTRAL BANK OF BRAZIL. *Report on Banking Economy 2018*. Issued in May 2019, p. 106.

facilitates remittances from Brazil). As such, fintechs specializing in foreign exchange and remittances like TransferWise are playing a socially valuable role in today's world, implementing cost savings, and facilitating *remittances* between families and friends separated across borders around the world.

Despite all prudential, economic and social arguments set forth in favor of prudential regulation fostering competition, the Central Bank did not seem to pay much historical heed to the subject. Rather, the Central Bank was created in 1964 through a very pro-concentration policy (post-Law n° 4,595) and has since endured the crises from the 90s which resulted in many failing banks (originating the PROER and PROEF programs), and constantly plagued by fear of competition affecting financial stability. As such, the Central Bank did not historically show any relevant concern about competition in the credit sector until a few years ago, as seen through the approval of all corporate mergers and acquisitions between financial institutions ever since 2000³⁵⁶. It is even quite possible to note that, on the votes drafted by the Central Bank to approve two relevant mergers in the past (Bradesco/HSBC and Itaú/Citi), it clearly showed less concern about competition effects than Cade when judging the merger³⁵⁷.

Such historical stance by the Central Bank might lead one to believe that it should be the Administrative Council for Economic Defense (“Cade”) to lead efforts in promoting competition in the Brazilian lending market, and not the Central Bank. Indeed, it might seem strange to ask for the country's prudential authority to lead the charge in stimulating financial rivalry instead of such country's

356 As per answered by Central Bank to our request n° 18600000516201979 under the Public Access to Information Law (the “*Lei de Acesso à Informação*”), on April 18th, 2019.

357 See the votes that approved the mergers of Bradesco/HSBC and Itaú/Citi by Central Bank – both drafted by executive member Sidnei Corrêa Marques, respectively (i) Vote n 263/2015-BCB, December 30th, 2015; and (ii) Vote n° 230/2017-BCB, October 26th, 2017.

competition authority – especially since this is not the case in other countries (i.e., United Kingdom).

However, we do defend that the Central Bank is better institutionally positioned than Cade to foster competition in the lending market. We are not referring to the historical conflict of competence between both authorities (which has already been solved through a Memorandum of Understanding signed in 2018)³⁵⁸, but to an issue of institutional design (of “*desenho institucional*”). While the Central Bank has the power to proactively regulate and adjust the behavior of each economic agent operating in the financial activities segment, Cade’s role is actually more reactive: (i) to approve or reprove mergers that meet the minimum criteria set out in Law n° 12,529; (ii) to impose certain obligations in merger agreements that can temporarily improve the market, (iii) to repress anticompetitive conduct, and (iv) promote competition advocacy in other areas of public policy.

When we evaluate the conjunction of these roles, it may be argued that Cade is not as well institutionally positioned as the Central Bank to promote competition in the Brazilian credit market. On the other hand, the Central Bank may contribute to consumer welfare in areas not fully protected by Cade, given its more reactive stance, nor by Consumer Law itself, given its incapacity to tackle monopoly/

358 In 2001, a conflict rose between the Central Bank and Cade on which should analyze and approve mergers in the financial system. It was around this time that Bradesco acquired BCN, and both were fined by Cade for not seeking its approval for the merger. This fine was suspended by the Superior Court of Justice on the basis that only the Central Bank was in a position to approve or reprove bank mergers, as supported by an opinion from the Federal Attorney General’s Office. Cade appealed to the Brazilian Supreme Court (Extraordinary Appeal n° 664,189). The lawsuit waged on until the dispute was put to rest by a Memorandum of Understanding signed between the two entities on February 28th, 2018 to settle this historical feud. It was agreed upon that the parties of any future merger in the financial system shall be required to seek prior approval from both Central Bank and Cade. The Memorandum of Understanding was signed by both parties on February 28th, 2018, and is available at: <https://www.bcb.gov.br/conteudo/home-ptbr/TextosApresentacoes/memorando_cade_bc_28022018.pdf>.

oligopoly price distortions (which may only be addressed/countered through competition policy³⁵⁹).

4. How The Central Bank Of Brazil Should (continue To) Promote Competition

Adorning the mantle of its institutional role, the Central Bank has seemed to have taken up the responsibility of fostering financial competition, demonstrating signs that a process of transformation was taking place regarding its stance on the subject. Chief among these was the issuance of *Agenda BC+* in 2016, which was a list of measures that the Central Bank planned to implement in order to improve the financial system, several of them aimed to foster competition, such as structuring positive credit scoring bureaus (“*cadastro positivo*”); segmentation of financial institutions by size³⁶⁰; easing portability

359 FORGIONI, Paula. *Fundamentos do Antitruste*. 10^a ed. São Paulo: Revista dos Tribunais, 2018, p. 257.

360 The guiding principle of segmentation is *proportionality* – applying more flexible rules for entry and allocation of capital to smaller entrants who do not present systemic risk. All over the world, financial authorities are employing regulation to ease entrants into the financial markets, many of which might serve as benchmarks for the Central Bank in its efforts (some already do). Switzerland, Japan and Sweden (along with Brazil, as per below) set up categories to fit financial institutions with ranges based on size (as an example: bank revenue between R\$ 500 million and R\$ 700 million falls into category A, while bank with revenues between R\$ 700 million and R\$ 900 million falls into category B). The larger the size, the more minimum requirements the institution needs to fulfill in order to establish itself and remain in operation. Creating a simplified version of this rule, the United States, the European Union, and Hong Kong began to relax the rules for allocating capital to institutions that did not reach a certain size. In 2017, based on the *proportionality* principle set forth above, Central Bank spurred the National Monetary Council to issue Resolution 4,553 to establish five different categories in which local financial conglomerates are distributed – segments S1, S2, S3, S4 and S5. The more robust the conglomerate is in terms of equity, systemic relevance and international performance, the closer it is to the S1 segment (in which the five largest Brazilian banks are). In line with the spirit of proportionality, the very preamble to Resolution N^o 4,553 states that segmentation is intended for the “*proportional application of prudential regulation*”. Even Febraban (an association commanded by the five largest banks) recognized the potential to generate more competition from this standard – even though it opposed the new rule,

and regulatory licenses for credit fintechs. All of these measures were effectively implemented by the Central Bank (and National Monetary Council) between 2017 and 2018.

This last item was one of the most praised feats from the Central Bank of Brazil concerning competition. In most countries, credit lenders must seek a regulatory license before they can start the actual lending. Both in Brazil and many countries abroad, the regulator's legal frameworks are not (or were not) capable of accommodating *fintechs* and their digital credit business model that does not rely on robust physical/economic structures – which has repelled startups from entering into financial markets until well later into the “*digital revolution*”³⁶¹. If credit fintechs tried to enter the Brazilian credit market in noncompliance with the minimum requirements required by Central Bank, they would be exposed to several risks³⁶².

called it a “*regulatory arbitrage*” and told it capable of bringing systemic problems in the medium/long term. For more on segmentation of financial institutions, see (1) Final Report of the Parliamentary Committee of Inquiry regarding credit cards (the “*Comissão Parlamentar de Inquérito dos Cartões de Crédito*”). *Federal Senate*, Brasília, July 2018, p. 19 and 95; (2) CARLETTI, Elena; SMOLENSKA, Agnieszka. *10 years on from the Financial Crisis: cooperation between competition agencies and regulators in the financial sector*. OCDE, Directorate for Financial and Enterprise Affairs, Competition Committee. Paris, OECD, 2017, p. 18.

361 THE ECONOMIST. Why fintech won't kill banks. *The Economist* (June 17th, 2015).

362 In the *criminal* sphere, Brazilian White-Collar Law defines as a crime against the financial system the conduct of acting as a mediator without a license, punishable by 1 to 4 years of imprisonment and a fine (art. 16 of Law 7,492, of 1986). This law is actively enforced, with active condemnations in the jurisprudence to this today against those who intermediated resources without being an authorized financial institution (Superior Court of Justice, AgRg in AREsp n° 889.798/SC, 6th Circuit, Minister Maria Thereza de Assis Moura, published on May 16th, 2016). In the *regulatory* sphere, transgressors face the traditional administrative penalties of fines, temporary disqualification or cessation of economic activity (arts. 3 and 5 of Law n° 13,506, 2017). The most emblematic case in this sphere was the conviction of the first ever peer-to-peer lending fintech in Brazil by the Central Bank. The digital platform, named Fairplace, was fined for acting as a financial intermediary without an appropriate regulatory license, even though it argued through appeal that its business model was limited to linking borrowers to investors through auctions of interest rates, never assuming the risk from the loans (as such, Fairplace called itself a “civil intermediary” instead of a “financial intermediary”). Notwithstanding, the conviction was maintained under the grounds that (i) Fairplace does not assume risk would not detract from the fact that its

To avoid such risks, and following similar strategies from around the world³⁶³, Brazilian credit *fintechs* around the world with no desire to bear license costs started to develop *partnerships* with licensed institutions in order to offer products through them. In Brazil, the pre-existent legal structure was for credit fintechs to act as *banking correspondents* for financial institutions under the regime of Resolution N° 3,954, dated 2011 (originally conceived to increase financial sales capillarity in the countryside). In the correspondence model, the credit fintech links up with a bank or “*financeira*” (credit, financing and investment company), uses its own digital platform to attract customers, and, when one of them takes out an in-app loan, he is actually signing a loan contract with the bank or “*financeira*” with which the fintech is partnered with. In other words, the fintech acts as a bridge between the customer and the financial institution, operating in the regulated role of correspondent.

The banking correspondence structure was widely adopted by credit fintechs across Brazil, and the Central Bank seemed to tacitly agree with fintechs’ adoption of the correspondence structure, as demonstrated by dialogues with the market, votes and no public penalties against it. Notwithstanding, this created a paradoxical “artificial framework” in which, as per Professor Todd Baker’s words

activity is intermediation of resources; and (ii) the intermediation of resources, even without the collection and application of resources, would already be sufficient to fit the platform in art. 17 of Law 4,595 (National Financial System’s Council of Appeals. Commissioner Flávio Maia Fernandes dos Santos. Appeal n° 13,925, decision issued on June 28th, 2016, published em September 28th, 2016). In the *civil* sphere, the ancestral Usury Law prohibits the signing of contracts with interest rates above 12% per annum (Decree n 22.626/1933). This limit does not apply to contracts entered into by financial institutions already authorized to operate by Central Bank, thanks to (i) the legal exception of art. 5 of Provisional Measure N° 2,170-36/2001; and (ii) Precedent N° 596/STF, which ratified that exception. Credit *fintechs*, as they do not have authorization from Central Bank to operate, could not grant credit above the 12% stipulated by the Usury Law, severely restricting their ability to charge interest rates corresponding to the risk of the activity and the borrowers.

363 VAN LOO, Rory. Making Innovation More Competitive: the case of fintech. *U.C.L.A. Law Review*, vol. 65, 2018, p. 232-279. Los Angeles: U.C.L.A., p. 241.

in reference to a similar problem in the United States, “no one can be a fintech bank [since there is no specific license], but, at the same time, anyone can be a fintech bank [since a fintech can easily partner with banks to access the market through them]”³⁶⁴.

By 2018, the prudential authority decided to tailor a new legal structure of financial institution-specific for fintechs, ideally a better substitute to the correspondence structure, encouraging more entrants to compete in the credit market and also reducing their dependency on traditional banks (since they would no longer need to act as their intermediaries to reach costumers). So it was that Resolution n° 4,656 was born, creating two specific financial institution licenses for credit *fintechs* - the Direct Credit Firms companies (*Sociedades de Crédito Direto – SCD*) and the Loans between Persons companies (*Sociedades de Empréstimos entre Pessoas – SEP*). To prevent eventual systemic crises, these institutions are not allowed to take deposits from the public (thus avoiding a great deal of the risks set forth in Chapter 3 above), and, for that, they are treated to much fewer regulatory burdens.

Since SCDs and SEPs are not in the scope of this paper, we shall not delve into them any further – except for pointing out that (i) according to João Manoel Pinho de Mello (one of the executives from Central Bank in charge of competition policies), Resolution n° 4,656 is an “*absolute success*” that has already licensed 10 SCDs and 4 SEPs, with many more in the pipeline³⁶⁵. Months later, the President of Central Bank would also declare before the Senate that there is total interest in analyzing/approving ever more requests for SCD and SEP licenses, all in a way of amplifying competition in the credit market with even more agility³⁶⁶; and (iii) the creation of a specific license for

364 BAKER, Todd. Simpler is better for fintechs breaking into banking. *American Banker* (February 20th, 2020).

365 In the meantime, according to fintech class associations (ABCD, ABIPAG and AB-Fintechs) in a statement to Central Bank, most credit fintechs still operate in the old banking correspondent structure. In ABCD; ABIPAG; ABFINTECHS. *Comentários ao Edital de Consulta Pública n° 73/2019 – proposal of open banking implementation* (January 31st, 2020), p. 11.

366 CENTRAL BANK OF BRAZIL. Public hearing n° 48/2019 of the Economic Matters

credit fintechs puts Brazil in front of many other countries that are still discussing the idea³⁶⁷.

By 2019, the Central Bank updated its objectives in “*Agenda BC+*”, while also renaming it to “*Agenda BC#*”, presumably to reflect the affinity with technology and innovation (especially data and artificial intelligence), and overall maintaining an apparently pro-competition spirit. Additionally, over the last 10 years, it has also actively intervened in the credit markets on several occasions with the express purpose of correcting market failures that free competition alone was not able to correct (i.e., limited rationality in the overdraft market, exclusivity contracts, elevated switching costs and lock-in effects).

As a result, nowadays, the Central Bank’s proactive stance towards fostering competition is openly recognized by officers from

Commission of the Federal Senate. Institutional presentation from the Central Bank of Brazil, p. 43.

367 In the United States, the regulatory measures to give out licenses to fintechs are quite late and tangled. In 2018, the federal financial agency Office of the Comptroller of Currency (“OCC”) declared that it would start accepting applications for fintechs to become financial institutions without having deposit insurance granted to them by the Federal Deposit Insurance Corp (“FDIC”). However, the OCC was subject to a lawsuit by a state financial agency, the New York State Department of Financial Services, on the grounds that no license could be granted to financial institutions that had no deposit insurance, as per the National Banking Act, 1863 – and the dispute goes on to this day. In parallel to this regulatory uncertainty suffered by American fintechs, only two are managing to claw their way out of the gray zone: Varo Money, which has actually managed to obtain a deposit insurance from the FDIC; and LendingClub, which has acquired a bank for itself (and, thus, a license to call its own). See (1) COWLEY, Stacy. Online Lenders and Payment Companies get a way to act more like Banks. *New York Times* (July 31st, 2018); (2) CARLETTI, Elena; SMOLENSKA, Agnieszka. *10 years on from the Financial Crisis: cooperation between competition agencies and regulators in the financial sector*, *op. cit.*, p. 19; (3) PEDERSEN, Brandon. OCC files appeal in fintech charter case. *American Banker* (December 19th, 2019); (4) MCCAFFREY, Orla. Varo Moves Closer to Becoming a Bank: FDIC approves application to provide insured deposits. *Wall Street Journal* (February 10th, 2020); and (5) BAKER, Todd. Simpler is better for fintechs breaking into banking. *American Banker* (February 20th, 2020).

