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The Creation of a "Digital Self" of Artificial Predictive Systems

Fabrizio Corona*

Abstract: This paper explores the evolution of digital oracle technology that has the ability to analyse the past and provide information about the future. Therefore, the development of a conscious artificial mind that has the ability to create a 'digital self' based on data and information processed by the artificial system is examined. Finally, the possibility of using the digital oracle and the artificial mind as tools for the creation of predictive justice systems is explored. The research highlights the potential of the digital oracle and artificial mind in providing proactive and advanced knowledge, with possible applications in analysing the past, creating a 'digital self' and in the field of predictive justice.

Keywords: artificial intelligence, predictive justice, justice and algorithms.

1 The digital oracle for analysing the past and knowing the future

Nothing human. The trial offers an interesting insight into the impact that the digital revolution is having on our lives, as it allows the encounter between the legal rule and everyday life, with its passions and aspirations. Digital progress has certainly impacted on the legal process, but it has even more impacted on every aspect of social and relational life. Process, in fact, is the product of the interweaving of space and time, of past action and a present event, based on the comparison between subjective perceptions and objective reality[1] . It is based on the same three units that were the basis of classical theatre, namely time, place and action. Already the word right, which derives from the late Latin *dirictum* (past participle of the verb 'to *direct*') opens up to the future, as it indicates a turning, a going towards something. In support of the assumption that the future tense is a constitutive part of law, it should be noted that Art. 11 of the Pre-Laws provides that: "*The law provides only for the future: it has no* retroactive *effect*"[2] .

Since the 1990s, thanks to the large-scale spread of digital technologies, data upon data have been layered over time, leading to the explosion of the scope of forecasting. A mass of socio-economic data tracking how we move, what we like, what our reactions are to what is happening in the world, our state of health, our thoughts, our friends etc.

Exploiting this information base, software with ever-increasing computing power is generating predictions about everything in society. A direct consequence of this is that today, man in his daily activities and decisions is constantly supported by a vast array of algorithms capable of predicting what will happen around us, our needs and our next actions.

This is the era in which every question, every curiosity, can be easily answered by typing a word or phrase into a search engine. The latter is able to return information, which until a few years ago was quite correct, now almost exact. In fact, data from past experiences feed the analysis of the present and, by conditioning it, define the maps of our future.

*Lecturer in Legal Informatics at the Università Telematica Giustino Fortunato, lecturer in Artificial Intelligence, Machine Learning and Law at the LUISS Guido Carli University; ✉ f.corona@unifortunato.eu

1. A. Garapon, J. Lassegue, *La giustizia digitale. Determinismo tecnologico e libertà*, Il Mulino, Bologna 2021. p.264

2. N. Irti, *Per un dialogo sulla calcolabilità giuridica*, in A. Carleo (a cura di), Calcolabilità giuridica, il Mulino, Bologna 2017.

The term 'forecast' is used to define that process of prognostic investigation of the future, based on data from past experience and centred on the study of trends, with the ultimate aim of simplifying any process. Indeed, any forecast is significantly dependent on the behaviour of the phenomenon considered in the moments prior to its evaluation[3] .

Often, the terms 'prediction' and 'prediction' are used interchangeably; however, it is fair to make a distinction about the meaning of the two words.

The expression 'forecasting process' usually refers to that complex of activities, more or less explicit, that lead to the formulation of a forecast; the latter makes it possible to associate probabilities of occurrence with certain future events.

Prediction', on the other hand, consists in identifying the specific value that a measurable quantity will assume in the future. Certainly not an easy objective, making predictions requires perfect analysis, knowledge and study of the phenomenon under consideration.

However, it is important to point out that data and information do not equate to new knowledge: what transforms them into predictive power - by sifting, filtering and making sense of them - are algorithms, or rather a set of rules that precisely define a sequence of operations. Algorithms can perform operations of calculation, data processing and automatic reasoning.

More specifically, ever since the first advances in computer science, scholars have speculated on the possibility of building intelligent artificial systems capable of competing with the human mind. In recent years, given the successes of artificial intelligence and the speed at which technology is developing, this possibility seems to be more concrete than ever, so much so that many are beginning to believe that in the not too distant future artificial systems will catch up with and surpass human intelligence, even to the point of developing a conscious mind.

Algorithms are flanking and replacing human decisions. We are witnessing a gradual increase in the use of robotic systems in areas such as justice, medicine and administration; this entails an ethical problem, even before the legal one, where the legal position of a subject, i.e. personal freedom, privacy, the right to information, transparency and a whole series of fundamental rights come into contact with a decision-making system that is not human, but of which a human must be the father.

In fact, one of the many things algorithms have learnt from individuals is: to be biased. In this respect, a striking example is offered by facial recognition software. In recent years, this software has been the protagonist of a real revolution; from being an experimental technology, it has become a popular commercial application, used for image analysis or automatic recognition of people, even as a biometric security system to access phones or other digital systems.

