Law, rights, and the fallacy of computation

On the hidden pitfalls of predictive analytics

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Abstract: The prediction of future states of the world is, probably, one of the most appealing perspectives opened up by the advent of Big data and artificial intelligence developments. This is also true in the legal field where a growing number of scholars and practitioners are drawn to the idea of exploiting the forecasting capabilities of algorithms. In recent years, prediction models have not only fed a lively theoretical debate on predictive justice and legal computability. They have also inspired the development of highly heterogeneous applications: new consulting services, intelligent platforms for workforce management, innovative tools for the judicial assessment of recidivism risk. In this scenario, while we are dazzled by the wonders of AI, a reflection is needed on the impact that computational heuristics can have on the very complexion of law. As a matter of fact, the use of predictive analytics in legal settings is often affected by issues spanning from inherent epistemic fragilities to the risk of turning into rights violations when dropped in real contexts. The paper provides a critical account of prediction and its hidden pitfalls by heading in two directions. The first one is to pave the way for an in-depth analysis of the theoretical and practical implications of predictive computation for the law. The second one is to present augmented intelligence – the cooperative integration between humans and machines – as a suitable paradigm to mitigate the risks of prediction and, more in general, to inspire the computational evolution of legal science and practice.

[Keywords: predictive analytics; computational epistemology; algorithmic injustice; legal theory; man-computer symbiosis]

I am still not altogether certain whether the ability to predict phenomena
in a particular area entitles one to claim full understanding.
Conversely, it may be quite possible to understand a particular realm of experience
completely without being able to predict all the results of future observations

(W. Pauli, as quoted in W. Heisenberg, *Physics and beyond: Encounters and conversations*, 1971)

1. Towards a critique of predictive analytics

That between law and prediction is an old bond. The anticipation of future states of reality – whether represented by a court decision or by a natural occurrence – is important in different legal areas. Prediction not only plays a central role in the evolution of many

relevant legal institutions[1] but gets to found theoretical perspectives about the law and its very nature[2]. In light of the above, it is not surprising that the idea of calculating the future has influenced legal scholars since von Neumann first implemented in a digital machine the universal computer longed-for centuries ago by Leibniz[3].

Thus, driven by the developments of *Cybernetics* and behavioral science, predictive computing became a qualifying objective for an entire research perspective in the 1950s: *Jurimetrics*, the "scientific investigation of legal problems" theorized by Loevinger, identified in the anticipation of judges' decisions one of its main areas of investigation[4]. Since then, the subject of forecasting has accompanied the entire evolution of IT-legal research through a path of expectations often followed by disillusionment.

Over the past few years, with the advent of Big data and artificial intelligence developments, computational prediction has once again attracted the attention of scholars, triggering a debate that now touches on a variety of contexts. Prediction models not only feed the theoretical debate – very lively in Italy – on predictive justice[5] and legal

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[1] Just think about the relationship between prediction and precautionary measures or the case of compensation for future damage.

[2] The prediction of judicial decisions is an essential part of the very notion of law in one of the first expressions of the US anti-formalist movement in the late nineteenth century. The reference is to the well-known definition of law offered by Oliver W. Holmes: "T*he prophecies of what the courts will do in fact, and nothing more pretentious, are what I mean by the law.*" See O.W. Holmes, "The Path of the Law", *Harvard Law Review*, 110 (1997), 5, p. 991. See J. Paul, "Foundations of American Legal Realism", in Id. *The Legal Realism of Jerome N. Frank*, Dordrecht, Springer, 1959, pp. 13-30.

[3] See M. Davis, *The universal computer: The road from Leibniz to Turing*, Boca Raton, CRC Press, 2018.

[4] See L. Loevinger, "Jurimetrics-The Next Step Forward", *Minnesota Law Review*, (1948), 33, p. 455-493. For an extensive reading on the role played by prediction within the Jurimetrics research field, see H. Baade (ed.), *Jurimetrics,* New York, Basic Books, 1963; R.C. Lawlor, "What Computers Can Do: Analysis and Prediction of Legal Decisions", *American Bar Association Journal*, 49 (1963), p. 337-344.

[5] Within legal systems that assign increasing importance to the principle of "*stare decisis*" (see G. Fiandaca, "Crisi della riserva di legge e disagio della democrazia rappresentativa nell'età del protagonismo giurisdizionale", *Criminalia*, (2011), pp. 79-98 where the Author talks about a "jurisdiction age"), prediction plays a crucial role with respect both to the exercise of the judicial function and the professional activity of lawyers (see A. Di Porto, "Avvocato-robot nel 'nostro stare decisis'. Verso una consulenza legale 'difensiva'", in A. Carleo (ed.), *Decisione robotica*, Bologna, Il Mulino, 2019, pp. 239-250). In more recent years, seminars, projects, and a large number of works have been devoted to the topic. Among these, see F. Romeo, "Giustizia e predittività. Un percorso dal machine learning al concetto di diritto", *Rivista di filosofia del diritto*, 9 (2020), 1, pp. 107-124, S. Quattrocolo, "Quesiti nuovi e soluzioni antiche? Consolidati paradigmi normativi vs rischi e paure della giustizia digitale 'predittiva'", *Cassazione penale*, 59 (2019), 4, pp. 1748-1765.

computability[6]. They have also become a driving force for developing very different applications in terms of goals and methods: new generation consulting services, algorithmic systems to support policymakers' decision-making, intelligent environments for workforce management, or the judicial assessment of recidivism risk[7].