Cade³⁶⁸, authorities from abroad³⁶⁹, specialized press³⁷⁰, and many a public statement by the Central Bank's executive board. In 2019, its Officer of Organization of the Financial System and Resolution publicly pointed out four practical measures necessary to increase banking competition in Brazil³⁷¹: (i) legal certainty in the recovery of guarantees and less information asymmetry (i.e., positive record); (ii) greater vigilance against anticompetitive conduct; (iii) encourage the entry of new competitors; and (iv) “ensuring that the market takes advantage of the huge pro-competitive opportunities that technological advancement [brings]”.

4.1. Fostering Competition Through Financial Data Sharing Between Lenders: Fuel For The Artificial Intelligence Behind Credit Fintechs

We now turn to how, in the Central Bank's endeavor to stimulate competition, it has decided to attack the barrier to entry formed by information asymmetry (as depicted by Chapter 2.1), in order to allow more fintechs and other entrants to enter into the lending market. As such, the authority has actively sponsored two

368 “In fact, considering other banks, it is worth saying that (...) the regulator has been acting more forcefully, namely, the Central Bank of Brazil (BCB), aiming to resolve the various market failures” (free translation). In Vote by Cade commissioner Cristiane Alkmin Junqueira Schmidt in the Concentration Act n° 08700.004431/2017-16, which voted to forbid the purchase, by Itaú Unibanco, of a minor shareholder position in *XP Investimentos*, on March 14th, 2018.

369 “The pro-active approach of stimulating new laws and cooperation with other countries by the Brazilian Central Bank could potentially help the fintechs to grow and change the Brazilian market as a result of more competition”. In SAGOENIE, Yashini, SMITS; Petra, BAKKER, Ernst-Jan. *Fintech in Brazil*. Ministry of Economic Affairs and Climate Policy of the Netherlands. Hague: Netherlands Enterprise Agency, February 2019, p. 5.

370 GRAY, Kevin, Brazil's central bank policies encourage fintech startups. *LatinFinance* (March 28, 2019).

371 João Manoel Pinho de Mello defende maior concorrência no setor bancário. *Correio Braziliense* (February 26th, 2019).

initiatives to stimulate sharing of data sharing between financial institutions.

First, the empowerment of *credit scoring bureaus*, which is still how most countries still operationalize the sharing of financial hard information. We refer to agents specialized in storing and sharing data on financial transactions between consumers and credit market institutions (and sometimes of other markets, such as public utilities). Each country has its own microsystem of credit information, hoarded in databases and sustained by a robust institutional design meant to maximize efficiency (from both technological and legal point of view). The very first credit bureaus date back to 19th century England, but true worldwide consolidation of credit scoring systems would only be technologically allowed after the second half of the 20th century³⁷². In Brazil, the positive credit score bureaus (the “*cadaastro positivo*”) were recently reformed by Complementary Law n° 166 and Resolution n° 4,737.

Second, the regulatory design of an *open banking initiative* – the sharing and leveraging of customer-permissioned data by banks with third-party developers and firms to build applications and services, such as those that provide real-time payments, greater financial transparency options for account holders, and marketing and cross-selling opportunities³⁷³. According to recent studies by Ornelas, Silva, and Van Doornik, the use of open banking to stimulate data sharing may actively improve the local lending market (Working Paper Series of the Central Bank of Brazil)³⁷⁴:

372 Credit Scoring Knowledge Guide. *International Finance Corporation (IFC)*, 2012, p. 5.

373 BASEL COMMITTEE ON BANKING SUPERVISION. *Report on open banking and application programming interfaces*. Bank for International Settlements, November 2019, p. 19.

374 ORNELAS; José Renato Haas, SILVA, Marcos Soares; VAN DOORNIK, Bernardus Ferdinandus Nazar. *Informational Switching Costs, Bank Competition and the Cost of Finance*. Working Paper Series n° 512. Brasília: Central Bank of Brazil, January 2020, p. 45.

[Policy] responses related to foster information sharing may help to decrease switching costs and alleviate the holdup problem. Open banking initiatives can make information held by incumbent banks to flow towards other financial institutions so that firms can get better interest rates from outside banks, thus enhancing competition. Another policy initiative is to reduce entry barriers to new competitors, like the credit fintechs. These institutions usually have a transactional lending approach, instead of relationship banking, so that an open banking initiative can enhance their ability to obtain information about firms and provide better loan conditions.

The open banking initiative is currently the Central Bank's most emblematic structural policy in its efforts to stimulate competition. Its most visible benchmark in this endeavor is the first nation to employ a relevant open banking initiative – the United Kingdom³⁷⁵, however, not all jurisdictions approach data sharing

375 The basis for the English open banking system was the famous Payment Services Directive 2 (PSD2), the European Union's regulation that aims to encourage data sharing on the payment sector (and not credit). The United Kingdom adopted the PSD2's pro-competition premise and took it one step further – mandating a system that may stimulate competition across all financial segments. In 2016, the English competition agency called Competitions and Market Authority (CMA) began structuring the guidelines for an open banking system to compel financial institutions to share their consumers' registration and transactional data with each other. The duty to build infrastructure, publish operational regulations, draft guidelines and the like was fulfilled by the Open Banking Implementation Entity Company (constituted by the CMA for this specific purpose). The company's official corporate purpose was to “*design the specifications for the APIs; support regulated third party providers and banks to use Open Banking standards; create security and messaging standards; manage the Open Banking Directory; produce guidelines for participants in the Open Banking ecosystem; set out the process for managing disputes and complaints*”. By 2018, the English open banking system became operational. See (1) FINANCIAL STABILITY BOARD. *Fintech and Market structure in financial services: market developments and potential financial stability implications* (published in February 14th, 2017), p. 8-9; e (2) CARMONA, Alberto; LOMBARDO, Agustín; PASTOR, Rafael; QUIRÓS, Carlota; GARCÍA, Juan; MUÑOZ, David; MARTÍN, Luis. *Competition issues in the area of financial technology (FinTech)*. European

with express intent to impose it. Currently, jurisdictions are divided on the subject between (i) jurisdictions that *determine* financial institutions to share their data via open banking, specifically the European Union, India, Mexico, South Africa, Thailand, and, as of now, Brazil; (ii) jurisdictions that *encourage* financial institutions to share their data via open banking, specifically Hong Kong, Korea and Singapore; (iii) countries that leave sharing at the sole discretion of each institution, specifically the United States, China and Argentina; and (iv) jurisdictions that are still defining open banking rules, specifically Australia, Russia, Turkey and Canada³⁷⁶.

Considering the relevance of data to financial competition as studied in Chapter 2.1, and as endorsed by Professors Sérgio Werlang³⁷⁷ and José Scheinkman³⁷⁸, there is little doubt that open banking holds high potential to improve the competitive process in the Brazilian lending market, and, consequently, reduce the current interest rates and lending spread, much like CMA expects the United Kingdom's open banking system to knock 30% off from English banking spread.

Indeed, it was the competition agency CMA the responsible authority for coordinating the implementation of English open banking – an intuitive premise, considering how the initiative is pro-competitive. However, in Brazil, it is not Cade that is coordinating the implementation of open banking, but the Central Bank itself – further confirming the opinion we defend in this paper about how, in the

Parliament. Policy Department for Economic, Scientific and Quality of Life Policies. Directorate-General for Internal Policies, 2018, p. 73.

376 BASEL COMMITTEE ON BANKING SUPERVISION. *Report on open banking and application programming interfaces*. Bank for International Settlements, November 2019, p. 19.

377 Lecture by Sérgio Werlang, ex-executive of Economic Policy in Central Bank of Brazil, ex-general executive in Itaú Unibanco and professor at Fundação Getúlio Vargas, in the event “*Fintechs e Blockchain: oportunidades para os mercados financeiros*”, organized by FGV EPGE on November 9th, 2019.

378 Lecture by José Scheinkman, professor at Columbia University, at the event “*Competição e Inclusão Financeira*”, organized by Instituto ProPague on August 14th, 2019.

Brazilian institutional design, the Central Bank is better positioned than Cade to promote competition in the credit market.

In practice, the construction of Brazilian open banking started in 2019, when Central Bank issued Statement n° 33,455. From the start, this preliminary set of rules already determine that the largest financial institutions (namely S1 and S2 categories) shall be forced to share their data in the open banking systems as soon as they are implemented. The Central Bank's statement seems to address the concern whether large banks would have an incentive to willingly share their precious data on costumers (thus renouncing their ex post monopoly on such data).

After Statement n° 33,455, the Central Bank issued Public Consultation n° 73, 2019 with an initial proposal of regulatory structure surrounding open banking. After lengthy discussions with the market on how to best implant and regulate it thoroughly, the final rules were finally determined by *Joint Resolution n° 1, dated May 2020*, issued by both the Central Bank and the National Monetary Council. The final version of the regulation appointed that Brazilian open banking would mandate financial institutions to share the following categories of data:

I - data on:

- a) service channels related to: 1. applied facilities; 2. correspondent in the country; 3. electronic channels; and 4. other channels available to customers;
- b) products and services related to: 1. demand deposit accounts; 2. deposit accounts; 3. prepaid payment accounts; 4. postpaid payment accounts; 5. credit operations; 6. foreign exchange transactions; 7. accreditation services for payment agreements; 8. time deposit accounts and other products of an investment nature; 9. insurance; and 10. open supplementary pension;

c) registration of customers and their representatives; and d) customer taxes related to: 1. demand deposit accounts; 2. deposit accounts; 3. prepaid payment accounts; 4. postpaid payment accounts; 5. credit operations; 6. registration and control account referred to in Resolution N° 3,402, of September 6, 2006; 7. foreign exchange transactions; 8. accreditation services for payment agreements; time deposit accounts and other products of an investment nature; 10. insurance; 11. open supplementary pension; and

II - services of:

a) initiation of payment transactions; and

b) submission of a credit operation proposal.

This robust pool of data is crucial to give new competitors a chance to compete in the lending markets, as per Chapter 2.1 in this paper. By gaining access to the troves of data usually hoarded by traditional banks, credit fintechs and other innovative entrants gain the capacity to adequately separate low-risk borrowers from high-risk borrowers, effectively reducing the barrier to entry that is formed by information asymmetry between lender and customer. Since most credit fintechs rely on artificial intelligence systems for this risk evaluation of each client, the open banking regulation actually does the job of feeding such systems with data on the fintech's potential borrowers, maximizing their efficiency and preciseness in analyzing each of them.

Credit fintechs' artificial intelligence systems also have an additional synergy opportunity with open banking – they may be used to track down those low-risk costumers from other financial institutions for the fintech to offer them products at more advantageous conditions than the ones they are currently receiving. As a practical example – if a low-risk customer is close to borrowing

from an overdraft credit line in their banking institution (the “*cheque especial*”), a credit fintech may be interested to offer them a credit line with lower interest rates, virtually taking this customer from the other institution. To that end, the fintech’s artificial intelligence systems shall be plugged into the open banking system and be allowed to discover, thanks to the constant influx of data, every such customer opportunity. Aware of this growing threat, the incumbent banks shall also employ efforts to please their customers as a way of keeping them from crossing over to the fintech side of the market. Quite possibly, the net result of this competition might be better conditions overall for financial customers in the Brazilian lending market.

Conclusions

In this paper, we have demonstrated how, amidst the problems in the competitive process of Brazilian lending markets, much may be gained from regulatory measures designed to stimulate/compel competitors to share amongst themselves the data they have acquired on their customers. The Central Bank of Brazil currently relies on two such initiatives, which are to empower credit scoring bureaus, and, most importantly, to structure an open banking system interwoven across Brazilian financial institutions.

If allowed access to good quality data from Brazilian consumers, credit fintechs and other entrants to the lending market may leverage such hard information to, through artificial intelligence systems, (i) screen their potential customers by separating low-risk borrowers from high-risk borrowers, all based on the information on such persons that is shared by other institutions (avoiding the problem of adverse selection); and (ii) identify profitable and low-risk customers held by incumbent banks that may be attracted by better conditions offered by the credit fintech. While merely examples, these possibilities illustrate how innovative entrants may compete more

efficiently if they are allowed to reap the benefits from (regulatory policies determining) shared data from other lenders in the Brazilian credit market.

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Artificial Intelligence And Solvable Civil Responsibility

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Introduction³⁷⁹

Human relations have undergone substantial changes in recent decades, driven by the introduction of technology in our daily lives. We witnessed an unprecedented revolution in the ways of communication and learning. With smartphones came the possibility of concentrating daily life on a device: financial and banking management, photos and videos, search engines, real-time translation, information by all means of communication, logistics, food, health, among a multitude of uses can be accessed in a few clicks. All segments of society were covered by Technology, including Law, which has a relevant role in understanding these interactions, especially in the analysis of legal institutions established in the democratic state of law, adapting them to the new social reality, in addition to proposing new mechanisms regulation. Artificial Intelligence drives and accelerates such changes, consisting of a more than relevant social fact, imposing on legal science not only a break of paradigms, but interdisciplinarity³⁸⁰, to present to the scientific community, in the first instance, and, as a consequence,

379 This article counted on the collaboration of Eric Worbetz in the translation.

380 CARDOSO, Renato César... [et. al.]. *Livre-arbítrio: uma abordagem interdisciplinar*. Belo Horizonte: Ed. Artesã, 2017. p. 8. Appeals to multi, inter, trans, pluri or post-disciplinarity have become commonplace in today's academic discourses. Discussing the definitions, hierarchies, limits and possibilities of each of these concepts here would escape the modest purposes of this preface. However, it must be stressed that it is not enough, in order to really move in the desired direction, to group specialists from different areas around a work table and wait for it to arise, as if by spontaneous generation, legitimate non-discipline. What is usually seen in such efforts is that, despite being very well intentioned, they fail to escape the pitfalls they encounter along the way, usually resulting from the specific and inalienable scientific training of each of the participants.

to the whole society, new forms of interpretation and regulation of the law.

The problematization presented by Curtis EA Karnow, Jason Millar and Ian Kerr³⁸¹, of the unpredictability of means adopted by algorithms to perform certain tasks, which he calls autonomous robots, whether in genetic algorithms, neural networks or other types of feedback cycles that generate unpredictable behavior, even if fed with data that would not imply such a result, is in the sense that Civil Liability, whether objective or subjective, has as a common element the predictability of damage, which makes its application to self-learning Artificial Intelligence difficult.

We intend to present with this article an alternative (solution) for the identification of liability for damages resulting from behaviors emerging from autonomous self-learning robots. In this research, we will try to understand (i) what artificial intelligence and machine learning consists of; (ii) the possibility of emergent, unpredictable behavior when feeding data or processing data; (iii) if there are damages caused by emergent, unpredictable behavior of the machine, submit them to civil liability, in the way put in the doctrine and legislation, proposing, if feasible, mechanisms of accountability for such unpredictable damages.