Underlying facial recognition are machine-learning algorithms that identify people by learning to recognise a number of biometric facial indicators, such as the position, size and shape of the eyes, nose, cheekbones and jaw peculiar to each individual.

However, the level of accuracy of these algorithms depends heavily on the type of learning they have undergone. To better understand the concept, an example can be given. Joy Buolamwini, a researcher at one of the world's most prestigious research universities, the Massachusetts Institute of Technology, was working on facial recognition algorithms when she realised that something was not working as she imagined.

Many times, when he sat in front of the camera, the computer did not recognise his face. In many cases she had to resort to the help of a fellow student, who was recognised immediately and without difficulty. The only difference between her and her colleague was the colour of her skin: she was an African-American in her twenties, while her colleague was white[4] .

Suspecting a more widespread problem, Buolamwini decided to undertake a study of facial recognition systems from Microsoft, IBM and Face ++, a Chinese start-up that had raised over five hundred million dollars from investors.

Buolamwini's intuition, in fact, went straight to the heart of an algorithmic problem, as demonstrated by tests conducted between 2015 and 2016: when it came to analysing the faces of male males, Microsoft's products did not make a single mistake, and IBM's had a negligible error rate of 0.3 per cent.

3. A. Vespignani, *L’algoritmo e l’oracolo. Come la scienza predice il futuro e ci aiuta a cambiarlo*, il Saggiatore Milano, 2019. p.177. Per approfondimenti sul tema: P.Domingos, *L'algoritmo definitivo. La macchina che impara da sola e il futuro del nostro mondo*, Bollati Boringhieri, 2020 p. 368; E.Calzolaio, *La decisione nel prisma dell’intelligenza artificiale,* Cedam, 2020 p. 216; E.Bassoli, *Algoritmica giuridica. Intelligenza artificiale e diritto*, Amon, 2022, p.322

4. I. D. Raji, T. Gebru, M. Mitchell, J. Buolamwini, J. Lee, E. Denton, Saving Face: Investigating the Ethical Concerns of Facial Recognition Auditing, in Proceed-ings of the AAAI/ACM Conference on AI, Ethics, and Society (AIES '20), Asso-ciation for Computing Machinery, New York, 2020.

But when it came to identifying the faces of black women, the story changed completely: the probability of incorrect assessments rose to 21 per cent in the case of Microsoft and 35 per cent in that of IBM. And it is for this reason that after her study Buolamwini started a battle that led her to found the *Algorithmic Justice League*: an organisation with which the 'poetess of code', as she calls herself, wants to make technology more attentive to the difficulties and discrimination that seem to disregard the great promise for a better society, the result of the marriage between artificial intelligence and big data.

Difficulties far from over, so much so that even today Google Foto, Google's service for storing and organising images, censors the search terms 'gorilla' and 'monkey' after raising a fuss in 2015, when it was discovered that the Mountain View giant's algorithms labelled black-skinned people as 'gorillas'[5] .

In short, those who design an algorithm (which will then be executed by the computer) still make choices, either voluntarily or involuntarily. This has consequences for the people who use these technologies: either because they blindly rely on them ('*I read about it in ...*') or because they lack a sound scientific approach.

In this respect, it is possible to say that a scientific position is reliable and sound not because scientists are *objective*, but because that position has been exposed to the exacting and thorough objections of competent colleagues concerned with verifying its reliability. Translating this principle into the realm of algorithmic reasoning, an artificial system is considered reliable only because it has been exposed to a gigantic amount of data. In reality, this only implies that the algorithm has been 'calibrated' with a lot of data, not that it is reliable in its decisions. In short, the data is only the starting point of the process that governs the robotic decision.

2 The development of a conscious artificial mind in the creation of a 'digital self'

Reflection Artificial intelligence may be more than a set of additional and advanced technological resources with which to simply do better and more quickly and effectively what humans can already do[6] . In this regard, we speak of 'profound technologies', 'inventions that reinvent us', which 'mark a different kind of change in the world' precisely because they aim to 'better design evolution'[7] . Substantial investments in AI, as well as in mobile broadband, nanotechnology and the *Internet of Things,* and, above all, the worldwide advancement in *high-performance computing*, have led to major breakthroughs in certain fields of action.

This type of AI is called Artificial *Narrow Intelligence* (ANI), i.e. an artificial cognitive agent that focuses on a single 'narrow' task with a limited range of abilities. Currently, the only algorithmic reasoning available is that which is capable of optimally solving difficult problems in specific areas, thousands of times faster than human cognitive factors. For example, this category includes spam filters, chess software, weather forecasts and shopping suggestions. However, according to some, flexible thinking is one of the main characteristics of the human mind and it is this that represents true intelligence[8] . One can therefore sense that we are still a long way from realising an artificial brain.