In such an enhanced scenario, despite the sophistication of the tools made available by research on the borders between artificial intelligence and law[8], there is no lack of problems. Predictive techniques have already shown that they can turn into serious threats for fundamental rights[9], raising sensitive issues in terms of implementation choices and reliability[10]. Computational heuristics underlying the prediction – it is worth emphasizing – are not infallible tools, and their failures are often difficult to identify even before than to counter.

The legal world has to make considerable efforts to address these critical issues, mostly still in need of answers. It has to redesign legal activities and procedures taking into account the possibility of predicting future events; to become familiar with the

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[6] Prediction (also understood as "predictability") occupies a central place in the discussion concerning Weberian-inspired "legal computability". On this point, see A. Carleo (ed.), *Decisione robotica*, Bologna, Il Mulino, 2019.

[7] A case worthwhile to cite, for instance, is that of *LexPredict*, a US company providing lawyers and firms with predictive analytics services. The operational space of these services is today extending, with prediction tools working to foresee everything: law case outcomes, performance, and work choices, employment opportunities, deviant behaviors, illness. Some related bibliographic references can be here reported, just by way of example. On the use of predictive models in criminal investigations and in the fight against crime, see the review proposed in M. Hvistendahl, "Crime forecasters*"*, *Science*, 353 (2016), 6307, pp. 1484-1487. Prediction techniques, moreover, are already at the basis of a number of relevant administrative decisions. A significant example is represented by the model developed by the Austrian Ministry of Labor to foresee the job chances of those enrolled in the job placement lists and choose - according to predictive analytics outcome - which reintegration paths or subsidies will be provided to the individual worker (see D. Allhutter *et al*., "Algorithmic profiling of job seekers in Austria: how austerity politics are made effective, *Frontiers in Big Data*, 3 (2020), available at: https://doi.org/10.3389/fdata.2020.00005 (Retrieved on 15 October 2020) About the use of prediction in judicial decisions, see D. Katz, "Quantitative legal prediction-or-how I learned to stop worrying and start preparing for the data-driven future of the legal services industry", *Emory Law Journal,* 62 (2013), pp. 909-966. Predictive techniques also support the management of employment relationships (hiring, assignment of tasks, layoffs), where the analysis of data captured in and outside the workplace is often used to foresee workers' health conditions or on their future job choices. On this point, see K. Crawford, J. Schultz, "Big data and due process: Toward a framework to redress predictive privacy harms", *Boston College Law Review*, 55 (2014), pp. 93-128.

[8] See K. Ashley, *Artificial intelligence and legal analytics: new tools for law practice in the digital age*, Cambridge, Cambridge University Press, 2017.

[9] See M. Reisse, "Human Rights and Artificial Intelligence: An Urgently Needed Agenda", *Human Rights Quarterly,* 41 (2019), pp. 1-13.

[10] E.g., those concerning data selection and preparation or the integration with other uses of computation.

conceptual vocabulary of information sciences; to understand how to recognize the distortive effects generated by predictions and their errors. In this context, a relevant obstacle is the fascination held, on law and social sciences, by the knowledge value of data, algorithms' logical rigor, and the assumed objectivity of automatic calculation. The very potentialities of predictive analytics that ever more catch the attention of scholars and professionals can hide aberrations and inconsistencies with far-reaching consequences on a legal, ethical, and practical level.

In the above scenario, the need to start a "critique of prediction" becomes clear. As indirectly suggested by the recent development of *Critical Data Studies*[11], what is necessary is a systematic analysis, an organic and interdisciplinary study allowing not only to identify the risks of predictive models, but also to hypothesize strategies capable of enhancing their potential by suggesting solutions plausible both on the legal and technical level. A major step in this direction is to focus and connect the most significant issues, so to outline a research agenda to be developed in the future. Below, three short notes that move along these lines.

2. Computational fallacy: on the epistemic fragility of prediction

Probably, the most pressing issue for the critical reflection on the legal uses of forecasting models lies at an epistemological level and is linked to an apparently trivial consideration: whatever the context considered, the point of using predictive heuristics depends on the degree of reliability, on the intrinsic "truth value" of the classifications and conjectures generated by the machines.