In the first part of this article, we will outline brief considerations on Artificial Intelligence and Machine Learning (Machine Learning), considering that the first chapters of this work do it in a more technical and didactic way, which will give us more attention to the most objective points of unpredictability of damages arising from self-learning mechanisms.

Then, we will analyze the general aspects and classification of civil liability regarding the taxable event (contractual, non-contractual, pre- and post-contractual) and its assumptions (anti-

381 CALO, Ryan; FROMKIN, A. Michael; KERR, Ian. *Robot Law*. Northampton: Elgar, 2016.

legality and experienced damage). We will abstain from the analysis of those excluded from civil liability since the objective of the present work is to identify the configuration of civil liability in unpredictable facts, and not to abstain from liability when they occur.

The third part of the article is aimed at analyzing the application of civil liability to unforeseeable damages arising from self-learning mechanisms, under two approaches: does civil liability apply only to foreseeable damages or can it also be applied (mitigated) to those unpredictable? If the impossibility of civil liability for unforeseeable damages is confirmed, are we allowed to think of a resolvable civil liability, under a resolutive condition, subordinated to the advent of a term, analogous to resolvable property? This will be the fourth part of this work. The result of this investigation will be presented as the conclusion of the article.

Artificial Intelligence And Machine Learning: Brief Consideration

The proposal of brief considerations on Artificial Intelligence had been attractive when the article was idealized and its structured summary was elaborated, which proved to be a trap. The first barrier to be overcome is that of the concept of AI, as we can be seduced by the brevity of some definitions, such as that it consists of creating mechanisms with behaviors, which, if performed by humans, we would consider intelligent³⁸². Throughout the history of AI, experts have differed in terms of concept and definition, from the standpoint of acting and thinking humanly and acting and thinking rationally³⁸³. Comparisons to human intelligence aside, there seems to be a

382 KAPLAN, Jerry. *Artificial Intelligence: What everyone needs to know*. Oxford: Oxford University Press, 2016. p.1.

383 RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. 3. ed. New Jersey: Prentice-Hall, 2010.

consensus on the definition of AI as agents capable of performing actions³⁸⁴ or generating information without human intervention in processing, from external data.

We follow the concept of “acting humanly”, which is at the heart of the Turing Test, where “natural language processing, knowledge representation, automated reasoning and machine learning” are measured. To these were added “computer vision to receive objects”³⁸⁵ and “robotics to manipulate objects” 8. Of the 6 disciplines proposed by the authors, we will stick to Artificial Intelligence as a robot and machine learning (machine learning), considering that the object of the study is the responsibility for damages resulting from the emergent (unpredictable) behavior of these robots.

Conceptualizing or saying what a robot is not less difficult than doing it with Artificial Intelligence, here the lack of consensus in definitions persists. What cannot be discussed is that both aim to “act humanly” if not substituting themselves, at least helping with mechanical and cognitive tasks. The attribution of the term robot to the machine with these characteristics comes from a Czech theater play by Karel Capek that deals with artificial human beings who perform slave labor in a factory. It is, therefore, an agent or system without biological life that performs physical³⁸⁶ and mental activities,

384 RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. 3. ed. New Jersey: Prentice-Hall, 2010. p. viii. “The main unifying theme is the idea of an intelligent agent. We define AI as the study of agents that receive percepts from the environment and perform actions. Each such agent implements a function that maps percept sequences to actions, and we cover different ways to represent these functions, such as reactive agents, real-time planners, and decision-theoretic systems. We explain the role of learning as extending the reach of the designer into unknown environments, and we show how that role constrains agent design, favoring explicit knowledge representation and reasoning. We treat robotics and vision not as independently defined problems, but as occurring in the service of achieving goals. We stress the importance of the task environment in determining the appropriate agent design.”

385 RUSSELL, Stuart J.; NORVIG, Peter. *Artificial Intelligence: A Modern Approach*. 3. ed. New Jersey: Prentice-Hall, 2010.

386 CALO, Ryan; FROMKIN, A. Michael; KERR, Ian. *Robot Law*. Northampton: EL-

excluding software here, as it does not have this (mechanical) mobility characteristic.

Robots are classified as autonomous, semi-autonomous and non-autonomous. The freelancers still have little use in everyday life, the emblematic example being the Roomba vacuum cleaner that, without any human intervention, leaves its charging base, performs the cleaning task throughout the house and returns to its base for energy recharging. (drums). Semi-autonomous and non-autonomous are those with partial or total human intervention in the execution of the tasks for which they were developed, with the cognitive characteristic remaining in them.

This cognition (learning) takes place through data external to the agents (machines) that absorb, process and generate results, referred to in the literature as machine learning. Among the various forms of machine learning, we will stick to that of unsupervised self-learning (feedback), because, as the name says, the agent is bound by human intervention in the search for results even if pre-established, but with unpredictable intelligence (processing). It is called “Strong AI”³⁸⁷.

In contrast to the description given by and the benefits of non-supervision in machine learning, a concern arises from this machine behavior without supervision of the processing means, that of the damages that may occur from this autonomy and the consequent liability for such damages. Are the means adopted by autonomous robots unpredictable, or is the unpredictability of damage? This is what we will try to answer in the next topic. We consider that only after the conclusion of the unpredictability will we be able to work the Civil Liability in the damages resulting from the emergent behavior of autonomous robots.

gar, 2016. p. 5-6.

387 ZIMMERMAN, Evan J. *Machine Minds: Frontiers in Legal Personhood*. 2015.

Unpredictability and Emerging Behavior

Curtis E.A. Karnow, when analyzing “The application of the traditional theory of civil liability to the intelligence of the built-in machine” argues that civil liability as instituted is not sufficient for damages arising from behaviors emerging from self-learning machines. Civil liability is the product of regulation of actions that generate damages, imposing, as a consequence, the duty of reparation. Such damages are predictable, as well as who suffers them and whoever causes them³⁸⁸. For the Author, accountability is the product of linear causality, which cannot be verified in the universe of interactions in machine learning (non-linear).

This universe is not restricted only to those with machine autonomy with partial human intervention, but also to machines (robots) with complete autonomy of action (processing) and choice of methods to achieve results, unpredictable by man³⁸⁹. In other words, the unpredictability of the damage that may be generated (emergent behavior) does not constitute a cause, but rather the consequence of unpredictable actions by self-learning machines, amid autonomous choices of methods for solving problems, even in search of a result intended by man.

The behaviors emerging from self-learning machines are characterized by the reorganization of “logical or physical modules

388 VENOSA, Silvio de Salvo. *Direito Civil: responsabilidade civil*. 9. ed. – São Paulo: Atlas, 2009. p. 1. In principle, any activity that causes a loss generates responsibility or duty to indemnify. There will sometimes be exclusions that prevent compensation, as we will see. The term liability is used in any situation in which any person, whether natural or legal, must bear the consequences of a harmful act, fact or business. Under this notion, all human activity, therefore, can carry the duty to indemnify. Accordingly, the civil liability statute covers the entire set of principles and rules that govern the obligation to indemnify.

389 CALO, Ryan; FROOMKIN, A. Michael; KERR, Ian. *Robot Law*. Northampton: Elgar, 2016. p. 53 “Interesting robots, for purposes of this chapter, are those that are not simply autonomous in the sense of not being under real-time control of a human, but autonomous in the sense that the methods selected by the robots to accomplish the human-generated goal are not predicable by the human.”

quickly, so to speak, to solve the assigned task”. Amid the environment and information in which it is submitted, the robot creates mechanisms, options, strategies, responses, that is, it develops the means necessary to achieve a certain purpose. In this behavior lies the autonomy and the greater the ability to reorganize processing and responses, the greater this autonomy will be, which is also equivalent to your “IQ”. The environment in which the robot interacts is a determinant of its processing capacity (IQ) because of the more unpredictable, the greater the need for intelligent responses³⁹⁰.

In summary, we consider that unpredictability in unsupervised self-learning robots is a fundamental characteristic, a reason for its creation to give it autonomy in decision making. Roomba was created for autonomous decision making, albeit for a simple cleaning task. Its decision-making autonomy is the reason why consumers acquire it, avoiding a domestic task. In the same sense is the adoption of a robot to assist customers in a pharmacy, which performs all tasks without any human intervention³⁹¹. If such a machine had the predictability

390 Karnov in CALO, Ryan; FROOMKIN, A. Michael; KERR, Ian. *Robot Law*. Northampton: Elgar, 2016. “The line between robot and environment, though, is in the abstract as vague as the line between one program and another. It is a matter of convenience and convention where we draw the line between a program and its “external” constraints, between the program, on the one hand, and the sources of inputs and destination of output, on the other. Modules make up modules, not just in software but for recombinant modular robots as well. (One man’s program is another’s subroutine.) In the purely software context, we have a system made up of a group of algorithms.²⁶ In this way we might distinguish the system from “external” sources of input or directions for output. But it is also true that modules, neurons, and subroutines interact, each acting as input and output to others. The larger and more complex the system, the more likely it is to have the tools to solve a problem and the more likely it is that one might call it “intelligent.”

391 HARARI, Yuval Noah. *Homo Deus: Uma breve história do amanhã*. Tradução: Paulo Geiger. São Paulo: Companhia das Letras, 2016. p. 225. And what is valid for doctors is doubly valid for pharmacists. The pharmacy operated by a robot in the United States that serves customers reading their prescriptions has opened in San Francisco a pharmacy operated by a single robot. When a human goes to that pharmacy, in seconds the robot receives all the customer’s prescriptions, as well as detailed information about other medications he takes and about his allergies. The robot makes sure that the new recipes do not cause any adverse reactions if combined with any other medication

of processing and actions as a characteristic, its service would be restricted to specific customers and products, excluding a large part of customers in search of medicines.

The unpredictability in our understanding, therefore, lies in the behavior of the machine (robot) and not in the damage resulting from the autonomy that is conferred to it. Notwithstanding the conclusion of the association between the duty of reparation imposed by the civil liability institute and the predictability of damages, we consider the analysis restricted to prior knowledge of the damage to be wrong. This is because civil liability has its regulatory element in the conduct, the damage being a consequence of the criminal conduct (subjective) or inherent in some activity (objective)³⁹².

We also disagree that the problems (damages) resulting from autonomous robots do not follow the linearity of social and legal relations between humans, that is, that they occur in an innovative way, unknown in the current legal universe, regardless of their origin. Aquilian civil liability, for example, has its origin in Roman law, persisting in our order, regardless of the current technological standard.

In other words, the concern with the emergent behavior of autonomous robots must be focused not on the predictability of the damages that come, but on the form of accountability when they occur. Is the existing civil liability sufficient to determine who is responsible

or with any allergies and finally supplies the customer with the required drug. In the first year of operation, the robotic pharmacist served 2 million prescriptions, without making a single mistake. On average, meat and bone pharmacists made mistakes in 1.7% of revenues. In the United States alone, this represents more than 50 million revenue errors annually!

392 JUNIOR, Tercio Sampaio Ferraz. *Introdução ao estudo do direito: técnica, decisão, dominação*. 5. ed. – São Paulo: Atlas, 2007. p. 163. When it comes to responsibility, there is an important notion whose interest in law is growing. There are cases in which it gains a certain independence from the subject of the obligation in the sense that the subjective bond does not count. That is, someone takes responsibility not because he is bound by his actions (subjective responsibility), but because of a risk that emerges from a situation.

for the duty of reparation? When it comes to continuous learning, should the developer or programmer be held jointly or severally responsible? This is what we intend in the next section.

Civil Responsibility³⁹³

Civil Liability arises from the injury caused to the legal sphere of others, generating the duty of reparation. This reparation (duty to respond) is directed at the agent involved in the damage, either by a direct action omission or by an activity that he performs. The damages experienced in the legal life can be of several orders, such as patrimonial (civil), criminal (penal), resulting from public (administrative) service, however, we are concerned here with Subjective and Objective Civil Liability³⁹⁴.

General Aspects And Classification And Assumptions

The Brazilian Civil Code did not systematically deal with Civil Liability, however, regulating the duty of reparation in several legal relationships, such as non-contractual liability (arts. 186 and 187), liability of the legal entity under public law (art. 43), damages arising from contractual arrears (arts. 393 to 401), obligations (arts. 389 to 401), losses and damages (arts. 402 to 405), exception of unfulfilled contract

393 The structuring of this chapter follows those presented by professors Everaldo Augusto Cambler in (CAMBLER, 2015) and Silvio de Salvo Venosa (VENOSA, Civil Law: general part, 2009) due to the didactics and language adopted in the works.

394 CAMBLER, Everaldo Augusto. Responsabilidade Civil na Incorporação Imobiliária. 2. ed. – São Paulo: Editora Revista dos Tribunais, 2014. p. 97-100. “So essential to life in society is the principle of responsibility that we can find it in the legal order of all politically organized peoples, imposing on those who cause harm to others the duty to repair. Whenever a value recognized by the law (legal good) is harassed, we resort to the legal order, seeking in it to find a sufficient protective mechanism against the reaction against the harmful fact. Practiced an act in disagreement with the duties that were inherent to him, the agent is reached by the social reaction against the damage caused.”

(arts. 474 to 477), indemnity (arts. 927 943 and 944 to 954), and more. Exceptions to the rule, there are still cases of indemnity duty that are not properly linked to damage or violation of the law, also provided for in the Civil Code, as in the case of the requirement of the conventional penalty (art. 416), assumption of risk of the insurer in policy issuance (art. 773), repetition of undue payment (art. 940), sanction to the heir who withholds property (CC. Art. 1.992), fine to the developer who breaches the law by not entering into a contract with buyers (Law 4.591 / 64, art. 35, § 5), among others³⁹⁵.

The determination of Civil Liability is conditioned to the losses and damages caused or experienced by the injured party. Therefore, it is necessary to assess its origin, or, in a better analysis, its classification as to the taxable event: contractual, non-contractual, pre and post-contractual, the latter two not addressed in this article, since beyond the limits and purposes of investigation.

Contractual Civil Liability stems from rules and sanctions pre-established in an agreement, as the name suggests. There is, therefore, a direct legal bond that, once violated, generates the duty of reparation to the injured party. Characteristics of this responsibility are non-compliance and irregularities in the way or time of compliance. As it is a contractual obligation, the contract must have its objective requirements configured, that is, the existence, validity, non-compliance and has caused losses. If the contract exists and is valid, the parties must honor it (obligation) and, once breached and injured the other contracting party, a new duty is born, that is, a new bond between the parties (reparation)³⁹⁶. The verification of damage

395 CAMBLER, Everaldo Augusto. *Responsabilidade Civil na Incorporação Imobiliária*. 2. ed. – São Paulo: Editora Revista dos Tribunais, 2014. p. 103-104.

396 CAMBLER, Everaldo Augusto. *Responsabilidade Civil na Incorporação Imobiliária*. 2. ed. – São Paulo: Editora Revista dos Tribunais, 2014. p. 110-112. “As regards contractual liability, despite the fact that the victim and the perpetrator of the damage are united by the contract long before the damage is produced, with the advent of this a new obligation is born that replaces the pre-existing one, equaling the contract and the default. contractual as sources of obligations: with the contract arises, for each of the parties, the obligation to fulfill the promised performance; with the default, a new bond of law is born between the same parties, that is, the obligation for the author of the damage to repair the damage suffered.”

in non-contractual Civil Liability, in turn, is not conditioned on the existence of a direct legal bond between the parties. The existence of the damage is the starting point of its measurement. There is damage caused by the violation of a right.