Research on this topic is currently moving towards a higher degree in the evolution of artificial intelligence: the creation of artificial cognitive agents with cognitive capabilities equal to or greater than those of humans, Artificial *General Intelligence* (AGI) and *Artificial Super Intelligence* (ASI) respectively. AGI technology would be able to perform any intellectual task that a human being can perform, and thus reason, think abstractly and learn from experiences, adapting to the surrounding reality. On the other hand, ASI technology is a form of intelligence that is superior to that of humans in any field. Mathematician Irvin John Good speaks of 'ultra-intelligent' machines, i.e. capable of 'far surpassing all the intellectual activities of any human being, however intelligent'.

5. A. Vespignani, *op. cit. p. 149 e ss.*

6. Cfr. B. Reese, *La quarta era. Robot intelligenti, computer consapevoli e il futuro dell'umanità*, Milano, 2019, 39, «il computer non è semplicemente un gadget, ma un dispositivo che ha una rilevanza filosofica». Anche L. Floridi, *La rivoluzione dell'informazione*, Torino, 2012, 13, secondo cui «le ICT non stanno soltanto ricostruendo il mostro mondo: lo stanno riontologizzando».

7. J. Preston, *L'era sintetica*, Einaudi, Torino, 2019, p.206

8. D. R. Hofstadter, Daniel C. Dennet, *L'io della mente*, Adelphi, 2006, p. 277. Per approfondimento sul tema, vedere saggio T. Nagel, *Che cosa si prova ad essere pipistrelli?*, in D.C. Dennett - D.R. Hofstadter (a cura di), *L'io della mente. Fantasie e riflessioni sul sé e sull'anima*, Adelphi, Milano 1993, p. 379-391.

Nick Bostrom, Oxford philosopher and leading thinker on artificial intelligence, expresses the same concept in terms of 'superintelligence', defining it as '*any intellect that far exceeds the cognitive performance of humans in almost any domain of* interest'[9] .

A super-intelligent artificial system learns from its mistakes, from the information it receives, by defining algorithms with computational structures. The creation of AGI and ASI technologies is certainly an ambitious goal, but neither impossible nor too far away. When looking into the future, we make the mistake of thinking in a linear way, remembering predictions for the future in light of past experiences. In fact, the exponential assessment is more correct because things will move at a much faster pace than in the past and present. In particular, many authors argue that, given the rate of technological growth, it is very likely that AGI will be reached at some point. Moreover, at the exact moment when this happens, human intelligence will be surpassed, as machines will tend towards even higher intelligence[10] . There would be what Good calls an 'intelligence explosion'.

Others, however, refer to a time when technological advances will accelerate beyond people's ability to understand and predict, using the expression 'technological singularity'. The idea that intelligence only deals with information and calculation leads researchers to believe that there are no obstacles to the hypothesis that machines may one day be smarter than humans[11] .

Superintelligence is software endowed with its own consciousness and even autonomous will, capable of developing motivations, intentions and even moral judgements on a par with the human capacity to think. Artificial systems at an advanced stage of intellectual evolution, in fact, will be able to understand their own limitations, intervening in the programmes that govern them by pursuing their own objectives, going beyond and, why not, in opposition to the interests of the programmer himself.

The development of ASI technology starts with understanding the architecture of the brain itself and is necessarily self-learning, but it can follow different development paths. Nick Bostrom, one of the main proponents of this line of thinking that sees the possibility of developing ASI technology in a short space of time, identifies four paths that can lead to superintelligence; however, as far as we are concerned in this study, two paths will be explored where the industry is actually moving.

First of all, substantial investments in *Machine Learning*, i.e. in that subset of AI that consists of the techniques that allow a processing system to improve its capabilities and performance over time, without being explicitly programmed for that purpose, by learning from data, could lead to superintelligence. In Machine Learning systems, unlike *Good Old Fashioned Artificial Intelligence* (GOFAI) software, which is based on the programmer's ability to break down the problem into many parts and program the processing system to make it behave in a certain way, it is necessary to proceed by trial and error, experimenting with various teaching methods and assessing the extent to which the processing system learns[12] . In this case, the system is comparable to a child's brain, so the figure of the educator is also decisive; or rather, the activity of the person who, using his or her intelligence, manages to improve the software by eliminating possible errors. In this sense, evolution could be favoured by Genetic Algorithms (GA). The basic premise to start from is that not only the brain but also its activities - that is, what is sometimes referred to as the 'mind' - are a consequence of its anatomy and physiology and nothing more[13] . These algorithms, therefore, imitating biological methods and, in particular, genetic optimisation, are inspired by Charles Darwin's theory of evolution.

If, until the 19th century, the mind-body dualism at the centre of Descartes' philosophy had been inclined to situate the human mind outside the realm of biology, the situation changed when evolutionists placed the emphasis on the study of humans from a biological perspective, reducing psychology to biology since human actions have hormonal, neurological and physiological components[14] .

John Holland in the 1970s identified a general problem-solving technique under investigation in these heuristic search and optimisation methods[15] . By following simple rules that are identical for different species, natural selection has provided a remarkable biodiversity; similarly, genetic algorithms must find solutions to problems with changing conditions after a finite series of standard steps. The basic idea is to choose the best solutions and combine them in some way so that they evolve towards the optimal point.