From this point of view, without questioning the role played by computation in enabling an ever-deeper understanding of the world[12], it makes sense to point out how the

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[11] *Critical Data Studies* is the name coined by Craig Dalton and Jim Thatcher (see, C. Dalton, J. Thatcher. "What does a critical data studies look like, and why do we care? Seven points for a critical approach to 'big data'", *Society and Space*, 29 (2014), available at: https://www.societyandspace.org/articles/what-does-a-critical-data-studies-look-like-and-why-do-we-care (Retrieved on 15 October 2020)) to point out an emerging area of multidisciplinary studies aiming at critically investigating the ethical, legal, social, political, and epistemological aspects of data science and of the algorithmic evolution of society. For an introduction see, A. Iliadis, F. Russo, "Critical data studies: an introduction", *Big Data & Society*, 3 (2016), 2, available at: https://doi.org/10.1177/2053951716674238 (Retrieved on 15 October 2020).

[12] On the epistemological perspectives opened up by the emergence of the computational science paradigm, see P. Humphreys, *Extending ourselves: Computational science, empiricism, and the scientific method*, Oxford, Oxford University Press, 2004.

cornerstones of the two main approaches to legal prediction – deductive and inductive models – are affected by inherent limits that can easily lead to fallacious representations of reality and its evolutions. In respect, it is worth spending a few words.

In deductive models, as one can guess from the name, the prediction results from an inferential process based on the application of general rules to concrete cases. Using logical-mathematical and algorithmic formalisms to describe, at the same time, provisions contained in legal rules, the case in question, and the inference schemes to be used, deductive models "calculate" the content of legal decisions with the benefits of a deterministic process: given the same premises, inference inevitably leads to the same result.

Several attempts have been undertaken in this direction, many of which very promising[13]. However, when we move from the abstraction of experiments – usually placed in extremely simplified application contexts – to practical implementations, different problems emerge that undermine prediction reliability. Legal norms are by their nature characterized by semantic and syntactic ambiguities that hinder their representation in formal and computable terms. Moreover, even in the simplest case, the rules to be applied are many, all (legitimately) subjected to different interpretations and structured in provisions that were not conceived to be read by software. They often suffer from such severe limits on the legislative technique[14] level that even the finest human exegete could be in trouble trying to interpret them[15]. In such a scenario, the possibility of generating reliable predictions, useful for real contexts, is undoubtedly limited.

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[13] The idea of translating legal rules into quantitative/computable languages and deductively predicting the outcome of judicial decisions can be traced back to *Jurimetrics.* The first works devoted to this topic, indeed, date from the late 1950s (see, for example, F. Kort, "Predicting Supreme Court decisions mathematically: A quantitative analysis of the 'right to counsel' cases", *The American Political Science Review,* 51 (1957), 1, pp. 1-12). The perspective has obviously evolved hand in hand with the technological advances, leading to very different outcomes but all subject to the same considerations (just by example, in the Italian scenario, see L. Viola, *Interpretazione della legge con modelli matematici*, Milano, Centro Studi Diritto Avanzato, 2018). For an up-to-date, international overview, see K. Ashley, *Artificial intelligence and legal analytics: new tools for law practice in the digital age*, cit.

[14] The complexity of legal rules has well-known causes. Laws are often written in a hurry. The result of this is represented by illegible provisions full of chain references to other norms, hard to reconcile with previous ones, or even contradictory. The articles not only frequently use expressions never used before that easily generate uncertainty and contentiousness but often state principles and prescriptions different from those that were in the intention of legislators. In this respect, see: B.G. Mattarella, *La trappola delle leggi: molte, oscure, complicate*, Bologna, Il Mulino, 2011.

[15] On the practical limits shown by artificial intelligence in the automatic application of legal rules, see K. Ashley, *Artificial intelligence and legal analytics: new tools for law practice in the digital age*, cit.: "the

Similar conclusions, albeit based on different considerations, can be drawn for inductive models that generate predictions by identifying patterns within large sets of raw data, without drawing on explicit rules to be applied to the information entered into the system. Inductive models start just from the data and the desired outcome (the recognition of a pattern, the prediction) and then, through a learning process[16], generate the computational heuristics that allow both to transform data into the result and interpret new datasets. Basically, as occurs in any human induction process, they generalize what has been observed to what has not yet been observed by extracting from the data the patterns of interpretation of reality to be applied in the future.

Despite the high level of sophistication achieved in most recent applications[17], even this kind of models shows pitfalls in terms of reliability[18], some of which come from the inductive method's inherent features before than from its implementation in computational artifacts.

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field of AI & Law has long studied how to design computer programs that can reason logically with legal rules from statutes and regulations. It has made strides, and demonstrated some successes, but it has also developed an appreciation of just how difficult the problem is".

[16] The reference here is to the machine learning techniques developed over the last 10 years and ever more used in all cases where it is difficult, if not impossible, to find solutions through algorithms offering a straight indication of all the operations to be performed on data. Just think about contexts characterized by one of the following circumstances: i) *difficulties in problem formalization* (e.g. anyone can determine whether an image contains the face of an acquaintance, but probably no one can describe the sequence of computational steps that, once performed on all image points, allow you to answer the question); ii) *high number of variables involved*; iii) *lack of theory* (e.g. the mathematical laws governing the performance of financial markets are not known); iv) *need for customization* (e.g. we want to classify documents based on a relevance criterion that depends on the user). For an introduction to machine learning, see P. Domingos, *The master algorithm: How the quest for the ultimate learning machine will remake our world*, New York, Basic Books, 2015.