The duty of reparation is linked to the finding of some objective requirements in the breach: action (intentional or reckless active conduct) or omission (abstaining from a conduct duty) with fault, the causal link between the damage and the agent's conduct cause and effective finding of damage, material or moral³⁹⁷. Such assumptions are common to contractual and non-contractual responsibilities.

The agent's action or inaction consists of positive conduct that he must adopt or in the absence of proper conduct, "thus violating a contractual, legal or social duty"³⁹⁸. Guilty conduct will be verified from the existence of negligence, imprudence and malpractice, also adopting intentional conduct, that is, deceit³⁹⁹. The damage relates to the damage experienced by the injured party, whether due to a contractual relationship or an illegal act practiced by a third party, not being restricted to patrimonial orders, but also ones. The causal link is the assumption that will inform the person causing the damage and, as a consequence, the person responsible for the duty of reparation.

397 VENOSA, Silvio de Salvo. *Direito Civil: parte geral*. 9. ed. – São Paulo: Atlas, 2009. p. 523-524.

398 CAMBLER, Everaldo Augusto. *Responsabilidade Civil na Incorporação Imobiliária*. 2. ed. – São Paulo: Editora Revista dos Tribunais, 2014. p. 121-122.

399 VENOSA, Silvio de Salvo. *Direito Civil: responsabilidade civil*. 12. ed. – São Paulo: Atlas, 2012. p. 26. Civil guilt in the broad sense encompasses not only the intentional act or conduct, the deceit (crime, in Roman semantic and historical origin), but also the acts or conduct riddled with negligence, imprudence and malpractice, that is, guilt in the strict sense (quasi-crime). This distinction between intent and guilt was known in Roman law, and was thus maintained in the French Code and in many other laws, such as crimes and quasi-crimes. This distinction, modernly, is no longer important in the field of responsibility. For indemnity purposes, it is important to check if the agent acted with civil guilt, in a broad sense, since, as a rule, the intensity of the intent or guilt should not scale the amount of the indemnity, although the present Code presents a provision in this sense (art. 944, sole paragraph). The indemnity must be marked by the actual loss."

The nature of the legal relationship adds two aspects to Civil Liability. The subjective, as a rule in our law, analyzes the damage based on the guilt of the causative agent so that the latter falls to the duty to indemnify. The Objective Civil Liability stems from the duty of indemnity as stated above, excluding, however, the verification of the agent's guilt and the causal link. It arises from a qualified risk, from the exploitation of a specific activity that can potentially cause damage⁴⁰⁰, even if certain precautions are taken⁴⁰¹.

In general, these are the considerations about Civil Liability that we consider relevant to the proposal of this article in the possibility of liability for damages resulting from the behavior of autonomous robots, with self-learning (machine learning). We ask readers (professors) for the synthesis of a topic so vast and dear to the science of law⁴⁰². If Civil Liability were exploited here with the rigor and fidelity due to it, we would not be allowed to approach artificial intelligence as intended.

Liability And Artificial Intelligence: Damages In Machine Learning

The Civil Liability in force in our legal doctrine and order will not find greater difficulties in making agents liable for the damages

400 Civil Code. Article 927 [...] Single paragraph. There will be an obligation to repair the damage, regardless of fault, in the cases specified by law, or when the activity normally carried out by the author of the damage implies, by its nature, a risk to the rights of others.

401 CAMBLER, Everaldo Augusto. *Responsabilidade Civil na Incorporação Imobiliária*. 2. ed. – São Paulo: Editora Revista dos Tribunais, 2014. p. 155-156.

402 VENOSA, Silvio de Salvo. *Direito Civil: responsabilidade civil*. 12. ed. – São Paulo: Atlas, 2012. p. vii-ix. Professor Venosa dedicates 10 chapters to the study of Civil Liability, in addition to the historical aspects that are characteristic in his works and the concepts, classification, characteristics, excluding, the following civil responsibilities are addressed: Due to someone else (direct and indirect, from parents for minor children, tutors and curators, the employer, hotel owners and the like, educational establishments, for the benefit of crime, legal entities under public and private law, the magistrate ...).

caused by autonomous robots. The same cannot be said when such damage results from emergent behavior, that is, the machine within its autonomy of learning or self-learning.

Despite the civil liability studies for autonomous robots such as those explored in the first chapter, the difficulty of accountability, in our opinion, does not lie in the unpredictability of the damage or the emergent behavior of the robot, but of who will be held responsible for such damage. The causal relationship can be affected by the implementation of robots in society, but not changed. The damage generated will affect people or things, but will not change, at least in the current state of the art, the patrimonial, moral, administrative or criminal sphere. We venture to affirm that unpredictable damage does not demand a new responsibility, but a restructuring of the systems, of which civil liability is an adjunct.

The liability for such damages will be hindered by the identification of the agent since the legal relations themselves are under development and the exploitation of technology does not stick to the current mode of production and social relations. If the robot causes damage due to its inherent processing autonomy, even if it is good and not a corporeal one, there is no dispute that it is the cause. If this is the cause of the damage, it is not a center for imputing rights and duties, to whom is responsible for such damages? Being a marketed product, would the manufacturer or developer be responsible? Such reasoning does not seem prudent to us, since self-learning and its consequent decision making are directly linked to the environment in which it is exposed, with the people it interacts with, even with other technologies present there.

We believe that subjective or objective civil liability, contractual or non-contractual, the identification of guilt or intent are sufficient for the damages resulting from this emerging behavior, demanding, however, a condition of displacement of the verification of responsibility, which we risk calling Civil Liability Resoluble.

Responsible Civil Resolution

The term resolvable comes from a property characteristic (movable or immovable), which consists of the consolidation of the property with the implementation of a condition⁴⁰³ or advent of the term⁴⁰⁴. It is common in real estate financing, through fiduciary sale of real estate, established by Law 9.514/97⁴⁰⁵. The constitution of the property takes place with the registration of the fiduciary alienation contract in the competent real estate registry, in which case there is a split of ownership. The fiduciary becomes the indirect owner and the fiduciaries become the direct owner. This has direct implications for liability for the property since whoever is in direct possession (fiduciaries) are accountable to third parties for damages arising from the use of the thing⁴⁰⁶. In general, the direct owner (fiduciaries)

403 Civil Code. CHAPTER III. Condition, Term and Charge. Art. 127. If the condition is resolved, while it is not fulfilled, the legal transaction will be in force, and the right established by it may be exercised since the conclusion of this.

404 VENOSA, Silvio de Salvo. *Direito Civil: direitos reais*. 12. ed. – São Paulo: Atlas, 2012. p. 392. Note that the resolvable owner exercises the powers of full owner: use, enjoy and even dispose of the thing. Unavailability will only occur if the constitutive act contains an inalienability clause. Under such aegis, even if the thing is alienated, the implementation of the condition or advent of the term, which have the seed sown at the origin of this modality, of domain, authorizes the claim by the new owner, in the exercise of his right of sequel. Thus, third parties who acquire property subject to term and resolving condition assume the risk of losing it. As the Condition is fallible, this possibility of loss is not, as can be seen, inexorable.

405 BRAZIL. Law no. 9,514, of November 20, 1997. Available at http://www.planalto.gov.br/ccivil_03/Leis/19514.htm. Accessed on: 30 jun. 2018. CHAPTER II. Of the Fiduciary Alienation of Coisa Immovable. Art. 22. Fiduciary alienation regulated by this Law is the legal business by which the debtor, or fiduciary, with the scope of guarantee, contracts the transfer to the creditor, or fiduciary, of the resolvable property of immovable property.

406 BRAZIL. Law no. 9,514, of November 20, 1997. Available at http://www.planalto.gov.br/ccivil_03/Leis/19514.htm. Accessed on: 30 jun. 2018. Art. 26. The debt is overdue and does not pay, in whole or in part, and the trustee is in default, under the terms of this article, ownership of the property in the name of the trustee will be consolidated. § 1 For the purposes of the provisions of this article, the trustee, or his legally appointed representative or legally appointed attorney, shall be summoned, at the trustee's request, by the official of the competent Property Registry, to satisfy, within fifteen

will only have the consolidation of their property after the payment of the debt has been implemented⁴⁰⁷, however, they do not shirk the responsibilities arising from damages caused in the exercise of such possession.

Another characteristic of this type of property is the capacity that both the fiduciary and the fiduciaries have to dispose of the thing, as long as there is no “inalienability clause”, maintaining the conditions agreed, especially the obligations⁴⁰⁸.

Civil Liability could be inserted into a resolution condition and even the setting of an initial, final term, or both. This proposition would not occur in the verification of configuration requirements or assumptions. So much less in the analysis of guilt, deceit, risk, exclusion, that is, in nothing that doctrine and legislation have built until today. The suggestion is that the resolute condition is an element of verification by the beneficiary of the technology, in the case of the autonomous robot.

days, the overdue installment. and those that fall due until the payment date, conventional interest, penalties and other contractual charges, legal charges, including taxes, condominium contributions attributable to the property, in addition to collection and subpoena expenses. Art. 27. Once the property is consolidated in its name, the fiduciary, within thirty days, counting from the registration date mentioned in § 7 of the previous article, will promote a public auction for the sale of the property. [...] § 8 The fiduciator is responsible for the payment of taxes, fees, condominium contributions and any other charges that fall or will fall on the property, whose ownership has been transferred to the fiduciary, under the terms of this article, until the date on which the fiduciary comes to be imitated in possession.

407 _____. Law no. 10,406, of January 10, 2002. Available at http://www.planalto.gov.br/ccivil_03/Leis/2002/l10406.htm. Accessed on: 30 jun. 2018. Art. 1,359. Once ownership has been resolved by the implementation of the condition or by the advent of the term, the real rights granted pending are also resolved, and the owner, in whose favor the resolution operates, can claim the power thing of those who own or hold it. Art. 1.360. If the property is resolved by another supervening cause, the owner, who acquired it by title prior to its resolution, will be considered the perfect owner, leaving the person, for whose benefit there was the resolution, an action against the person whose property was resolved to have the thing itself or its value.

408 VENOSA, Silvio de Salvo. *Direito Civil: direitos reais*. 9. ed. – São Paulo: Atlas, 2012. p. 392.

Consumer relations, in our opinion, remain intact. The production and commercialization of autonomous robots follow the same rules, with some adjustments, such as guarantee, validity, return, etc. However, once the technology has been applied to the full extent of social life, the robot detaches from its main characteristic, before its circulation. Learning will take place exactly in these social relationships, with countless daily interactions that will directly impact self-learning. Let's look at an example.

A robot marketed to assist and accompany the elderly, analogous to what we commonly call caregivers, has a series of interactions, even if limited, in the residence or place where the person needs care. A free or expensive session of this robot to another family, which lacks the same assistance for an elderly person, will imply a sudden change in the environment. That is, it will greatly interfere with learning. This interference generates an emergent behavior and the robot alters a given medication, weakening the clinical condition of the elderly, almost causing his death. In addition to the despair and distress caused the maintenance costs of assistance increase, including the return of the robot and the hiring of a new (human) caregiver. Will the liability for damages be attributed to the previous owner? Should strict liability be claimed and demand the robot vendor, builder or programmer?

We believe that the Resoluble Civil Liability is currently the most appropriate to the situation. Exceptions to the rule will be assessed in the specific case, provided that the liability's resolving condition has been exhausted.

An initial and final term could be implemented as a resolutive condition within consumer relations, even if initially. The manufacturer would be subject to liability from the time the robot is placed on the market and for a certain period of use, provided that there are rules for changing the environments in which the robots are exposed and regarding the costly or free session to third parties.

Conclusion

The key point in the analysis of liability for damages arising from robots with self-learning (machine learning) is the realization that the cause for the occurrence of these damages lies not in their unpredictable behavior, but in the environment in which data and information are generated and created and linked directly to self-learning. This autonomy of cognition and, therefore, the unpredictability of actions to accomplish a given task is the main characteristic of this type of technology.

We have not affiliated with the doctrine that unpredictability resides in damage and that causality in this type of technology is not linear. The damages caused will follow the same order of causal links that we know and may differ in their extent. Technologies replacing humans in productive and intellectual activities are already a reality and with robots, it will be no different in the mechanical and cognitive execution of humans. This substitution or assistance does not immediately result in a change in causality and the appearance of damage that is foreign to our reality. These conclusions can be denied briefly, but we do not see them in the short term.

Resolvable Civil Liability, in this sense, precedes the identification of the damage, its characteristics and assumptions. It aims to establish a cut-off rule, delimitation of the investigation field, verification of guilt, risk theory and exclusionary configurations. This cutting rule consists of the use of technology, to whom it benefits and whether the environment of this benefit has interfered with the emergent behavior and consequent damage to be repaired.

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Legal Aspects Of The Use Of Artificial Intelligence In Medicine

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Abstract

This paper focuses on the legal aspects of the use of artificial intelligence in medicine, to analyze the potential risks of violating the rights of the human person through the use of these technologies in two situations: problems in diagnostic imaging and invasions of privacy through databases. In this case, special attention was paid to Brazilian legislation, especially the Consumer Protection Code and the Brazilian General Data Protection Law.

Keywords

Digital Health - Biolaw - Privacy Laws

Introduction

In recent years, artificial intelligence has become a panacea. Like any technology initially misunderstood by the general public, it is about a hope of solving the most varied problems, even when unnecessary if a minimum of organization institution existed, as in the case of the Judiciary Power in Brazil, in which, instead of producing decisions by a simplified form for the facilitation of interpretation of

the information contained therein, artificial intelligence is expected to do this job in place of legal professionals.

Despite the recent growth of interest in this technology, the dream of getting to artificial reproduction of human thought is ancient, preferably automatically and quickly. Thus, artificial intelligence was developed with the first computers and those solutions were important for the development of computer science, but limited to the universe of the machine on which the software ran. However, three factors have led to an increase in the use of artificial intelligence: the expansion of storage data, the capacity of processing data and the connection of computers to the Internet, which has enabled cloud computing. These new features have made artificial intelligence more accurate and present in people's daily lives, including medicine.

The use of artificial intelligence is not limited only to the technical possibility of using this technology. It involves legal aspects, which are essential for defining the limits of what is allowed and what is prohibited, due to the potential problems arising from its use, as well as the analysis of what is legal and what is illegal, in order to imply liability in case of damages caused to persons. For methodological issues, the goal of this paper is to study the legal aspects of the use of artificial intelligence in medicine. This is an area where there are great challenges for doctors and other health professionals, by the restructuring of the profession itself due to the impact of these technologies and the readjustment of the doctor-patient relationship mediated by artificial intelligence in diagnostics, with potential risk situations of privacy invasions.