9. N. Bostrom, *Superintelligenza*, Bollati Boringhieri, Torino 2018, p. 49.

10. D. J. Chalmers, *The Singularity: A Philosophical Analysis*, Journal of Consciousness Studies, 2010, p. 1-75.

11. M. Tegmark, *Vita 3.0 Essere umani nell'era dell'intelligenza artificiale*, Raffaello Cortina Editore, Milano 2018, p.82.

12. A. M. Turing, *Computing machinery and intelligence,* in Mind 49: 433-460, 1950, p. 456.

13. D. R. Hofstadter, D. C. Dennet, *L'io della mente*, Adelphi, Milano 1997. p. 277

14. D. R. Hofstadter, D. C. Dennet*, Ibid.*

15. J. H. Holland, *Adaption in Natural and Artificial Systems*, Bradford Books, 1975. p.221

In the language of genetic algorithms, the function that is to be maximised is called '*fitness*'. The fitness function for AI evolution requires simulating the development, learning and cognition of neurons to assess their fitness. How it would work, in simple terms, would be as follows: a group of computers would attempt to perform complex tasks and the most successful ones would merge with each other, causing half of their programming to be merged into a new computer. At the same time, the less successful algorithmic reasoning would be removed. Proceeding in this way, following multiple interactions, the process of 'natural selection' would produce increasingly efficient computers. Furthermore, through the creation of an automated cycle of evaluation and reproduction, the process could take place on its own.

On the one hand, it could be argued that this kind of approach, like the evolution of the species, takes billions of years to perfect; in fact, when it comes to software, progress may seem slow but it is not. In fact, while evolution has no foresight and works randomly, in this case there would be the researcher driving evolution like a *deus ex machina* towards increasing intelligence. This kind of approach, at least at an early stage, requires the assistance of programmers; however, in later stages the 'AI seed', i.e. the sophisticated algorithmic reasoning capable of improving its own internal architecture, should be able to understand its own mechanisms and devise new algorithms and computational structures to be able to independently improve its cognitive performance[16] .

Another way to support the feasibility of an ASI technology is based on global brain emulation. To understand the reasons for this, one can start from a famous paradox in quantum physics: ”Who killed Schrödinger's cat?

Imagine that a kitten is placed in a closed box together with a vial of poison. A gavel, which can trigger and break the vial, is activated by a counter that records random events, e.g. radioactive disintegration. The experiment must have a sufficiently long duration for a probability equal to one means that the hammer will be triggered. Quantum mechanics represents this system, in mathematical terms, as the sum of a cat-alive function and a cat-dead function, each with a probability of one means. The question is whether the act of looking (i.e. measuring) kills or spares the cat, since, before the experimenter looks in the box, both solutions have the same probability[17] .

This example allows us to reflect on a profound conceptual difficulty. In more formal terms, a complex system can only be described using a probability distribution that ties together the possible outcomes of an experiment. To decide between the various alternatives, a measurement is required: this measurement is what constitutes an event, whereas probability is a mathematical abstraction. The conclusion that the physical event and the content of the human mind are inseparable led many researchers to consider consciousness as an integral part of the structure of physics[18] .

Thus, perspectives from three broad fields are integrated: psychology, biology and physics.

First, the human mind, including consciousness and thought, can be explained through the activities of the central nervous system, activities that in turn can be reduced to the biological structure and functioning of this physiological system. Secondly, biological phenomena at all levels can be fully understood in terms of atomic physics, i.e. through the action and interaction of the atoms of carbon, nitrogen, oxygen and so on that make them up. Thirdly and finally, atomic physics, which is now understood in the most complete way thanks to quantum mechanics, must be formulated by considering the mind as one of the primary components of the system[19] .

The opportunity to study the human brain and understand how it works led scholars to believe that by scanning it in sufficient detail, it would be possible to produce software with the same computational structure.

Neuroanatomy would make it possible, by dissecting a real brain into thin layers and scanning the individual parts, to create an accurate 3D reconstruction to be implemented on a sufficiently powerful computer. The result, if fully successful, would be a digital copy of the original intellect, with a detailed photograph of all the neurons and their connections, capable of reproducing the intelligence, personality and memory of the individual from which it is taken. The emulated human mind then exists as software in a computer. The mind may reside in a virtual reality or interface with the outside world by means of robotic appendages. However, for the creation of a reliable model, it is necessary to understand certain biological dynamics. In fact, the brain is an organ that interprets the outside world, draws information from it and influences it in turn; therefore, simulating a brain on

16. N. Bostrom, *op. cit.*, p. 58.

17. D. R. Hofstadter, D. C. Dennet*, op. cit.*

18. T. Nagel, *Che cosa si prova ad essere pipistrelli?*, in D.C. Dennett - D.R. Hofstadter (a cura di), *L'io della mente. Fantasie e riflessioni sul sé e sull'anima*, Adelphi, Milano 1993, p. 379-391.