[17] In recent years interesting works have been published that succeeded in making accurate predictions about court decisions by combining inductive inference techniques with large amounts of data from legal cases. Among such works, see D. Katz, M. Bommarito, J. Blackman, "A general approach for predicting the behavior of the Supreme Court of the United States", *PloS one*, 12 (2017), 4, available at: https://doi.org/10.1371/journal.pone.0174698 (Retrieved on 15 October 2020).

[18] The eruption of Big data onto the scene of science has brought new issues within the horizons of computational epistemology. Most of them are specifically related to the extraction of knowledge from large amounts of information (see R. Kitchin, "Big Data, new epistemologies, and paradigm shifts", *Big data & Society,* 1 (2014), 1, available at: https://doi.org/10.1177/2053951714528481 (Retrieved on 15 October 2020)). The issue has gained attention also in the legal field, even if at different times and with different nuances. The data deluge and the related heuristics has put the law under pressure not only in terms of substantive regulation but also from a purely epistemological perspective. The problem of defining the value of knowledge derived from data is, in fact, showing up in the emerging field of Empirical Legal Studies (F.L. Leeuw, H. Schmeets, *Empirical legal research: A guidance book for lawyers, legislators, and regulators*, Cheltenham, Edward Elgar Publishing, 2016) and in most of the recent reflections on the relationship between AI and the legal profession (see, P. Moro, "Intelligenza artificiale e professioni legali. La questione del metodo", *Journal of Ethics and Legal Technologies*, 1 (2019), 1, pp. 24-43).

The epistemic fragility of inductive inference is, in itself, a "*tòpos*" of the philosophy of science that has long dwelt on the limits of induction as a way to produce scientifically reliable knowledge[19]. A first and well-known weak point, already identified in Hume's writings, lies in the impossibility of evaluating the accuracy of a generalization produced, through logic, starting from a series of even consistent observations. Whatever the number of swans observed – to use Popper's metaphor – it can never be argued with certainty that all swans are white.

A second weakness is then represented by the extreme sensitivity of the inductive method to the observations' content and characteristics. There is a high risk that data collected are unfitted to the research purpose pursued, and this as a consequence of different factors: the choice of an unsuitable sample; a clerical or technical error in data collection; or, again, an underestimation of the impact produced, on the results of the observation activity, by researcher's theoretical reference framework[20]. Assumptions, previous knowledge, biases, and expectations (what has been summed up as "theory ladeness" in the philosophy of science) can seep in apparently secondary choices (measurements to be made, data format, metrics), affecting the result of the inferential process in a way that may not be evident immediately.

Added to all the above, are today further critical issues stemming from the features of machine learning techniques used to deploy inductive processes. Regardless of the method considered and despite the availability of "reverse engineering"[21] procedures, the *ex-post* analysis of the computational path that links the input data and the output is

[19] Earliest reflections on the inductive method date back to Bacon and Hume. However, the critique of the inductive process as the cornerstone of the scientific method develops from the analysis carried out by Russell and Duhem in the first half of the last century.

[20] Firstly, put forward by Pierre Duhem, the concept of "theory ladeness" – the idea that observations are affected by the investigator's theoretical presuppositions and expectations – has been investigated starting from the foundational works of authors like Norwood Russell Hanson and Thomas Kuhn. See, among the others, N.R. Hanson, *Patterns of Discovery*, Cambridge, Cambridge University Press, 1953; T.S. Kuhn, *The Structure of Scientific Revolutions*, Chicago, University of Chicago Press, 1962.

[21] The expression indicates a set of techniques used to identify the mechanisms underlying a given software's functioning, such as its architecture and internal structure. This process is used whenever components functions are not documented so that other solutions are required to understand how a software works.

always a complex operation[22] that can affect the possibility of criticizing and assessing the legitimacy of legal activities based on them.

3. Beyond epistemology: the arcane threats of algorithmic power

The weakness of computational inference is not itself the only argument for a critique of prediction. When used in real-world settings, predictive models give rise to risks that go far beyond the borders of epistemology, walking into the life of people, law, and its institutions. In this vein, issues to be identified and investigated are many.

a) Epistemic fragility of computational inferences and rights violation

The first problem to deal with is the risk that the fallacy of the inferences turns into a violation of individual rights. Whatever its final destination – the classification of an individual's risk category or the prediction of future events – a flawed inference leads to a misleading representation of factual circumstances capable to undermine the application of legal norms and the exercise of all forms of decision-making power – political, administrative, judicial, managerial – where choices affecting individual rights are rooted in factual assessments[23].