1. Artificial Intelligence In Medicine

Medicine is a science and an art. A science, because researches have been done to understand diseases. An art, because this knowledge is not an end in itself, but is aimed at restoring health, improving the quality of life and well-being. The development of medicine by clinical research is fundamental, but some past experiences became a delicate subject, perhaps traumatic, due to the fact that during World War II, thousands of prisoners were subjected to unauthorized experiences that exposed them to high risks, resulting in their death in almost all cases. For this reason, the 1947 Nuremberg Trials sentenced the doctors who participated in these unethical experiments and a decalogue was established regarding the principles that should be observed in researches with human beings, which unfolded in the principles of bioethics, which, among others, autonomy and non-maleficence. In the 1960s, the World Medical Association launched the Declaration of Helsinki, which regulates research with human beings through *soft law*. This legal text was updated several times, and the last of which was in 2013 in the city of Fortaleza, Brazil.⁴⁰⁹

As a result of all these researches, the benefits of a balanced diet, physical activity and the effects of tobacco and alcohol were understood. The ethology of a lot of diseases was discovered. Medicines, clinical treatments, surgical techniques and transplants were developed. A huge field was opened for the use of technologies in equipment, instruments, prostheses, orthoses and other material objects inserted in the human body.

409 WMA - The World Medical Association-WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects [Internet]. The World Medical Association. [cited 2020Jan30]. Available from: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>

Medical equipment is a practical application of the laws of physics in terms of acoustics, such as the stethoscope, as well as hydrostatics, in the case of pressure gauges, in addition to electricity and electromagnetism in cardiac devices and radioactivity in radiographic examinations and treatment of cancer. But in the 1950s, electronics arose with the invention of the transistor and construction of the first computers, as well as the basic concepts related to artificial intelligence. With the development of microelectronics, it was possible to reduce the price and size of computers and the information storage media, such as hard drives.

The use of electronic and computer equipment in the medical field has grown exponentially, due to the fact that pieces of software are capable of simulating various equipment and processing data collected by health professionals from a simple blood test to those that require greater complexity. An important aspect related to the use of information technology in medicine is the storage of data about the patient. Health records are documents in which professionals enter all information concerning the history, diagnosis and procedures performed. Traditionally, this document was produced on paper. However, inevitably, they have become electronic, both for practicality and for the ease and reduction of storage costs.

The Internet, which commercial opening took place in the 1990s, is another paradigmatic leap within medicine. First, the circulation of knowledge by the publication of papers on research with human beings carried out in different parts of the world was modified, by the transformation of the medical journals: instead of printing them on paper, they became virtual and easily available on the Internet. It is known that knowledge in the medical field - as in any other area - has increased exponentially in small time intervals, which makes it impossible to keep up to date in the area, even if the professional only dedicates himself to read everything that is published worldwide. In

addition, cloud computing on the Internet allowed the formation of large databases - the big data.

With the expansion of possibilities for using artificial intelligence, medicine has become a very interesting area for its use. Considering the capacity for artificial reproduction of human faculties of interpretation, analysis and judgment of information, the challenge arises of performing medical acts with equipment, which can make decisions that traditionally are under the responsibility of a professional. Furthermore, artificial intelligence is a tool perfectly suited to clinical research, because knowledge in the field of medicine is essentially empirical, based on statistics, developed through tests to prove or not the hypothesis developed by the researcher. Artificial intelligence can assist professionals in making decisions about which treatment should be adopted by each patient.

Interestingly, artificial intelligence in medicine has been widely used by the population for years, albeit inappropriately in several cases. When the person perceives something different from himself, it is very common to make a search on Google about the symptoms presented. The results are exhibited and the person reads various papers and gets a preliminary conclusion. He goes to the doctor, who often cannot be absolutely informed about new treatments and medicines. This situation imbalanced the power relationship between doctor and patient, which gave rise to the idea of a “Doctor Google”. However, this habit has become an object of interest to data scientists and medical researchers. Investments in prediction by artificial intelligence were made and one of the main products developed is precisely a software with an artificial intelligence algorithm able of predicting the date of the person’s death.⁴¹⁰

410 Cuthbertson A. This Google AI can predict when you’ll die [Internet]. The Independent. Independent Digital News and Media; 2018 [cited 2020Jan30]. Available from: <https://www.independent.co.uk/life-style/gadgets-and-tech/news/google-ai-predict-when-die-death-date-medical-brain-deepmind-a8405826.html>

In addition, the use of information technology has led to the improvement of equipment, especially in terms of diagnostic imaging, as in the case of computed tomography and magnetic resonance imaging. Considering that diagnostic imaging requires the interpretation of the professional, there is the observation with the naked eye or by camera, but rather by building bidimensional monochrome of a three-dimensional structure. This fact may prevent the identification of the problem, or, the reverse, the generation of a “false positive”. The use of artificial intelligence in conducting exams would make them more accurate compared to those in which there is a greater participation of professionals in the interpretation of diagnostic imaging.⁴¹¹

Therefore, medicine and technology go together. Due to the commercialization of this activity, there is inevitably a market appeal for the use of technologies, which contribute to the restoration of health with greater speed and accuracy, because greater efficiency in the activity of doctors would be achieved and, above all, with risk reductions. Recently, the rise of “Digital Health”, “e-Health” and even “m-Health” (mobile Health) led the World Health Organization launch in 2019 the text entitled “WHO Guidelines: recommendations on digital interventions for health system strengthening”, prepared in 2018 following a resolution of its General Assembly, because no careful analyses of the benefits and risks of using technologies in health care, including telemedicine, the support of digital tools in medical decision-making, as well as the storage and use of patient data records, are available up to now.⁴¹²

411 Shetty S, M.s. Using AI to improve breast cancer screening [Internet]. Google. Google; 2020 [cited 2020Jan30]. Available from: <https://blog.google/technology/health/improving-breast-cancer-screening/>

412 WHO Guideline: recommendations on digital interventions for health system strengthening [Internet]. World Health Organization. World Health Organization; 2019 [cited 2020Jan30]. Available from: <https://www.who.int/reproductivehealth/publications/digital-interventions-health-system-strengthening/en/>

2. Legal Issues Related To The Use Of Artificial Intelligence In Medicine

The legal issues related to the use of artificial intelligence, both in medicine, as in any other area, consist of the lawfulness or not of the use of this technology and what should be the legal consequences in torts. For now, there are two subjects related to artificial intelligence in medicine. The first one refers to the diagnostic imaging by artificial intelligence and the second one, privacy violations generated by the data analysis enhanced by artificial intelligence.

2.1. Diagnostic Imaging With Artificial Intelligence

The first situation consists in the use of artificial intelligence in diagnostic imaging. In this field, technology was what has allowed the preparation of diagnostic results by doctors over the years, despite the importance of the professional intuition.

The duty not to cause damage to people's lives and physical integrity is a fundamental principle of law, both in past and nowadays. Under Criminal Law, the agent is punished in case of homicide and personal injury. In Private Law, personality rights are guaranteed and, more concretely, there is a general prohibition of not causing injury to others, whose violation entails civil liability for the repair of damages caused, both in Civil Codes and in the consumer protection laws. However, as health equipment may actually injure the life and physical integrity of the person, there is an additional control conducted by the State, before placing the equipment on the market. In this sense, in Brazil, article 25 of Law no. 6,360, of 1976, establishes that *“devices, instruments and accessories used in medicine, dentistry and related activities, as well as those of physical education, beautification or aesthetic correction, shall only be manufactured, or imported, for delivery for consumption and exposure to sale, after the Ministry of Health has*

decided whether or not registration is required". Currently, this control is made by the National Health Surveillance Agency - ANVISA, under Law n. 9,782, on January 26th, 1999.

As the possibility that diagnostic imaging equipment with or without artificial intelligence software causing direct and immediate death or injury in the patient is highly remote, the hypothesis that raises doubts on the part of jurists is the artificial intelligence software on the equipment has made a wrong analysis, resulting in a mistaken diagnosis. In Private Law, this fact is known as the loss of chance doctrine, which is the loss of the unique opportunity of having avoided the occurrence of the damage or its reduction.

In this case, the equipment manufacturer is the main liable for the payment of an award of damages. It is a strict liability, due to the sole placement of the product in the market. This means that it must not do this until the risk of mistaken diagnostics is evidenced as very low, because good faith in the relationship between manufacturer and users must prevail. It is what art. 931 of the Brazilian Civil Code, according to which *"except in other cases provided for by special laws, individual entrepreneurs and companies are liable, regardless of fault, for damages caused by products placed into circulation"*.

From the point of view of the patient, the Brazilian Consumer Protection Code (Law n. 8,078/1990) reinforces the idea that products or services may cause damages to consumers. Article 6 establishes the basic consumer rights. The first of which is Article 6, I: *"The protection of life, health and safety against the risks caused by practices in the supply of products and services considered dangerous or harmful"*. And, in the event of damage caused by products placed on the market, Article 12 of the Consumer Protection Code establishes the s manufacturer's strict liability.

A relevant issue is the use of the development risk doctrine, according to which the manufacturer could exempt himself from liability, if it was proven that he was unaware of adverse events

regarding the use of this equipment. In Brazil, this doctrine is not admitted, nor does it have a legal provision.

Other responsible for repairing damages in the event of a mistaken diagnostic is the health establishment that uses the equipment with artificial intelligence to perform diagnostics imaging, because it assumes the risk of the decision of its use in this activity. From the patient's point of view, even if the examination is performed by equipment, the mistaken diagnosis is legally qualified as damages. It is a hypothesis of the services supply's strict liability, under Article 14 of the Consumer Protection Code.

The patient may file an action for damages, both the manufacturer of the equipment and the health establishment that used it in the supply of services, by joint and several liability, in case of mistaken diagnostic made by the equipment. However, if the patient only files an action against the health establishment, the latter may subsequently demand compensation from the manufacturer based on Article 933 of the Brazilian Civil Code. Nevertheless, it is not possible to denounce the lawsuit by the manufacturer, under the terms of Article 88 of the Consumer Protection Code, if the action is filed before a Small Claims Court.

On the other hand, if the manufacturer is exclusively sued for the payment of damages, an action of restitution against the health establishment may be filed. However, the nature is fault-based liability, governed, therefore, by Article 186 of the Brazilian Civil Code, which the burden of proof of guilt of the supply of services that eventually has used the equipment wrongly, which resulted in misdiagnosis.

In practice, this type of civil liability will certainly be much less frequent than in comparison with traditional methods of performing diagnostic imaging, because the accuracy of the equipment will be greater than the accuracy of a professional. Although human intelligence is far superior to artificial intelligence, the latter has

a comparative advantage: the machine does not suffer from fatigue effects, which may affect the analysis of the professional.

Finally, the professional responsible for the equipment is ultimately liable for the damage caused to people due to wrong diagnosis, even if with artificial intelligence, because, under Article 4, VII, of Law no. 12,842, on July 10th, 2013, which regulates the practice of medicine in Brazil, the “endoscopic, imaging, invasive diagnostic procedures and pathological examinations” are private medical activities. Even if a professional is not liable for the damages caused to patients, there is no way to avoid professional liability under the medical association.

2.2. Privacy Violations

The second hypothesis of damages caused by the use of artificial intelligence in medicine is related to privacy.

The idea of recognizing a right to privacy arose as a way of preventing information about persons from being obtained without consent and with which third parties could create embarrassing situations without just reason. Formulated as the “right to be let alone”, the right to privacy was structured to protect invasions by journalists, photographers and the State itself. With the assembly of databases, the right to privacy was also invoked so that only persons authorized could have access only to certain information, as in the case of consulting the restrictions on access to credit on the market. On the other hand, the intensive use of social networks has caused a revision on the concept of privacy: in addition to traditional hypotheses, it is now people themselves who voluntarily disclose everything about their private lives. As this disclosure is made on the Internet, it facilitates greatly this process.

The gathering of data in research with human beings can give rise to privacy violations. Thus, every study must avoid the generation

of risks to life and health as much as possible, and also ensure that the data will be used exclusively for this purpose, without the identification of the participants. As foreseen in the Declaration of Helsinki and, in the Brazilian case, in Resolution CNS n. 446/2012, such guarantees must be provided by the researchers to the participants through an Informed Consent Form, through which the object of research is explained, the risks involved are clarified, the freedom of withdrawal of the research is guaranteed at any time, as well as the payment of compensation in case of damage to personality rights. The study is controlled by a Research Ethics Committee. The breach of these rules is considered unethical and its publication is prohibited in any scientific journal.

With the greater speed of data processing and the expansion of the data storage capacity, especially through cloud computing, a large amount of information can be gathered and stored to be used in one or more studies, or, yet, biobanks formed from materials extracted from the body of a living or dead people, with or without genetic material. Depending on the research, the analysis made by traditional methods was impossible, given the difficulty of processing and establishing a large number of big data and its relationships in a short time. However, with artificial intelligence, these analyses can be carried out more quickly and without human fatigue. Researches on medicines, including antibiotics and vaccines, have been improved and the solutions will be offered faster than the traditional methods.

In data analysis carried out using artificial intelligence under the supervision of a Research Ethics Committee, there is a control over the potential risks arising from the use of this technology, but valuable information can be obtained indirectly, as it is with social networks, where people voluntarily offer information to interested parties. For example, with the popularization of DNA tests carried out by the post office to prepare genetic maps related to ancestral origins and probability of manifestation of genetic diseases, huge databases

and biobanks have been created without ethical control to be analyzed by artificial intelligence.

Another aspect related to artificial intelligence in research with human beings is in health records. Although being a patient of the document, the professional launches information about the person, which does not know what has been registered, or the meaning and relevance of these data, nor any idea of the impact they can have in their own lives. In any healthcare service, the patient's consent to write on a health record is not required.

When health records were written on paper forms, the possibility of gathering this information was quite impossible, because they were kept in archives by professionals or hospitals. Currently, the use of information and communication technologies in the health area created the so-called electronic health record - EHR. In digital format, this information can be easily gathered from several isolated health records, without the patient being aware of this fact - despite the existence of the right to privacy and professional secrecy - becoming a health *dossier* on every time the person was sick, what medicines were used and the body's responses in all these situations.

Two types of analyses can be made with the use of artificial intelligence in these cases. The first would be a statistical one, to understand a specific disease in one population for a certain period or even in series. The second, more invasive of privacy, although apparently an isolated case, is one in which one can predict when the person will die. While a Research Ethics Committee may control or prohibit the use of clinical research about it due to the surveillance of the researchers, however, the same guarantee does not exist in terms of medical records.

Considering the economic dimension of this information, one cannot be naive that such data will never be used. Just remember the scandal regarding data collection from Facebook, where user data was used improperly for the purpose of profiling people. The risk of

misuse of information relating to the probable moment when a person will die, may inevitably lead to an unobtrusive cost-benefit criterion being taken into account, in violation of the principle of human dignity, when refusing treatment, an incentive to euthanasia, as the reasoning for the unnecessary treatment costs, which is previously known to be mere palliative, whenever the person will live for a short time. Information of this type is relevant for those who have to ensure the economic balance of the health system. Medical treatments will be provided only to those who have financial resources to pay for them in full.