19. D. R. Hofstadter, D. C. Dennet *Ibidem;* N. Bostrom, *Superintelligenza*, Bollati Boringhieri, Torino 2018, p. 49.

the outside may say nothing about how it works. For this reason, some scientific projects, such as *the Human Brain Project* (Hbp) funded by the European Union or the US *Brain Initiative*, are carrying out not only work on mapping the human brain but also a careful study of the dynamics underlying its functioning. There is growing attention to biological issues and evolutionary thinking. Indeed, both human and animal cognition can be considered components of a single, general evolutionary process that pervades the entire biological universe and, precisely because of its algorithmic nature, can be simulated in a computer[20] .

It is possible to say, recalling the title of a successful essay published by Sigmund Freud in 1919[21] , that the machine operates as *das Unheimliche*, as something that is rejected because it ”engenders anguish and horror”, yet it arouses such feelings because it has something familiar about it.

”The machine is disturbing because it resembles us, and this all the more so today when it advances a -pretension- of being a subject, of thinking and deciding in place of man, who is poor in silicon. The machine is das Unheimliche because man well knows that he is also a machine: a machine certainly animated by an ingenious and mysterious motor principle, but still a machine. And so the machine that he has tried to reject is his other, his ghost'[22] .

There are good reasons to think that the indispensable enabling technologies are feasible, even if not in the near future. In fact, the combination of ever more impressive big data and the gradual increase in the computing power of the computer bodes well for the emergence of a true digital intelligence one day. From this perspective, having removed the problem of the structural diversity between the biological brain and the artificial brain, the question of the creation of an artificial consciousness is either linked to a religious factor; thus, determined by divine intervention and, therefore, not reproducible, or it is the result of natural electrochemical activity and, therefore, nothing stands in the way of its future realisation.

3 Towards the creation of predictive justice tools

Jurists have always been confronted with the challenges posed by technological innovation. In 1963, the *American Bar Association* published an article that first posed the question: ”*Will computers revolutionise the practice of law and the administration of justice, as they will in almost everything else?* ”[23] . The article examines the impact of new technologies on society, arguing that they will inevitably revolutionise all areas, including, of course, the law.

In this respect, as a preliminary step, case law aims to solve all new problems resulting from rapid technological development, which increasingly intersect with the life of every individual. Legal practitioners have to investigate and regulate issues of a completely new nature. Historically, classical categories and interpretative tools (e.g. analogy) are used to regulate new phenomena at the legislative, jurisdictional and scientific levels, seeking a middle way between tradition and innovation.

Precisely with the aim of emphasising how technological changes influence the legal world, a three-level classification has been proposed[24] .

First of all, there is the aforementioned 'supporting technology', which encompasses all cases in which new technologies allow unrestricted access to information, including through applications that facilitate the search for legislation and case law[25] . This first form of integration between technology and law is not likely to profoundly alter the world of law and the *modus operandi of* legal practitioners.

The discourse changes when, by means of innovative technological tools, it is possible to replace certain activities typically performed by the individual, through the automation of certain decision-making processes in the administrative, contractual and, more generally, in the administration of justice. One speaks, in this case, of 'replacement technology'.

20. D. C. Dennet, *L'idea pericolosa di Darwin. L'evoluzione e i significati della vita,* Bollati Boringhieri, Torino 1997, p. 11.

21. S. Freud, *Il perturbante*, in Saggi sull'arte, la letteratura e il linguaggio, Torino 1991.

22. A. Punzi, *Judge in the machine. E se fossero le macchine a restituirci l'umanità del giudicare?*, in C. Carleo, op. cit., p. 139.

23. R.C. Lawlor, *What Computers Can Do: Analysis and Prediction of Judicial Decisions*, in ‘American Bar Association Journal’, 49, 1963, p.337.

24. T. Sourdin, *Justice and technological innovation,* in Journal of Judicial Administration, 2015, p. 96.

25. T. Sourdin, *Ibid.*

One thinks in this respect of alternative dispute resolution means, such as the so-called ADR ('Alterative Dispute Resolution') and ODR ('Online Dispute Resolution'). ADR ('*Alterative Dispute Resolution*') and ODR ('*Online Dispute Resolution*')[26] . Great Britain together with the Netherlands and Latvia are the most advanced European countries in this respect, then at European level with Regulation No. 524/2013, a common framework available on the internet (*European small claims*)[27] was established for the resolution of cross-border disputes.

These online dispute resolution services are gradually evolving and are increasingly being integrated into the process. The scope of application is not only low-value litigation, but also tax, social security and divorce litigation.

The main role of these ODR systems is clearly to contribute to the use of conciliation, mediation and out-of-court arbitration services, insofar as these services are also used in the course of legal proceedings under the supervision of a judge who has to decide on the outcome of the dispute. In all these cases, technology is no longer a mere support, but comes to replace at least one segment of the decision-making process, understood in a broad sense.