This way, new forms of injustice loom in an increasing number of empirical investigations and legal cases. In the labor world, the aberrations produced by machine learning mechanisms and by their introduction into workforce analytics systems lead to

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[22] In this regard, one can consider, for instance, the phenomenon of the "uncertainty bias", a distortion working into decision-making systems classifications (e.g. those that support decisions relating to the granting of bank loans based on applicant's estimated solvency). The phenomenon occurs when the following conditions are true: i) a group is under-represented in the sample, so there is more uncertainty in the forecasts concerning it; ii) the algorithm is risk-averse; therefore, all things being equal, it will opt for decisions based on predictions for which it is more confident. In other words, the uncertainty bias causes the predictive algorithms to favor the groups best represented in the datasets on which the algorithm has been trained since there will be less uncertainty associated with these predictions.

[23] On the problematic relationships tying power and algorithms see, in the area of philosophy of law, B. Romano, O. Mannoni, G. Petrocco, *Algoritmi al potere: calcolo giudizio pensiero*, Torino, Giappichelli, 2018; P. Moro, *Intelligenza artificiale e professioni legali La questione del metodo*, cit., G. Fioriglio, "Dittatura dell'algoritmo: motori di ricerca web e neutralità della indicizzazione: profili informatico-giuridici", *Bocconi Legal Papers*, 5 (2015), p. 113; G. Ziccardi, "L'uso dei social network in politica tra alterazione degli equilibri democratici, disinformazione, propaganda e dittatura dell'algoritmo: alcune considerazioni informatico-giuridiche", *Ragion pratica*, 1 (2020), pp. 51-70. On the connection between prediction and judicial power see F. Romeo, "Giustizia e predittività. Un percorso dal machine learning al concetto di diritto", cit.

management choices (relating, for example, to shifts, earnings, or disciplinary measures) impinging on fundamental guarantees for workers spanning from the right of clear and transparent employment contracts to that of being provided with dignified working conditions[24].

Similar phenomena emerge in the judicial field (especially in criminal jurisdiction and in the fight against crime) where computational prediction has already shown it can severely affect the right of defence or that to a fair trial. The *COMPAS*[25] software represents, in this perspective, only the most known and debated example of a new generation of decision support tools that tend to spread far beyond the administration of justice.

The list could go on and on. Mostly embedded in algorithmic decision-making systems used by public institutions and private enterprises, predictive models bring new threats that, as emerges from recent EU Commission documents[26], can impact a wide range of fundamental rights ranging from freedom of expression to that of association and this regardless of the legal framework examined[27]. With this systemic risk, we will have to come to terms in the future.

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[24] Discrimination based on reasons of race, sex, religion or geographical location is an evermore frequent phenomenon. For an analysis based on an interesting interdisciplinary approach see, among the others, P.T. Kim, "Data-driven discrimination at work", *William & Mary Law Review*, 58 (2016), pp. 857-936.

[25] A famous case is that of *COMPAS* (acronym for Correctional Offender Management Profiling for Alternative Sanctions), a platform developed by the American company Northpointe to support judges in assessing the risk of recidivism. Following an investigation carried out with the help of the ProPublica association, it was found that the algorithm was tending to assign higher risk values to black defendants than to white ones, despite the similar recidivism rates between the two groups. On the COMPAS case see, with a specific focus in constitutional law implications, A. Simoncini, S. Suweis, "Il cambio di paradigma nell'intelligenza artificiale e il suo impatto sul diritto costituzionale", *Rivista di filosofia del diritto*, 8 (2019), 1, pp. 87-106.

[26] A detailed list of the rights threatened by the spread of algorithmic decision systems (and, in more general terms, by artificial intelligence) is reported in a recent white paper of the EU Commission: "AI can affect the values on which the EU is founded and lead to breaches of fundamental rights, including the rights to freedom of expression, freedom of assembly, human dignity, nondiscrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation, as applicable in certain domains, protection of personal data and private life, or the right to an effective judicial remedy and a fair trial, as well as consumer protection". See EU Commission, "White Paper on Artificial Intelligence: A European approach to excellence and trust", available at: https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf (Retrieved on 15 October 2020).

[27] We refer to the penetrating analysis carried on in E. Bayamlıoğlu, R. Leenes, "The rule of law implications of data-driven decision-making: A techno-regulatory perspective", *Law Innovation Technology*, 10 (2018), pp. 295-313.

b) Predictive analytics and the (un)certainty of the algorithmic law

Beyond threatening individual rights, the spread of predictive models is in danger of altering fundamental traits of the rule of law understood as the set of guarantees relating to the identification, prediction, understanding, and dispute of judicial decisions, as well as of the rules on which decisions themselves are based.

At a closer look, the unpredictability and inaccessibility of predictive models (in particular those based on machine learning techniques) yields new risks for the certainty of law here meant in its broadest meaning of the possibility of relying on the validity, duration, effects, and even concrete application of legal rules (to include the administrative and judicial activity as well as, more in general, any action undertaken by public authorities). The inaccessibility of the normative provisions embedded into the algorithms and the intrinsically random nature of classification and predictive techniques are intertwined with the causes of uncertainty identified by legal scholars for a long time.