Brazilian Law guarantees the protection of privacy. The Federal Constitution affirms in Article 5, X, that “intimacy, private life, honor and people’s image are inviolable, and the right to compensation for material or moral damages resulting from their violation is guaranteed”. Likewise, Article 21 of the Brazilian Civil Code establishes that “The private life of the natural person is inviolable, and the judge, at the request of the interested party, will adopt the necessary measures to prevent or terminate an act contrary to this rule”. As can be seen, the traditional rules were sufficient for the protection of privacy in a world without Internet, in which it was possible to identify the person who carried out the injury, forcing him to stop his invasive conduct.

The World Medical Association, incidentally, has had this concern with the misuse of patient data in recent years. Currently, the “Declaration of Taipei on Ethical Considerations regarding Health Databases and Biobanks”⁴¹³ has been edited, which last version was in October 2016. In this normative text, there are dispositions with ensuring confidentiality regarding the use of data, and the affirmation of the right of the person to authorize the storage of his biological

413 WMA - The World Medical Association-WMA Declaration of Taipei on Ethical Considerations regarding Health Databases and Biobanks [Internet]. The World Medical Association. [cited 2020Jan30]. Available from: <https://www.wma.net/policies-post/wma-declaration-of-taipei-on-ethical-considerations-regarding-health-databases-and-biobanks/>

material for scientific purposes, as well as to revoke the consent regardless of any justification. Furthermore, a call for governments to take measures to enforce the people's interest at the expense of the interests of stakeholders, as well as a request for all professionals to prevent that national laws are less protective in comparison with the provisions of this text in terms of protection of the dignity, autonomy and privacy of persons.

In the same sense, specific regulations in Brazil on the subject of medical data protection are in Resolution CNS no. 441, on May 12th, 2011, on biobanks and biorepositories. In the field of health records, the Resolution CFM no. 1,821/2007, as amended by Resolution CFM no. 2,218/2018, as well as Law no. 13,787, on December 27th, 2018, which establishes rules for digitization and use of computerized systems for the safekeeping, storage and handling of the patient's health record. In terms of guarantee of privacy, the main rule is Article 4 of this Law, according to which "*the storage of digital documents shall be protected them from unauthorized access, use, alteration, reproduction and destruction*". This protection is very low for the world today.

Evidently, the traditional guarantees of protection of the person's privacy are insufficient for the reality of the 21st century, in which there is big data and software with artificial intelligence. In recent years, countries have sought to legislate on data protection in a more comprehensive and detailed manner. In Europe, the General Data Protection Regulation - GDPR (EU 2016/679) was issued in 2016, which came into force on May 25th, 2018. European Union member countries have been updating their legislations, including Portugal, with Law no. 58/2019 and the French Law of June 20th, 2018. In America, it is worth highlighting the Peruvian Law n. 29,733, on July 3rd, 2011 and, more recently, in Brazil, Law no. 13,709, on August 14, 2018, named General Data Protection Law - LGPD, by Law no. 13,853, on July 8th, 2019.

Under Articles 7 and 11 of the LGPD, health data are considered sensitive data. More specifically, Article 11 of this Law establishes that these data can only receive treatment after the person's consent (item I), but they can also receive treatment without the person's consent in the event of compliance with legal or regulatory obligations by the data controller (item II, a). This provision may or may not be adequate to the legal framework for the protection of health-related data due to its vagueness. Another hypothesis is when public policies can be developed (item II, b). As there is no specification about the nature of these policies, a wide use can offer risk to people. Yet, the provisions of item II, c, which allows the processing of data by research bodies, ensuring privacy if possible, as well as the item II, f, when this act is done in "protection of health, exclusively, in a procedure performed by health professionals, health services or health authority" are evidently insufficient to protect persons. At this point, the LGPD is weaker than the regulation drawn up by the Brazilian National Health Council, as well as the Declarations of Helsinki and Taipei rules, which require the person's consent, while the LGPD exempts such consent. As LGPD is superficial at this point, it is authorized that such data may be treated using artificial intelligence software, which can further increase violations of the right to privacy.

On the other hand, later, to mitigate these risks, Law n. 13,853 inserted rules about the use of sensitive data, according to provisions of the current paragraphs 4th and 5th of the LGPD.⁴¹⁴ Thus, the Brazilian

414 § 4^o *Communication or shared use between controllers of sensitive personal data related to health is prohibited in order to obtain an economic advantage, except in the cases related to the provision of health services, pharmaceutical assistance and health assistance, provided that that in compliance with paragraph 5 of this Article, including auxiliary services for diagnosis and therapy, for the benefit of the data subjects < interests, and to allow: (Wording given by Law n. 13,853, of 2019)*

I - data portability when requested by the holder; or (Included by Law n. 13,853, of 2019)

II - financial and administrative transactions resulting from the use and provision of the services referred to in this paragraph. (Included by Law n. 13,853, of 2019)

Paragraph 5 Operators of private health care plans are prohibited from processing health data for the practice of selecting risks when hiring any modality, as well as when hiring and

Legislative Power realized the enormous risk arising from the sharing of sensitive patient data, even prohibiting decisions that result in the refusal of medical treatment to anyone for economic reasons.

Anyhow, although Article 52 of the LGPD provides for sanctions, including the payment of fines and even the destruction of the database, these measures may be ineffective in restoring the problems caused after the violation of privacy of persons.

Conclusion

Artificial intelligence is a powerful tool for the improvement of the living conditions of human beings, because it enhances the quality of various activities, from those simpler, to those more complex, including the development of more precise equipment and also in the evolution of scientific knowledge, as in the case of the medical area through clinical research.

However, like any technology, its use has positive and negative aspects, with the incentive to produce benefits and prohibiting conducts aimed at the production of harm. It is not intended to ban the use of software with artificial intelligence algorithms in medicine, but it is necessary to establish the limits between the legal and the illegal, through the current rules. The precautionary principle must be remembered, according to which not everything that can be done must be done. In fact, technologies shall be at mankind's service, because they have dignity, not vice versa.

Even though there are sufficient legal rules for the payment of an award of damages in the case of diagnostic imaging, however, there is a weakness in the legislation regarding the protection of the person's privacy. A greater danger lies in the automation of this type of decision-based on the treatment of sensitive data collected

excluding beneficiaries.

without previous consent. Considering that artificial intelligence is not a complete one, such as that of the human being, endowed with multiple intelligences, one must reflect on how this decision-making in health matters with software equipped with this resource can be excessively risky for persons, as for society, resulting, in certain cases, in the discrimination of the human being. Just keep in mind the use of free live navigation applications with artificial intelligence: it is suggested to drive to one path, but does not take into account whether the driver has greater or lesser ability to make difficult handlings or sudden changes, or whether this suggested path is more or less dangerous. Or, even, the call center services provided by robots, in which the only option is to communicate with the software, without human support. Despite the development of more precise artificial intelligence systems, there is the feeling that the system is unable to understand the nuances of human communication.

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Electronic Lawsuit Systems And Machine-made Judgments: Developing Standards For a “Legal Turing Test”

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Introduction

This study intends to demonstrate the legal relevance of regulating the development and use of artificial intelligence in machine-made judgments. The object of the work is to respond to the following questions: (i) does the development of an electronic lawsuit system facilitates the development of machine-made judgment algorithms? (ii) can machine-made judgments be indistinguishable from human-made judgments (first aspect of the proposed “Legal Turing Test”)? (iii) should machine-made judgment algorithms be developed to avoid the inscrutability problem (second aspect of the proposed “Legal Turing Test”)?

The method adopted was eminently cognitive-expository which is intended to develop the understanding of the concept of the “Legal Turing Test” and describe the problem of inscrutability in machine learning algorithms applied in the legal field, regarding machine-made judgments.

1. Machine-made Judgments And Electronic Lawsuit System

1.1. Why Develop Machine-made Judgment Algorithms?

It is possible to assume that, if we ask dozens of people - between laypeople and lawyers - whether they would rather have a judicial case judged by a human judge or by a computer, a good part of that contingent would opt for the human judge.

On the other hand, we could reframe the poll by asking if these people whether they would prefer the judgment made by a Judge A or by a Judge B, both described as follows: Judge A has studied thousands of cases - but only five or six that are similar to their case; had 38% of his decisions reformed by the court; is not updated with jurisprudence and he will take three months to deliver the sentence. Judge B has already studied almost every case in the country - including all those that are similar to their case; is synchronized in real-time with the jurisprudence and can deliver the sentence within minutes; in addition, they can be sure that Judge B will not have his trial affected by factors such as hunger, relationship problems or his team's poor performance in the championship. Probably some people would change their opinion about which judge they would like to hear their case.

The possibility of machine-made judgments is a subject that arouses both fascination and fear. And it also attracts criticism on both sides.

Regarding the “possibility” aspect, there is a solid case to be made that considers whether a machine-made judgment is a legitimate decision or only a mock statement of reasons. In this respect, Mozetic defends the position of the legal impossibility of using machine-made judgments.⁴¹⁵ Or, in plain terms, even if the computer can deliver

415 Mozetic's objection, that defends the position of the legal impossibility of using machine-made judgments algorithms, states: *“All this derives from a procedural perspective of the judicial decision understood by the artificial intelligence itself and the Law, in which the legal argument is understood as both an element of justification of the decision as*

fantastic results in many areas, it will not be able to work out a legal rationale ⁴¹⁶.

However, it can also be argued that the “fear” aspect is more related to the disruption and change of the *status quo* provided by the paradigm shift than to the possibility of automation, since there isn’t, in fact, any transcendental element that makes the legal activity – including judging cases - distinct from any other intellectual activity produced by humanity. Precisely for this reason, judicial decisions are in fact subject to automation to a greater or lesser extent, and this really is not a problem, but a solution. ⁴¹⁷

an element of explanation as regards the logical relation between the arguments and the pretension. But there is a big problem here: where is hermeneutics? Does ROSS understand the world? In short, for the Law, it is a unitary process between understanding, interpretation and application. For this reason, it is opportune to emphasize the Gadamerian affront to the challenges of a technological mentality related to Law. An intelligent legal system can not integrate all these elements, which are essential to reach a decision.” (“Tudo isso deriva de uma perspectiva processual da decisão judicial compreendida pela própria inteligência artificial e o Direito, em que o argumento legal é entendido tanto como um elemento de justificação da decisão, conforme apontado acima, como um elemento de explicação no que se refere à relação lógica entre os argumentos e a pretensão. Mas, há um grande problema aqui: onde está a hermenêutica? ROSS compreende o mundo? Em suma, para o Direito, é um processo unitário entre a compreensão, interpretação e aplicação. Por essa razão, é oportuno salientar a afronta gadameriana frente aos desafios de uma mentalidade tecnológica relacionada ao Direito. Um sistema jurídico inteligente não pode integrar todos esses elementos, que são essenciais para se chegar a uma decisão.” MOZETIC, Vinícius Almada. Os Sistemas Jurídicos Inteligentes e o caminho perigoso até a E-Ponderação artificial de Robert Alexy. Disponível em <http://emporiododireito.com.br/leitura/os-sistemas-juridicos-inteligentes-e-o-caminho-perigoso-ate-a-e-ponderacao-artificial-de-robert-alexey>. Acesso em 01/12/2017.)

416 “*However, despite enormous successes in certain areas such as the field of legal information retrieval a large portion of legal problem solving resists to be computerized. Judicial reasoning can be considered a member of the portion. At any time in history in any country in the world no computerized formalism for judicial reasoning has ever been employed on a large scale in everyday practice.*” (ARASZKIEWICZ, M. (Ed), ŠAVELKA, J. (Ed). *Coherence: Insights from philosophy, jurisprudence and artificial intelligence*. Law and Philosophy Library 107. Ed Springer Verlag, 2013. p. 204).

417 In this sense, the theories elaborated by Antônio Álvares da Silva: “*The machine-made judgment of repetitive cases is not the debasement of the judiciary. Instead, it means it’s modernization to be part of a mass and globalized culture, where there is a proliferation of data and knowledge of all kinds(...)* The decision-making function is possible only in a ‘*modelized*’ universe in which premises and consequences are accurate and stable. It is

But this discussion is far from being a new issue.

The theoretical possibility of using computers to at least aid judgments had already been advanced by twentieth-century theoreticians, including the creator of cybernetics, Norbert Wiener, for whom “legal problems are communicative and cybernetic, that is, to promote orderly and repetitive regulation of certain critical situations”⁴¹⁸

The studies in the field of cybernetics were incorporated by law theorists, not in the sense of seeking full automation of legal works, but rather as a means of supporting mechanical procedures to assist the jurist’s creative activity.⁴¹⁹

common to say that law would never reach this universe because of the permanent variety of decisions, but in fact what happens is exactly the opposite (...). The exhaustive activity of the judge will be relegated to complex cases, for which he will have time, provided he is free from small actions. Every effort to renew the judiciary consists in formalizing legal reasoning as far as possible. The appeals to the ‘concrete case’, ‘irreplaceable attitude of the judge’, ‘impossibility of the machine to replace man’ are traditional mentalizations that today are no longer insurmountable truths” (“O julgamento por computador de casos repetitivos não é o aviltamento do Judiciário. Pelo contrário, significa sua modernização para fazer parte de uma cultura de massas e globalizada, em que prolifera excesso de dados e de conhecimento de toda espécie [...] A função decisória só é possível num universo ‘modelizado’ em que premissas e consequências são precisas e estáveis. É comum afirmar-se que o Direito não atingiria jamais este universo, em razão da variedade permanente das decisões, mas, na verdade, o que acontece é exatamente o contrário [...] A atividade exaustiva do juiz será relegada aos casos complexos, para os quais terá tempo, desde que se livre das pequenas ações. Todo esforço para a renovação do judiciário consiste na formalização do raciocínio jurídico até onde for possível. Os apelos ao ‘caso concreto’, ‘atitude insubstituível do juiz’, ‘impossibilidade de a máquina substituir o homem’ são mentalizações tradicionais que hoje não constituem mais verdades intransponíveis” (ÁLVARES DA SILVA, Antônio. *Informatização do Processo: Realidade ou Utopia?* In: *Cinco Estudos de Direito do Trabalho*. São Paulo: LTR, 2009. p.108-110.)

418 *“die Rechtsprobleme sind kommunikativ und kybernetisch, d. h. sie sind die Probleme der geordneten und wiederholbaren Regelung gewisser kritischer Situationen”* (WIENER, Norbert. *Mensch and Menschmaschine*. Kybernetik und Gesellschaft. Frankfurt: Athenäum Verlag, 1966. p. 107).