This substitution becomes even more evident in the third level, so-called *disruptive technology*. As early as the 1980s, Francesco Romeo tested neural networks in areas where people made judgements influenced by their own subjectivity. The tests, carried out for the first time in Italy, consisted of simulations of taste judgements on olive oil and wine. [28]

In 1991, Lothar Philipps and Francesco Romeo designed the first legal neural network on Motor Vehicle Liability for research together with Siemens[29] . The project, later completed by Francesco Romeo and Fabrizio Barbarossa[30] was presented in San Diego at the World Congress on Neural Networks. The starting point is the legal framework, in particular the presumption of culpability, pursuant to Article 2054 of the Italian Civil Code, which regulates, in general form, liability for damage caused by vehicles. Paragraph 1 of the rule establishes that the driver is obliged to pay compensation if he does not prove that he did everything possible to avoid it. There is therefore an aggravated liability, and there are also absolute presumptions of culpability, both in some specific rules of the Highway Code and in paragraph 3 of Article 2054 of the Civil Code, according to which the owner, usufructuary or purchaser, who is not the driver, is in any case jointly and severally liable, unless he proves that the vehicle circulated against his will. Barbarossa points out how the aforementioned first paragraph represents a legal presumption of liability of the driver, who is not subject to a rather improbable liberating proof, such as, for example, that of a fortuitous event, pursuant to Article 2051 of the Italian Civil Code, but in any event on him falls the probative burden not merely of having exercised ordinary diligence, but of having done everything possible to avoid the damage. This paragraph is commonly interpreted by jurisprudence, according to maxims of experience, since the possibility of damage is an abstract concept, to be concretised according to different legal events. The neural network, devised by Professor Romeo and Dr. Barbarossa, also had the task of assessing how personal convictions, within the extremely labile framework of the maxims of experience, were affected.

It is also worth mentioning an interesting application of neural networks, devised in 2008 by researchers at Loyola University and Texas A&M University[31] , which is able to predict which prisoners sentenced to death will actually suffer the death penalty. This connectionist system is able to determine with a reasonable probability of even more than 90% which prisoner will die, based on

26. We can give an example. The European Project CREA acronym for "Conflict Resolution with Equitative Alghoritms" aims to introduce an innovative dispute resolution mechanism, through the use of equitative algorithms, usable by all legal practitioners (lawyers, mediators, judges, etc.), as well as by citizens, through the implementation of a special on-line platform. This project co-financed by the European Commission, through the E-Justice development plan aims to change the approach to civil, national and cross-border proceedings. It aims to overcome the differences between the national laws of the Member States with a view to ensuring greater efficiency of the legal system in the European area, as well as to settle disputes that are not governed by mandatory rules.

27. Carta etica europea sull'utilizzo dell'intelligenza artificiale nei sistemi giudiziari e negli ambiti connessi. Adottata dalla CEPEJ nel corso della sua 31 Riunione plenaria (Strasburgo, 3-4 dicembre 2018), pp. 31-32.

28. F.Romeo, *Simulazione di giudizi soggettivi su oli di oliva mediante reti neuronali* in *rivista di merceologia, volume 32-2* p. 109-121, 1993. Per ricerche simili vedi anche: F.Romeo, F. De Antoni, *Le acque minerali italiane: una strategia statistica per la loro classificazione* in *rivista di merceologia, volume 31-3* p. 225-259, 1992; M.Giaccio, F.Romeo, Classification by Means of Neural Networks, New Classification Methods in Forum Ware p. 14-22, 1993; F.Romeo, M.Giaccio, *Simulation of Human Subjective Judgement with Neural networks: The Computer plays the Classifier the Sommelier and the Judge,* in Informatica e diritto, p.85-120, 1993

29. L. Philipps, *Distribution of Damages in Car Accidents through the Use of Neural Networks*, Cardozo Law review, 1991.

30. F.Romeo, F.Barbossa, *Simulation of Verdicts in Civil Liability* in, *World Congress on Neural Networks – San Diego 1994. International Neural Network Society Annual Meeting, Elbraum - Hillsdale New Jersey* p.432-436, 1994. Per ricerche simili vedi anche: F.Romeo, M.Giaccio, in, *World Congress on Neural Networks – San Diego 1994 International Neural Network Society Annual Meeting, Elbraum - Hillsdale New Jersey* p.437-440, 1994; F. Barbarossa, *Responsabilità civile automobilistica e reti neurali,* Università degli Studi G. D'Annunzio di Pescara, 1990/91; F. Romeo, F. Barbarossa, *Ein neuronales Netz zur Beurteilung der Verkehrshaftpflichtsfalle, referee to GWAI,* Bonn, 4 settembre 1992.

31. L. Greenemeier, W*ho Will Die?: Computer Predicts Which Death Row Immates Will Be Executed*, in: *Scientific American*, 3 luglio 2008. p.12

personal information, such as gender, ethnicity, age, education, and the state that issued the sentence. In this regard, it should be noted that the type of crimes committed and questions of criminal responsibility have very little weight, non-legal assessments based on personal prejudices playing a decisive role.

These examples are proof that legal reasoning does not only follow logical patterns.