The substantial impossibility of establishing how and why a predictive analytics tool may judge a person at risk for reoffending (to give just an example) goes hand in hand with the uncertainty elements already depending on the legal framework inconsistencies or the excesses in political or judicial discretion, causing risks worthy of analysis. On the other hand, predictions can be applied regardless of the will of their recipients and, actually, even from the very possibility of understanding the content and enforcement mechanisms of the algorithmic rule[28].

In democratic systems, the prevention against the arbitrariness in the exercise of any form of power (public and private) and the very admissibility of legal responsibility for unlawful acts are only possible in the face of procedures with predictable effects, governed by knowable and understandable mechanisms. The use of automatic classification and forecasting techniques in the adoption of regulatory, administrative, and managerial measures (an administrative choice, a management decision made by an

[28] The introduction of predictive and classification systems in the legal rules application process exposes citizens to the risk of incurring in coercive decisions based on things they have never done and will probably never do. See, V.T. Zarsky, "Transparent Predictions", *University of Illinois Law Review*, 4 (2013), pp. 1519-1570.

employer, or a restraining order adopted by a judge) threatens these guarantees, making it harder to access and object to the very mechanisms they determined the acts.

The issue is exacerbated by the fact that models exploiting data-driven inferences to identify situations and subjects to which legal effects have to be applied, undermine the conventional regulatory model in which the rules explicitly relate individuals, facts, and legal effects. Processes underlying computational classification and prediction mechanisms are instead at least partially dynamic, the result of a permanent reconfiguration; the very decision-making rules emerge autonomously from the data used to train the system.

In this scenario, any forecast-based activity is not an entity clearly defined in all its preceptive features. It is rather opaque and permanently subject to evolutions due to inferences providing a probable but uncertain knowledge. An epistemology that identifies causal links in purely probabilistic terms through the gathering and recursive analysis of data not only undermines the possibility of relating the occurrence of a fact with legal consequences in causal terms but limits human autonomy as individuals can no longer contest the result using rational arguments. So, implemented with current techniques and without adequate countermeasures, computational prediction paradoxically risks turning into a threat for its very goal, i.e the predictability of what happens in legal systems.

c) Heisenberg effect and the self-fulfilling prophecy

The list of issues stemming from the use of predictive models ends up with two risks – closely connected in terms of the dynamics determining them – that do not depend on the prediction reliability but on how the actors of the legal universe can react to the availability of representations of future states of the world.

The first one can be effectively identified by recalling the term – "Heisenberg effect"[29] – coined in the foundational writings of Jurimetrics, when authors like Julius Stone have used the mechanics of the quantum universe to metaphorically describe the effects of the prediction enabled, in those years, by the first encounters between

[29] It is worth citing, in this sense, the highly current words used by J. Stone, "Man and Machine in the Search for Justice", *Stanford Law Review*, (1963), 16, pp. 515-560: "lawyers should be aware that reliance at the judgment seat on new predictive techniques would seriously threaten the judge's central concern with justice. For if the results thus predicted for him do affirmatively guide him in present decisions, each judge will tend to vote somewhat more consistently with his past record".

information technology, law, and behavioral sciences. Just as the act of measurement affects the evolution of quantum phenomenon being measured – this is the suggestion –, so the availability of predictions on law-relevant future events (e.g. the most likely decision based on the features of a case) can influence the behavior of judges, producing effects to think about in critical terms.

A first consequence may be the induction of a conformist attitude towards previous pronouncements fueled by the human tendency to follow already beaten paths. In this, prediction can weaken the judge's propensity to review positions taken in the past, an attitude that is essential for ensuring the evolution of legal systems according to the changes taking place on the legal, economic, social, and cultural level.

The second consequence of the Heisenberg effect is the risk of an "ossification process" of the decision-making mechanisms, increasingly delegated to logical-mathematical and algorithmic operations. The use of calculation is thus likely to dismiss an indispensable human and emotional dimension from the judicial decision horizon. As highlighted in the emerging research field of *Law & Emotions*[30], the hermeneutical techniques used to define the meaning of legal provisions need to be integrated by an emotional reading of the trial events, a suitable means to put the judge in contact with needs and opinions that occur in the social context and to draw from them the legal value he should consider in his fundamental work of mediation between abstract norms, constitutional values, and living law[31].

The last issue unfolds on an axiological level and pushes us to question the sense of using computational prediction as a base for any legally relevant decision, whether it is a court judgment, an administrative measure, or a company recruiting strategy. Regardless of technical choices, data-driven inferences make their predictions by

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[30] The emergence of the research area can be traced back to the publication, in 2006, of a special issue of the journal *Law and Human Behavior* (B.H. Bornstein, R.L. Wiener, "Emotion in Legal Judgment and Decision Making", *Law and Human Behavio*r, 30 (2006), pp. 115-248). The area has evolved and structured with the contributions of scholars from different backgrounds, such as lawyers, psychologists, cognitive scientists, sociologists and even philosophers (the 27th IVR World Congress of the International Society of Philosophy of Law and Social Philosophy, held in Washington in 2015, was devoted to the topic).