419 As said by Klug: *“First of all you have to eliminate the prejudices. Especially, it would be a mistake to assume that the introduction of electronic automation in law means attempting to construct “judicial automations.” Nor is it “legislative automation.” Instead, the correct idea is that machines can take care of certain procedures that are mechanical, so that the lawyer can enjoy greater freedom for a more productive work, especially for legal*

According to Antônio Álvares da Silva, computers can be used to perform “mechanical procedures, leaving the judge with free time for complex judgments, studies and reflections.”⁴²⁰ The author also explains that a human computing activity has long been done by courts: “advisors do the research and outline the structure of the decision, demanding the judge intervention only for proofreading and the final touch.”⁴²¹

In fact, there are several possibilities and fields of action in which digital computers can help human work, contributing to its optimization and training or even to perform human work on their own⁴²².

creation work”. (“Pero ante todo hay que eliminar prejuicios. Especialmente, sería un error suponer que la introducción de autómatas electrónicos en el derecho significa el intento de construir “autómatas judiciales”. Tampoco se trata de “autómatas legislativos”. Antes bien, la idea correcta es que las máquinas se pueden harcer cargo de ciertos procedimientos que son mecánicos, con el objeto de que el jurista pueda gozar de mayor libertad para el trabajo más productivo, sobre todo para el trabajo de creación jurídica.” (KLUG, Ulrich. *Lógica jurídica*. Tradução para o espanhol de J.C. Gadella. Santa Fé de Bogotá, Colômbia: Editorial Temis S.A, 1998. p. 22-226.)

420 “*procedimentos mecânicos, deixando ao juiz tempo livre para julgamentos complexos, estudos e reflexões.*” (ÁLVARES DA SILVA, Antônio. *Informatização do processo: Realidade ou Utopia ?* In: *Cinco Estudos de Direito do Trabalho*. São Paulo: LTR, 2009. p.108.)

421 “*essa atividade já é feita pela delegação que se faz a assessores para a pesquisa e esboço da estrutura da decisão, ficando o juiz apenas para a conferência e o toque final.*” (ÁLVARES DA SILVA, op. cit. p. 108.)

422 “[...] *as optimizers*. There are many opportunities to leverage machine intelligence to help improve the accuracy and efficiency of human computation algorithms. Machine learning techniques, such as active learning, can help reduce the cost of human computation by choosing only informative queries to ask. [...] **as enablers**. As human computation systems are built to handle increasingly complex tasks done by increasingly larger crowds (e.g., to generate disaster relief plan), we need to use machine intelligence to coordinate individuals, and to make sense of, organize and display information to workers. In other words, AI algorithms can be used to make humans compute better. [...] **as workers**. For many tasks, machines actually outperform humans, both in terms of accuracy and speed. One can imagine future human computation systems to leverage both AI and humans as workers to perform different tasks they are better at. An effective human computation system should be able to interweave machine and human capabilities seamlessly. This idea is not new; many research concepts familiar to the AI community./ [...]” (LAW, Edith; VON AHN, Luis. *Human computation*. Synthesis Lectures on Artificial Intelligence and Machine Learning, #13. 2011 by Morgan & Claypool Publishers. p. 3).

There are, however, key aspects of developing machine-made judgment algorithms to be analyzed.

1.2. Key Aspects Of Developing Machine-made Judgment Algorithms

The idea of compiling structured legal data to facilitate judicial activity is not new. In the first half of the twentieth century, Lee Loevinger theorized that the task of structuring legal relevant data was an indispensable part of the work of lawyers⁴²³.

From the initial research of Loevinger, further studies were developed in the field of legal informatics, aiming to facilitate the obtaining of legally relevant information and also to establish procedures to understand this data, in order to increase productivity and speed of work without loss of quality.

Therefore, a central point of development of the area consists in the creation of a reliable database, able to serve as a repository for consultation able to facilitate the tasks of elaboration of legal pieces and prediction of judicial decisions. As said by Pagano: *“the creation of a legal database is an objective of general interest and as such it should be carried out by the State.”*⁴²⁴

423 *“The task of data retrieval is one of the most basic, pervasive, and important of all the functions performed by lawyers and judges. This includes the activity which lawyers commonly refer to as “legal research,” but also considerably more. It is important to note that when lawyers use the term “legal research” they mean library searching, whereas scientists use the term “research” to mean laboratory experimentation. For the sake of both clarity and generality the term “data retrieval” is more useful in the present context. One of the principal aspects of data retrieval in the law is that of finding applicable, analogous, or relevant precedential authority in the reported cases for determination of some current question. Indeed, a large part of the formal professional education of the lawyer consists of training and exercise in the analysis of problems, the use of a legal vocabulary, and the use of legal index systems in order to perform this task.”*(LOEVINGER, Lee. *Jurimetrics: the methodology of legal inquiry*. New York, Basic Books, 1963. p. 9).

424 *“la creazioni di una banca di dati giuridici è un obiettivo di interesse generale e come tale deve essere realizzato dalla mano pubblica.”*(PAGANO, Rodolfo. *Informatica e diritto*. Milano: Dott. A Giuffrè Editore, 1986. p. 61).

With the building of this database, it will become possible to treat legal information in accordance with the techniques and procedures of information science. In this way, some kind of algorithmization of Law can be considered, in the sense that it will be possible to extract the elementary tasks that allow legal conclusions and are essential to the development of a machine-made judgment algorithm.

However, those researches developed in the last century found limits in the capacity of possible tasks accomplished by the computers of the time, as well as in the difficulty of elaborating algorithms that could work with a dynamic database without the possibility to incorporate the advances of the jurisprudence.

Fortunately, the processing power of today's computers makes it possible to expand beyond Turing's deterministic systems through the development of machine learning techniques that, as defined by Samuel⁴²⁵, can make an impact in several areas such as the Law⁴²⁶, with remarkable advantages as showed by Mackay⁴²⁷. Several

425 "Machine Learning is a field of study that gives computers the ability to learn without being explicitly programmed (...) Programming computers to learn from experience should eventually eliminate the need for much of this detailed programming effort" (SAMUEL, Arthur. L. "Some Studies in Machine Learning Using the Game of Checkers." *IBM Journal of Research and Development*, v. 3, p. 210. Issue: 3, 1959. p. 210).

426 "Thus, it seems that any legal problem, as well as any other problem, can be solved if and only if an adequate collection of information is acquired and processed to the form of a solution. At this point one can hardly avoid the obvious parallel to the very well established concept of algorithm that is usually used within the computer science. To understand the procedure of legal problem solving within the framework of algorithms and computer science one must at first be able to recognize the information that are—to put it in legal terminology—relevant to the given problem. These information can be considered an input to the process. In case of algorithms we usually speak of 'some value or set of values' that is an input of an algorithm. Secondly, it is necessary to characterize the information that is to be regarded as an output of the legal problem-solving process. Since in case of algorithms we once again speak of 'some value or set of values' in case of legal problem-solving procedures we can settle with the statement that the output of the process is the information relevant to the solution of the problem. In this sense, both algorithm and legal problem solving procedure can be understood as a 'sequence of [: :] steps that transform the input into the output'" (ARASZKIEWICZ, M. (Ed), ŚAVELKA, J. (Ed). *Coherence: Insights from Philosophy, Jurisprudence and Artificial Intelligence*. Law and Philosophy Library 107. Ed Springer Verlag, 2013. p. 204).

427 "Machine learning allows us to tackle tasks that are too difficult to solve with fixed programs written and designed by human beings. From a scientific and philosophical point

algorithms - designed to perform different tasks - can be submitted to different machine learning techniques, depending on the expected result, according to Ayodele.⁴²⁸

But it is not necessary for the machine to reinvent the wheel. “Intelligent” behavior can be built through a previously modulated knowledge-based system. In this regard, the algorithm will seek to provide the most appropriate results for a given input from the information search in a pre-existing database. It is the so-called case-based reasoning (CBR) model that consists of an AI field of study that uses a large case library for consultation and problem solving, where the presented problems are solved, through the recovery and consultation of cases already solved and the consequent adaptation of the solutions found.⁴²⁹

Regardless of the discussion of which model of the system should be developed, as noted by Pagano⁴³⁰, those kinds of systems also

of view, machine learning is interesting because developing our understanding of machine learning entails developing our understanding of the principles that underlie intelligence. “MACKAY, David J. C. *Information Theory, Inference, and Learning Algorithms*. Cambridge University Press, 2003).

428 “Supervised learning --- where the algorithm generates a function that maps inputs to desired outputs. One standard formulation of the supervised learning task is the classification problem: the learner is required to learn (to approximate the behavior of) a function which maps a vector into one of several classes by looking at several input-output examples of the function. Unsupervised learning --- which models a set of inputs: labeled examples are not available. Semi-supervised learning --- which combines both labeled and unlabeled examples to generate an appropriate function or classifier. Reinforcement learning --- where the algorithm learns a policy of how to act given an observation of the world. Every action has some impact in the environment, and the environment provides feedback that guides the learning algorithm. Transduction --- similar to supervised learning, but does not explicitly construct a function: instead, tries to predict new outputs based on training inputs, training outputs, and new inputs. Learning to learn --- where the algorithm learns its own inductive bias based on previous experience. (AYODELE, Taiwo Oladipupo Ayodele. *Types of Machine Learning Algorithms*. “ In: ZHANG, Yagang (Ed.). *New advances in machine learning*. InTech, 2010. p. 19).

429 Cf. CARPINO, Pedro Luiz Gomes. *Inteligência artificial aplicada ao direito: fundamentos e perspectivas dos sistemas especialistas legais, com ênfase em direito previdenciário. Trabalho de conclusão de curso*. 2006. Faculdade de Tecnologia da Baixada Santista.

430 “l’informatica giuridica investe due ordini di problemi: il reperimento della informazione giuridica (legal information retrieval) e la gestione di procedure di formazione e applica-

deal with two types of problems: the repressing of legal information (legal information retrieval) and the management of training procedures and the application of the law through automated systems.

In relation to this aspect, a game-changer technology is the advent of electronic lawsuit systems that can provide both the consolidation of a reliable and constantly updated legal database and the development of algorithms that can provide legal information retrieval with a high success output. Among those systems, the most noteworthy is the *Processo Judicial Eletrônico* (Electronic Judicial Process) system.

1.3. The Electronic Lawsuit System Pje And The Brazilian Experience

The Electronic Judicial Process (PJe) is a computer system developed by the CNJ (National Council of Justice) in partnership with various courts, the Federal Justice Council (CJF) and the Superior Council of Labor Justice (CSJT), in addition to the contribution of the National Council of the Public Prosecutor's Office (CNMP), The Brazilian Bar Association (OAB), the Federal Attorney General's Office (AGU) and Public Defender's Offices, designed to provide support for an electronic lawsuit system that works entirely through the Internet, has a free distribution to the judiciary, uses open-source technology solutions and has as a guideline the use of encryption in the records of the proceedings, through digital certification in the ICP-Brazil standard, to guarantee the integrity and security of information.⁴³¹

The PJe system allows the creation of a legal database at an unprecedented level of interaction. This occurs because the biggest

zione del diritto mediante sistemi automatizzati" (PAGANO, Rodolfo. *Informatica e diritto*. Milano: Dott. A Giuffrè Editore, 1986. p. 591).

431 Cf. CONSELHO NACIONAL DE JUSTIÇA. Caderno PJe - Processo Judicial Eletrônico. 2016. Disponível em: <<http://www.cnj.jus.br/files/conteudo/arquivo/2016/09/551be-3d5013af4e5013af4e50be35888f297e2d7.pdf>>. Acesso em: 22 de setembro de 2016.

cost of developing such an organized database consists of extracting information from the physical-analog environment and converting it into digital data.

The development of PJe has been accelerated in the last few years because most of the relevant data and information were no longer restricted to the analog medium, which required a time-consuming process of reworking the computer with the data contained in the paper but available directly in digital media, facilitating the process of data analysis by the machine.

Therefore, with an increasing, unified and online 24/7 legal database, with just a few minutes of searching the internet, one can obtain precedents from the most diverse courts in Brazil.

The database contained in the PJe system is already stored in digital format and contains not only sentences and judgments of the courts, but the content of most petitions formulated by lawyers, documents and expert reports.

Therefore, perhaps for the first time in human history, we have the material conditions (a 100% computerized legal database) and the technological possibility of developing a reliable and cost-effective machine-made judgment algorithm.

The PJe system already provides a mechanism for filtering, analyzing, consulting and compiling relevant legal data that is essential for legal activity because, with the massive overload of legal information that arrives at all times through the various means of communication, it's being impossible for a human judge to be up to date with the most recent decisions. It is the phenomenon of "overdose of information", which afflicts all contemporary society, but especially legal professionals.⁴³²

432 "Legal professionals, be they judges or lawyers, handle information in order to take decisions. As such they are vulnerable to the Information Overload phenomenon. Moreover, increasingly more non-legal professionals have to deal with the Law due to increasing regulations in for example environmental protection and public security in buildings." (BENJAMINS, V. V. Richards et al. Law and the Semantic Web, an Introduction. In: Lecture

The excess of information, while giving the judge greater subsidies for the rendering of decisions, also implies the need to compile and adjust all the information received for the analysis of the concrete case⁴³³.

Given the possibilities of PJe system, there are already some initiatives that aim to use that database and resources to create new systems such as the “assistant for decision-making”⁴³⁴ and “indexing and retrieval of information”⁴³⁵. The next logical step is the development

notes in artificial intelligence 3369, p. 1–17, 2005. © Springer-Verlag. Berlin Heidelberg 2005. p. 1.

433 *“The informational needs of a judge are not the same as those of a regular citizen. Similarly, the needs of an experienced judge are different from the needs of a recently appointed one. This rupture of the unity of informational needs as well as the emergence of different kinds of agents modifies the relationship between the user and the informational system. From the notion of a particular “case” –where the positive Law is expected to give an answer—we move on to the notion of “problem” of a particular person with specific needs as well. In this sense, the notion of “Law as a practice” (from the “case” to the “problem”) evidences the shift to a mentality much more instrumental than final, since it puts the emphasis on the individuals and their informational needs. [...] new and hopeful possibilities for legal informatics and, specifically, for knowledge systems are arising in the European context. The increasing consciousness about the complexity of Law allows to track the projects on the path of utility for certain individuals rather than claiming an objectivity of the answers.”* (AGUILÓ-REGA, Josep. Introduction: Legal Informatics and the Conceptions of the Law In: *Lecture Notes in Artificial Intelligence* 3369, p. 18–24, 2005. p. 22 © Springer-Verlag. Berlin Heidelberg 2005).

434 *“The solution is based on the creation of decision models by each magistrate. These models can be divided, at the discretion of the magistrate, into the following structures: menu, report, ground, device, vote and free text. For each of the above structures, topics may be registered, organized according to the magistrate’s preference. For example: Exception of incompetence - I admit, Exception of Incompetence - I reject, Free Legal Assistance - I accept, Limitation granted, Receipt of Complaint etc. For each of the topics, there is an associated text that allows integration with process data at the time of document generation (NMI). The magistrate can share his models and structures with the other magistrates. This tool can be integrated with any procedural system through manual export of the document or through interoperability. The administration of the work group, with different profiles for reading, writing or administration, may be made by the magistrate himself or by someone designated by him.”* (CONSELHO NACIONAL DE JUSTIÇA, Op. Cit. P.28/34)

435 *“Information retrieval using the satellite system, aiming to optimize the performance of textual searches in processes/documents, in order to improve the experience of using the system. Allow the search for a term in structured and unstructured data, whether by class, subject, procedural movement or any data/metadata that re-*

of a machine-made judgment algorithm that can be trained using the organized database of the PJe.