Artificial intelligence can go so far as to create decision models that can be used by the judge to settle a dispute. In this case, we speak of 'predictive justice': that is, the ability to predict, with probabilistic systems using logical-statistical algorithms, the outcome of a dispute. This 'prediction' function can be used in three different ways depending on the data fed into the computer, so it is possible to distinguish:

- *Crime prevention software*. In fact, by analysing data extrapolated from complaints submitted to the police, e.g. relating to robbery or theft, which have similarly been repeated in specific areas, some AI systems are able to predict where and when other crimes of the same type are likely to occur. In this regard, software based on this type of algorithm is already widely used in more than nine Italian prefectures, namely XLAW, which currently has an accuracy of between 87% and 93% in Naples, between 92-93% in Venice and around 94% in Prato. This programme enables the processing of data on all kidnappings, robberies, pickpocketing and thefts deduced from the complaints submitted by citizens and from information gathered by the neighbourhood police, as well as from press and social media reports;
- *Complementary jurisprudential software both in terms of the interpretation of law and the possible identification of arguments to support the case in court.* AI also plays a very important role in relation to criminal evidence, both in terms of representation and evaluation. The progressive automation of everyone's life makes it easy to obtain data that are managed and processed by intelligent tools. Consider, for example, the black boxes for insurance purposes on cars, these allow us to obtain informative data such as speed, distance travelled by the vehicle, etc., which are fundamental for determining the dynamics of an accident. Another, certainly more complex, aspect of the application of Artificial Intelligence concerns the evaluation of oral or documentary evidence. The University of Edinburgh has developed and implemented the ADVOKATE software, which is an *assesment of* eyewitness evidence that makes it possible to assess whether statements made by a witness are reliable[32] . The system assesses the subjective and objective, spatio-temporal and psychophysical conditions of the witness and consequently the truthfulness of what he/she has reported[33] . Applications such as the one just described reveal any contradictions within the statement made and help contextualise what was said. Indeed, increasingly sophisticated systems are able to determine whether there have been opportunistic comments in the testimony or, in other words, whether the witness has provided facts that no one asked for in a mere attempt to strengthen his credibility.
- *Software that aims to predict the outcome of a judgement*. When one thinks of using the logical processes associated with robotics to emulate the typical activity of the judge, in deciding a dispute, or of the lawyer, in sustaining a defence thesis in a specific case, information technology must go well beyond the simple level of data storage. The complexity of this phase is inherent in the relationship between the case and the interpretation of the law, and leads to a product that ends up becoming in all respects the result of logical reasoning[34] . Judicial decision-making becomes '*robotic*' when the use of algorithms in the form of *software is used* to provide answers to those disputes that are the responsibility of the human figure of the judge[35] . When we speak of *robotic justice, we* mean the development of technologies, which has taken place in the judicial activity, involving the use of automated systems of judicial decision-making, which use algorithms with a high degree of autonomy, which emulate human decision-making through the use of increasingly sophisticated *software* aimed at solving problems of various kinds depending also on their degree of learning. This concept of *robotic justice* is nowadays most often referred to as *predictive justice*, which the European Commission for the Efficiency of Justice (CEPEJ) defines as follows: "*Predictive justice refers to the analysis of a large number of judicial decisions by means of artificial intelligence technologies in order to formulate e.g. those relating to redundancy payments or*

32. J.Nieva-Fenoll, *Intelligenza artificiale e processo*, Giappichelli, Torino, 2019, p.107 s. Sul tema vedi anche: S.Villata, M.Araszkiewicz, K.Ashley, et al. *Thirty years of artificial intelligence and law: the third decade. Artif Intell Law* (2022) p.23

33. J. Nieva-Fenoll *Ibid.*

34. G. Mammone, *Considerazioni introduttive sulla decisione robotica,* Contenuto in A. Carleo, *Decisione robotica,* Bologna 2019 p. 23

35. M. De Felice, *Decisione robotica negoziale. Nuovi 'punti di presa' sul futuro*, Contenuto in A. Carleo, Decisione robotica, Bologna 2019 p. 179.

> *maintenance payments). The term 'predictive' used by the legal tech companies*[36] *is taken from the branches of science (mainly statistics) that make it possible to predict future outcomes through inductive analysis. Judicial decisions are processed in order to discover correlations between input data (statutory criteria, facts of the case, motivation) and output data (formal decision on, for example, the amount of compensation). The correlations that are found to be relevant make it possible to create models that, when used with new input data (new facts or clarifications introduced in the form of parameters, such as the duration of the contractual relationship), produce, according to their developers, a prediction of the decision (e.g. of the compensation range)*[37] *".* The latter represents the most controversial application of those technologies included in the branch of predictive Artificial Intelligence. With reference to the latter application, among the motivations pushing towards the replacement of the personal judge by the robot judge is certainly the desire to ensure greater efficiency of justice and legal certainty[38] .

In this regard, it is interesting to point out that the tendency to reject the use of predictive justice software is based on the danger that it would replace man, making his world cold and mechanical, his labour-force fungible and his cognitive abilities superfluous. The rejection of the decision-making robot, therefore, is intended to prevent man from losing his centrality in the universe, and all the more so because this would happen at the hands of devices that he himself invented[39] .