[31] On this point, see the thoughtful reflections expressed in T.A. Maroney, "Law and Emotion: A Proposed Taxonomy of an Emerging Field", *Law and Human Behavio*r, 30 (2006), pp. 119-142; S. Fuselli, "Tra legge e sentenza. Sul ruolo delle emozioni nella decisione giudiziale", in P. Moro, C. Sarra (a cura di), *Positività e giurisprudenza. Teoria e prassi nella formazione giudiziale del diritto*, Milano, Franco Angeli, 2012, pp. 19-50.

projecting onto the future the regularities found in the data depicting the past. To ground, on such a basis, decisions that can seriously impact on individuals and collectivity is a choice that should be evaluated by combining the necessary analysis of the technical dimension with a careful study of ethical and political implications, even before the legal ones related to it.

Predictive computation risks feeding new forms of "self-fulfilling prophecy"[32], the phenomenon described in sociological and psychological literature under which a prediction becomes true just because it has been expressed. Large-scale diffusion of predictive heuristics in sensitive contexts like criminal enforcement policies (just think the case of the *COMPAS* software above mentioned) it is so likely fostering, in a potentially hidden and unconscious way, the materialization of the same phenomena that it would like to avoid.

4. From predictive analytics to man-computer symbiosis

Observations made in previous paragraphs provide an overview, albeit briefly, of the critical issues inherent in predictive models. Computational heuristics, which the law shows is increasingly willing to rely on, risk not only clouding our real ability to understand the world[33] but also significantly harming the needs, principles, and fundamental guarantees of our legal systems.

A technical approach might partially answer the problem: improving the techniques of computational inference in order to make them more accurate and reliable, no doubt, is a path to go. However, in our opinion, the most important answers are related to the underlying models that inspire the use of predictive technologies in the legal field. Many of the aberrations we have mentioned, indeed, do not arise from inferences' fallacy but from the way of using prediction, from the role that is assigned to it within decision-making processes, and from the way in which the knowledge offered by machines is integrated into human action.

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[32] The self-fulfilling prophecy is a classic theme of sociological reflection dating back to seminal work from Robert K. Merton (see R.K. Merton, "The self-fulfilling prophecy", *The Antioch Review*, 8 (1948), 2, pp. 193-210).

[33] In this vein, the image evoked by Bratton of a computation that transforms from "*tool of perception*" into "tool of blindness" seems very effective. See, B.H. Bratton, *The Stack: On Software and Sovereignty*, Cambridge, MIT Press, 2016.

From this perspective, the object to which our critical evaluation is addressed becomes the – still prevalent – paradigm that sees in the machine an entity to be used to replace humans. In such a perspective, the risk that automated processes independent of human contribution and control open the way to uncontrolled effects is much higher.

In such a scenario, an innovation model is necessary that does not uncritically pursue the transfer of human choices to computational artifacts; it should rather aim at enhancing the kind of support of such artifacts while ensuring human intervention and adequate protection against the threats that the computational prediction projects onto the legal world in a broad sense understood. The needs to be met in this regard are different. If a primary need is to allow humans to have adequate control over decision-making carried out by machines or by means of them, it is also necessary for the processes based on computational inference techniques to be enhanced by the know-how of domain experts (judges, public administration officers or political decision-makers), by making their knowledge and evaluations somehow part of the decision-making processes.

In the light of the above, the paradigm it seems appropriate to strive for is not that of artificial intelligence, but that of the so-called "augmented intelligence". Recently much discussed, the perspective has been sketched out for the first time in the 1960s in a highly quoted article by John Licklider, visionary founding father of modern computer science[34]. In the model of technological evolution underlying augmented intelligence – evocatively defined by Licklider as "man-computer symbiosis"[35] – the goal is to achieve a cooperative integration between man and machine where the power of computation

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[34] The idea to combine human cognitive abilities and knowledge with the extraordinary processing power made available by Big data analytics tools has triggered interest in recent years, involving very different scientific and application fields. There is already an extensive and heterogeneous literature on this topic. Among the most recent works, see N. Zheng, et al. "Hybrid-augmented intelligence: collaboration and cognition", *Frontiers of Information Technology & Electronic Engineering*, 18 (2017), 2, pp. 153-179.

[35] As pointed out by Licklider "The main aims are (1) to let computers facilitate formulative thinking as they now facilitate the solution of formulated problems, and (2) to enable men and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs. In the anticipated symbiotic partnership, men will set the goals, formulate the hypothesis, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking. Preliminary analyses indicate that the symbiotic partnership will perform intellectual operations much more effectively than man alone can perform them". See, J.C. Licklider, "*Man-computer symbiosis*", *IRE transactions on human factors in electronics*, 1 (1960), pp. 4-11, available in: https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4503259 (Retrieved on 15 October 2020).

merges with the mental capacities of humans and the machines stop being a mere instrument of our actions to become "the other with whom we interact"[36].