However, it should be noted that in order to be used on a large scale in an official way by the courts, systems that use machine-made judgment algorithm – whether they are linked or not with PJe system – should, at least, be subjected to a test to see if the system can regularly retrieve outputs that are acceptable, or, at least, as acceptable as a human-made judgment.

2. The “legal Turing Test”

The traditional problem posted by Alan Turing⁴³⁶ regarding artificial intelligence, notably the concept of the “Turing Test” that sets the following criteria for deciding whether a machine thinks: if the behavior of a machine is indistinguishable from that exhibited by a human being, there is no reason not to attribute to that machine the capacity to think.⁴³⁷

Turing’s assertion can be understood in a less literal way: machines do not need to emulate all the elements that make up the human brain (to present real artificial intelligence) to solve complex tasks. A computer, through data processing that guides it to follow a procedure of simple tasks and predetermined through good enough

fers to the process. (CONSELHO NACIONAL DE JUSTIÇA, Op. Cit. P./34)

436 “I propose to consider the question, “Can machines think?” This should begin with definitions of the meaning of the terms “machine” and “think.” The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words “machine” and “think” are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, “Can machines think?” is to be sought in a statistical survey such as a Gallup poll. (TURING, Alan.M. (1950). *Computing machinery and intelligence*”. *Mind*, 59, 433-460. Disponível em: <http://www.loebner.net/Prizef/TuringArticle.html>. Acesso em: 10 de agosto de 2016).

437 Cf. PINO ESTRADA. *Inteligência Artificial e Direito*. *Revista Eletrônica Direito & TI*. Porto Alegre. 2015. Disponível em: <<http://direitoeti.com.br/artigos/inteligencia-artificial-e-direito/>>. Acesso em: 10 de agosto de 2016.

programming, can present a performance of level equal or superior to the minimum acceptable threshold for a certain work.

This concept can be utilized in the legal field to measure the quality of the output of a machine-made decision algorithm.

The development of machine-made judgments algorithms with the use of learning techniques can be made in several ways, the most common being the direct search by means of the query to a structured database, in a model called “decision trees”⁴³⁸, and the search through raw and unstructured information contained in the network itself, in the so-called “neural networks”⁴³⁹.

Both patches have downsides as noted by Bourcier⁴⁴⁰, but while neural network systems provide a greater possibility of

438 “A decision tree is a binary tree where each internal node is labeled with a variable, and each leaf is labeled with 0 or 1. The depth of a decision tree is the length of the longest path from the root to a leaf. [...] An assignment determines a unique path from the root to a leaf: at each internal node the left (respectively right) edge to a child is taken if the variable named at that internal node is 0 (respectively 1) in the assignment. The value of the function at the assignment is the value at the leaf reached” (RIVEST, Ronald L. *Learning decision lists*. Machine Learning 2:229-246, 1987. Kluwer Academic Publishers, Boston. p. 233)

439 “The neural network resembles the brain on two points: knowledge is gained through learning steps and synaptic weights are used to store knowledge. A synapse is the name given to the existing connection between neurons. In the connections are assigned values, which are called synaptic weights. This makes it clear that artificial neural networks have in their constitution a series of artificial (or virtual) neurons that will be connected to each other, forming a network of processing elements.” (ALECRIM, Emerson. *Redes neurais artificiais*. 2004. Disponível em: <<http://www.infowester.com/redesneurais.php>>. Acesso em: 03 de setembro de 2016. no original: A rede neural se assemelha ao cérebro em dois pontos: o conhecimento é obtido através de etapas de aprendizagem e pesos sinápticos são usados para armazenar o conhecimento. Uma sinapse é o nome dado à conexão existente entre neurônios. Nas conexões são atribuídos valores, que são chamados de pesos sinápticos. Isso deixa claro que as redes neurais artificiais têm em sua constituição uma série de neurônios artificiais (ou virtuais) que serão conectados entre si, formando uma rede de elementos de processamento).

440 “Numerous technological means exist in artificial intelligence (AI) for the use of legal knowledge in intelligent information systems. Expert systems provide for the possibility of effective explanation of reasoning, but they need a prior formalisation in the form of inference rules. Neural networks avoid the phase of formalisation, but they do require a learning phase and, moreover, they lack explanation abilities. Categorizations could be activated directly in line since they are neural structures and not a stored memory.” (BOURCIER, Daniele. *Institutional Pragmatics and Legal Ontology Limits of the Descriptive Approach of Texts*. In:

automation than the decision tree system, by allowing the network inputs themselves to feed the database to be scanned by the algorithm without the need of building a structured database, they are not efficient to solve the inscrutability - or “black box” - a problem since the thousands of calculations of the cognitive procedure used by those algorithms are not linear and explicit, as Warner Jr points out⁴⁴¹.

It should be emphasized that inscrutability is not a problem restricted to computers. The decisions made by human judges are also subject, to some degree, to this problem⁴⁴².

The inscrutability is a key aspect to be considered in developing machine-made judgment algorithms because the

Lecture Notes in Artificial Intelligence 3369, p. 158-168, 2005. © Springer-Verlag. Berlin Heidelberg 2005. p. 166).

441 “A neural network-based law machine should be capable of emulating the inherently parallel reasoning process of the lawyer and thus, of providing a superior platform for the modeling of the legal reasoning process. However, neural networks suffer from a ‘black box’ image resulting from the considerable difficulty attaching to the process of attempting to understand how they represent knowledge. Thus, it is difficult to establish the legitimacy of a network’s results in terms of the law.” (WARNER JR, David. R. *A Neural Network-based Law Machine: The Problem of Legitimacy*. Law, Computers & Artificial Intelligence, Volume 2, Number 2, 1993. Ohio: Ed. Ohio Northern University, 1993. p.135)

442 “Another cybernetic aspect worthy of being considered is that of the “black box”. It is about observing the reaction of the system to the stimuli it receives from outside. If we think about the activity of the judges, we do not know exactly what happens in their heads when they solve a case, but the externalization of this process can be observed through what they say in their sentences. And so it can happen that the legal system can do it in a different way before a given stimulus by internal differences (axiological, cultural, information) which would lead, for example, to contradictory jurisprudence or to the fact of the votes of majorities and minorities in collegiate courts. This is also related to other systemic notions: equifinality and multi-purpose.” (“Otro aspecto cibernético digno de ser considerado es el de la “caja negra”. Se trata de observar la reacción del sistema a los estímulos que recibe del exterior. Si pensamos en la actividad de los jueces, no sabemos exactamente qué pasa en sus cabezas cuando resuelven un caso, pero puede observarse la exteriorización de dicho proceso a través de lo que dicen en sus sentencias. Y así puede suceder que el sistema jurídico puede hacerlo en forma distinta ante determinado estímulo por diferencias internas (apreciaciones axiológicas, culturales, de información) lo que daría lugar, por ej., a la jurisprudencia contradictoria o al hecho de los votos de mayorías y minorías en tribunales colegiados. Ello también se relaciona con otras nociones sistémicas: la equifinalidad y multi-finalidad.” (GRÜN, Ernesto. *Una Vision Sistemica y Cibernetica del Derecho*. Buenos Aires: Ed Abeledo_Perrot., 1995. p.63).

decision-making procedure made by the machine is subject to failure. Heuristic failure can result in extremely slow processing or overhead of the computational system or result in an error in the delivery of the output, considering as valid a clearly incorrect information, or even worse. Even more serious is when the failure of the heuristic procedure can be induced through the intentional use of failures or limitations of programming in the algorithm itself, through deliberate human intervention⁴⁴³.

However, it is important to emphasize that the problem of heuristic failures is not only found in computerized algorithms, but also in the cognitive processes used by human beings to make decisions. This means that heuristic procedure errors often do not stem from the operation of the algorithm but from cognitive failures in programming or performing the task for which it was designed. And, often, they are incoherent cognitive failures, motivated by emotions or prejudices rooted in the cognitive process of the human beings, which distances him from an impartial and rational decision about the facts.

These biases and cognitive failures of human beings can be transferred consciously or unconsciously into the programming of an algorithm⁴⁴⁴, so that it can be argued that bias will always be present in

443 “It is a function of the correctness of its implementation (what algorithm designers tend to focus on) and the correctness of its learned behavior (what lay users care about). As a recent example, take Microsoft’s AI chatbot, Tay. The algorithms behind Tay were properly implemented and enabled it to converse in a compellingly human way with Twitter users. Extensive testing in controlled environments raised no flags. A key feature of its behavior was the ability to learn and respond to user’s inclinations by ingesting user data. That feature enabled Twitter users to manipulate Tay’s behavior, causing the chatbot to make a series of offensive statements. Neither its experience nor its data took novelty in a new context into account. This type of vulnerability is not unique to this example. Learning algorithms tend to be vulnerable to characteristics of their training data. This is a feature of these algorithms: the ability to adapt in the face of changing input. But algorithmic adaptation in response input data also presents an attack vector for malicious users. This data diet vulnerability in learning algorithms is a recurring theme. (OSOBA, Osonde; WELSER IV, William. An intelligence in our image.” *The Risks of Bias and Errors in Artificial Intelligence*. Santa Mônica, Rand Coporation Ed. 2017. p. 04)

444 “Algorithms aren’t subjective. Bias comes from people.” (HARDY, Quentin. *Determining Character With Algorithms*. *New York Times* 07/27/2015, page B5 of the NewYork

human-made decisions and machine-made decisions and, because of that, bias is more a constant than a problem regarding the development of a system. Thus, it's even possible to argue, as noted by Surden⁴⁴⁵ that even inscrutable machine-made decisions can be, in fact, less biased than those made by human judges.

Therefore, there are two ways to proceed.

Machine-made judgment algorithms can be developed to avoid the inscrutability problem with the use of decision-tree based systems, but those algorithms will be less efficient and will provide worse output than the ones that can be obtained with the use of other more advanced and effectible machine learning techniques that have the downside of being inscrutable, thus resulting in a slow and more expensive development of the field.

However, it can be argued that there is no need for machines to be designed to avoid inscrutability since human-made judgments already are susceptible to the problem of inscrutability and are validated under the rule of law.

In that way, there are two aspects which should be considered for the creation of a “Legal Turing Test”: a first aspect, which is focused only on the quality and precision of the output and the second aspect,

edition.)

445 “*Implicit in such a system of written opinions is the following premise: that the judge actually reached the outcome that she did for the reasons stated in the opinion. In other words, the justifications that a judge explicitly expresses in a written opinion should generally correspond to that judge’s actual motivations for reaching a given outcome. Correspondingly, written legal decisions should not commonly and primarily occur for reasons other than those that were expressly stated and articulated to the public. (...) Since machine learning algorithms can be very good at detecting hard to observe relationships between data, it may be possible to detect obscured associations between certain variables in legal cases and particular legal outcomes. It would be a profound result if machine learning brought forth evidence suggesting that judges were commonly basing their decisions upon considerations other than their stated rationales. Dynamically analyzed data could call into question whether certain legal outcomes were driven by factors different from those that were expressed in the language of an opinion.*” (SURDEN, Harry. *Machine Learning and Law*. Washington Law Review, Vol. 89, No. 1, 2014. Disponível em SSRN: <https://ssrn.com/abstract=2417415>. Acesso em 02/11/2017. p.108-109).

which is focused on solving the inscrutability problem, demanding that the output should also retrieve the disclosure of the decision-making process of the machine.

But, in fact, a machine that can pass only on the first aspect of a “Legal Turing Test” is already usable in a large scale.

As already demonstrated, the advent of an electronic lawsuit system (PJe), which contains virtually all the elements necessary for data analysis (petitions, documents and sentences) in its database, allows the algorithm to search the relevant information for the construction of the corresponding output from a CBR model with the aid of machine learning mechanisms.

Thus, a text generated by an automated system that meets the requirements provided by law and can present textual cohesion sufficient to be indistinguishable from a similar work elaborated by a human being, if signed and validated by a human magistrate, will be a possible decision and with formal fulfillment of the requirements of the legislation.

So, in the case that an output attends all those requirements, it can be considered that the machine-made judgment algorithm passed on the first aspect of the “Legal Turing Test” and, if that decision is validated by a human judge it will be indistinguishable from a human-made decision.

Therefore the final decision regarding the use and development of those systems - in a way that makes room for the upsides of the technology and minimizes the downsides - demands a human-made decision in terms of regulation⁴⁴⁶.

446 Which this author has already explained in more detail in another work. Cf. VAL-ENTINI, Rômulo Soares. *Julgamento por computadores? As novas possibilidades da juscibernética no século XXI e suas implicações para o futuro do direito e do trabalho dos juristas*. Belo Horizonte: UFMG. 2018. (tese de doutoramento)

Conclusions

The conclusions are the following:

- The current technological stage already allows for the development of machine-made judgment algorithms especially in countries or jurisdictions that have electronic lawsuit systems that contain an extensive, up-to-date and reliable database of judicial decisions, and a “Legal Turing Test” can measure if those machine-made judgments are legally valid.

- A “Legal Turing Test” can be established in two different measures. If a machine can return, without human intervention, an output of plain text, written in natural language, that can be accepted by a legal expert as a sufficient and valid judgment of a specific legal case – whether or not the expert agrees with the decision– the machine will have passed in the first aspect of a “Legal Turing Test” and, therefore, the system can be used in aiding judges for new trials or even to provide a fully automated machine-made judgment.

- Even if there is no way to guarantee that a machine-made decision algorithm will find the correct decision for the case evaluated, it is very likely that even an inscrutable algorithm will be able to formulate a technically valid and acceptable judgment for an analyzed case, since the output text will be presented after an exhaustive consultation in a database that will contain thousands of analogous decisions made by human judges and, thus, having more information available to make a decision than a human judge.

- Therefore, it’s possible to accelerate the development of those systems by using inscrutable machine-made judgments algorithms that can return a high-quality output to make better and quicker judgments and is consistently able to pass on the first aspect of a “Legal Turing Test”. Since human-made judgments already are susceptible to the problem of inscrutability and are validated under

the rule of law, there is no need for machine-made judgment algorithm to be designed to avoid inscrutability.

- It's also possible to take more time and spend more resources in developing a non-inscrutable machine-made judgment algorithm. They will be more expensive and will struggle to reach a level of output that consistently passes on the first aspect of a "Legal Turing Test". However, this approach has the advantage of developing systems that will be able to provide disclosure of the decision-making process in a given case – reaching the second aspect of a "Legal Turing Test". In doing so, it can be argued that a machine-made judgment is even fairer than a human-made judgment.

- In either case, in the author's opinion, it's also feasible to take a third option and think about a procedure in which the first automated decision would be endorsed by a human judge and would later be reviewed by a collegiate body composed of human beings (assisted or not by machines) that would define if the judgment initially provided by the computer is adequate to the concrete case or if there is any particularity in the concrete case not perceived by the algorithm and able to change the decision.

- Such new human-made decision, in turn, would be integrated into the database, creating a "new standard" and, at the same time, will contribute to the improvement of the algorithm learning system and prevent the "stagnation" of the jurisdiction, creating new decision-making elements that will be taken in consideration by the algorithm in the future.

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