It is argued, indeed, that the robot decides in a cold and aseptic manner, or rather that it lacks a context-sensitive view of the subject matter of the dispute, of the controversial goods of life and of the identity of the parties, that it is incapable of appreciating the values at stake and thus of guaranteeing their adequate protection or of carrying out a prudent balancing of them[40] .

However, such arguments, which contrast the anonymous coldness of robotic judging with the sensitive creativity of human judging, clash with all those normative interventions aimed at proceduralising the decision-making process with the aim of curbing the uncontrollable arbitrariness of the judge[41] . In fact, it is precisely the robotic decision that can be a tool against the fallibilities and uncertainties of the human decision maker.

The gradual replacement of man by a non-human cognitive system, especially in sectors characterised by excessive workloads, such as the justice sector, seems to be a necessary and providential intervention. The need for a reasonable length of trial is expressly provided for in Article 111 of the Constitution, which defines this requirement as one of the corollaries of the so-called 'fair trial'. In contrast to the speed of the trial, however, we find other principles that in some ways produce opposing needs: guaranteeism and effectiveness[42] .

Due process inevitably depends on a proper balancing of these constitutional principles. Speeding up trials could, in fact, lead to a reduction in procedural guarantees and contradictory procedures, with a consequent negative impact on the justice system. Therefore, robotic decision-making can certainly be a valid solution to the excessive length of Italian trials[43] , but it must be accompanied by guarantees such as to ensure performance qualitatively equal to that of a personal judge, without compression of the principles of due process.

It is now necessary to analyse the last hypothesis, considered by many to be the most important, according to which resorting to a robot judge would entail a guarantee of legal certainty. As already mentioned, one of the critical aspects of the Italian judicial system is legal uncertainty, since judgments often end up being unreasonably creative, not allowing for a high degree of predictability of the final decision, thus compromising the 'certainty' that is a characteristic of law. Verifiability of the decision-making process, in fact, constitutes one of the necessary pillars for the implementation of stable law. In fact, the legal system, as law in the objective sense, has the fundamental purpose of giving order to society; the achievement of this objective presupposes recourse to rules conforming the conduct of the consociates that are part of the social group to which one wishes to refer.

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36. The term 'legal tech' refers to companies that use information technology within the law to provide innovative legal services. These are start-ups specialising in law. Other terms appear in different business areas, such as fintech for start-ups providing financial services and medtech for medicine.

37. Carta etica europea sull'utilizzo dell'intelligenza artificiale nei sistemi giudiziari e negli ambiti connessi. Adottata dalla CEPEJ nel corso della sua 31 Riunione plenaria (Strasburgo, 3-4 dicembre 2018), p. 47.

38. M. Luciani, *La decisione giudiziaria robotica,* Contenuto in A. CARLEO, *Decisione robotica,* Bologna 2019 p. 63.

39. A. Punzi, *op. cit.*

40. M. Luciani, *La decisione giudiziaria robotica,* Contenuto in A. CARLEO, *Decisione robotica,* Bologna 2019 p. 63.

41. M. Luciani. *Ibid.*

42. N. Picardi, *Manuale del processo civile, Giuffrè,* Milano 2013 p. 236.

43. The European Court of Human Rights in numerous cases for violating Article 6 ECHR, which reiterates the need for reasonable time limits for trials.

These rules are crystallised in norms that must be brought to the knowledge of the citizens and, in order to ensure their full comprehensibility, bear language that for the law ends up coinciding to a large extent with the common language. This aspect, however, does not exhaust the implementation of the law; in fact, once it has been expressed in writing, it must be applied, and thus meaning must be given to the concepts and expressions used by the legislator; this is done through the interpretative activity of the judge. Interpreting a rule does not only mean clarifying what is unclear or controversial in the text, but rather giving meaning to the phrases that compose it. Therefore, it can be concluded that the specific moment of law production does not occur a priori, when the content of a provision is fixed, but a posteriori, when its meaning is determined. This poses the first major problem in ensuring the certainty of the application of the rule, since every type of language is composed of terms and phrases that have a margin of indeterminacy and very often contain inaccuracies and ambiguities in their meaning. Moreover, if it is true that legal language, just like ordinary language, can result in locutions with a generic, vague or ambiguous content that undermine the certainty of its content, it is also true that law, as a practical science, defines general and abstract rules to be applied to individual concrete cases. The interpretation of the statements is inevitably influenced by the specific case that the judge finds himself deciding, for which he declines to apply the law.

The need for legal certainty arises from the fact that an individual operating in a given legal system must be able to foresee the consequences of his actions. Indeed, each individual must be able to refer a specific case to the general rule that contemplates it, knowing in advance what legal consequences might be associated with the occurrence of a concrete case[44] . The impersonal application of the legislative dictate would produce a calculability of law to be understood in the purest way, allowing us to see law as the result of mathematical schemes.

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