The perspective is not completely unknown to the legal world. In a recent work about the future of artificial intelligence and legal analytics[37], Kevin Ashley explicitly refers to the need of imagining a new generation of systems for "cognitive computing", "a kind of collaborative activity between humans and computers in which each performs the kinds of intelligent activities that they can do best". The idea is also true for automatic prediction and classification techniques: a worthy goal is to work on approaches and technical solutions that allow exploiting the computation while preserving the possibility for a human contribution and control.

A significant part of the effort to be made inevitably unfolds on the design and technological level. To become real, the vision of "intelligence augmentation" requires *ad hoc* artifacts able to take into account the application context, the needs to be met, and the features of the information to be processed[38]. The creation of integrated tools enabling sophisticated forms of heuristic cooperation between humans and machines[39] thus generates new questions for research areas between law and computer science, such as that of legal information technology or the emerging field of computational legal studies[40].

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[36] See D.J. Gunkel, "Do Machines Have Rights? Ethics in the Age of Artificial Intelligence. Interview with Paul Kellogg", *Aurora Online*, (2014), available at: http://aurora.icaap.org/index.php/aurora/article/view/92/114 (Retrieved on 15 October 2020)

[37] K. Ashley, *Artificial intelligence and legal analytics: new tools for law practice in the digital age*, cit., p. 1.

[38] N. Lettieri, "Knowledge Machineries. Introducing the Instrument-enabled Future of Legal Research and Practice, in G. Peruginelli, S. Faro, *Knowledge of the Law in the Big Data Age*, Amsterdam, IOS Press, 2019, pp. 10-23; N. Lettieri, A. Altamura, R. Giugno, A. Guarino, D. Malandrino, A. Pulvirenti, R. Zaccagnino, "Ex machina: analytical platforms, law and the challenges of computational legal science", *Future Internet*, 10 (2018), 5, available at: https://doi.org/10.3390/fi10050037 (Retrieved on 15 October 2020)

[39] Prediction heuristics can be combined with other computational heuristics (eg. information extraction network-based inference) and embedded in analytical platforms in which humans keep control. For an experiment heading in this direction see N. Lettieri, D. Malandrino, L. Vicidomini, "By investigation, I mean computation. A framework to investigate the societal dimension of crime", *Trends in organized crime*, 20 (2017), pp. 31-54. For a more general overview, see N. Lettieri, A. Altamura, R. Giugno, A. Guarino, D. Malandrino, A. Pulvirenti, R. Zaccagnino, *Ex machina: analytical platforms, law and the challenges of computational legal science*, cit.

[40] The expression refers today to an interdisciplinary research area aimed at experimentally exploring the use of advanced computational techniques (graph-based inference models, machine learning, agent-based simulation, evolutionary computing) to innovate the processes of law creation, understanding, and study. For an overview, R. Whalen, "The Emergence of Computational Legal Studies: An Introduction",

The challenge to be faced, anyway, does not end with the idea of an "instruments-enabled" science[41] and legal practice. The achievement of a mature approach to prediction in law asks for new research paths, characterized by a rethinking of lawyers' objectives and working methods and, above all, of the relations between the law and other disciplines. There are many fields to be composed in a unitary vision: the information technology, the areas of social science making the empirical analysis of predictive algorithms impact possible as well as, obviously, the branches of positive law from time to time called to evaluate models accuracy and the nature of their results. Added to this is – not least – the philosophy of law called to perform an essential role to enlighten the many regulatory and axiological implications related to the ambition to predict the future.

The goal is challenging and long-term but well deserves the effort. If it still makes sense looking at law, today, as "*hominum causa constitutum*", namely as a social construct conceived around people and the needs of their coexistence, we cannot but expect the same from technologies that evermore permeate the legal systems. From this point of view, there is no difference between predictive computing and any other technology: it must serve humans, not harm them.

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in Id. (ed.), *Computational Legal Studies: The Promise and Challenge of Data Driven Research*, Cheltenham, Edward Elgar, 2020; N. Lettieri, "Law in The Turing's Cathedral. Notes on the Algorithmic Future of Legal Research", in W. Barfield (ed.), *Cambridge Handbook on The Law Of Algorithms*, Cambridge, Cambridge University Press, pp. 32-95, forthcoming.

[41] "Instrument-enabled science" is the expression used by Claudio Cioffi Revilla – director of the Center for social complexity at George Mason University – to describe the computational social science paradigm in which the development of a deeper understanding of social phenomena is enabled by the creation of new research tools: "Just like Galileo exploited the telescope as the key instrument for observing and gaining a deeper and empirically truthful understanding of the physical universe, computational social scientists are learning to exploit the advanced and increasingly powerful instruments of computation to see beyond the visible spectrum of more traditional disciplinary analyses", C. Cioffi-Revilla, "Computational Social Science", *WILEY Interdisciplinary Reviews: Computational Statistics*, 3 (2010), pp. 259-271, available at: https://ssrn.com/abstract=1708051 (Retrieved on 15 October 2020).