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# ARTIFICIAL INTELLIGENCE IN CRIMINAL JUSTICE ADMINISTRATION: THE USE OF MACHINE LEARNING FOR PREDICTIVE JUDICIAL ANALYSIS OF LEGAL DISPUTES

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## ABSTRACT

*The burgeoning advent of Artificial Intelligence (hereinafter referred to as AI) has taken the world by storm. This paper explores the interplay between machine learning and the current landscape of criminal justice administration in India. The discussion begins with an introduction to the core principles and central features of machine learning methodologies. The author shall then explain the concept of predictive justice, in context of machine learning methodologies, such as supervised learning and natural language processing. The Indian judicial system has been plagued by several challenges. Therefore, this paper seeks to examine the extent to which the use of predictive justice algorithms can aid and assist judges and magistrates, thereby enhancing judicial efficiency and transparency. Finally, the paper delves into the challenges posed by the use of predictive justice algorithms, with respect to the process of judicial decision making. Further, the paper critically evaluates concerns pertaining to transparency, accountability and preservation of constitutional principles, stemming from a potential risk of automation bias in the outcomes proposed by the predictive models. The author shall conclude the discussion by suggesting that a comprehensive regulatory framework is necessary to address the skepticism around AI driven outcomes, and to facilitate the integration of predictive justice analytics into the domain of dispute adjudication in a seamless manner.*

**KEYWORDS:** *Machine Learning, Predictive Justice, Supervised Learning, Natural Language Processing, Criminal Justice Administration*

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## INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

In simple words, AI refers to the ability of computers, machines or robots to successfully execute complex tasks and advanced functions, using a set of algorithmic technologies.

These tasks and functions are such that are ordinarily performed by humans through extensive application of analytical, cognitive and behavioural skills. According to Section 238 (g) of the John S. McCain National Defence Authorisation Act [1] for Fiscal Year 2019, the term 'AI' includes each of the following:

1) Any artificial system which is capable of performing tasks under different kinds of unforeseen circumstances without human intervention, or that can automatically improve its performance when exposed to fresh data sets, by learning and drawing statistical inferences from prior experiences.
2) Any artificial system that can comfortably solve problems which otherwise require sophisticated, anthropomorphic abilities such as perception, cognition, learning, and communication, for optimum execution.
3) An artificial system designed to think or act like a human. This includes cognitive architectures and neural networks.
4) An artificial system designed to act rationally, such that it achieves the intended objective through perception, planning, reasoning, learning, communication and decision making.
5) A set of techniques meant for the purpose of approximating a cognitive task with reasonable accuracy. This includes Machine Learning, one of the most widely used AI driven technologies.

## UNDERSTANDING MACHINE LEARNING

Machine Learning is an umbrella term that refers to a group of computer algorithms, capable of progressively achieving enhanced accuracy with respect to automation, prediction and approximation of outcomes, by observing and analysing a large body of pre classified and categorized datasets within a structured database, thereby detecting recurring patterns in the data so analysed. It is on the basis of the information obtained from these inferred patterns, that the algorithm learns to make intelligent decisions and accurate predictions. Therefore, it is assumed that the algorithm is 'learning' to improve its performance. However, it cannot be asserted that the algorithm exhibits cognitive

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[1] The John S. McCain National Defence Authorisation Act For Fiscal Year 2019, s. 238(g)

skills akin to the ones that are routinely displayed by humans, because, even the most sophisticated technologies fail to surpass human intellect, which is characterized by abstract reasoning and flexibility.

## SUPERVISED LEARNING MODELS

Inputs that are fed into an algorithm are examined, processed and analysed to continuously derive new sets of rules that can be applied to enhance the accuracy of the outcomes predicted. Machine learning algorithms are often utilized by social media platforms for the purpose of identifying and segregating unsolicited commercial messages (popularly known as 'spam') from the ones that the user intends to retain and preserve. Out of all the messages received by a user on a given day, when he consciously marks some of them as unwanted, he is practically feeding a categorized prototype of spam data into the algorithm, to be analysed for detecting similar patterns in subsequent samples. Further, this also enables the algorithm to learn about verified samples of messages that the user considers urgent and important.

The process of training an algorithm using sample datasets that have been comprehensively and exhaustively structured and categorized, thereby enabling it to learn from the statistical patterns so inferred, and make automated decisions on new data, represents an approach known as 'Supervised Learning'. Once an algorithm has been trained to spot the common characteristics shared by the datasets within a given category of prototypes, it can successfully distinguish between the samples belonging to different categories. As and when the algorithm is exposed to newer forms of categorized data, it continues to detect subsequent patterns, thereby adding to the body of statistical rules that it has inferred and mastered over time. This enables the algorithm to synergize previously learnt rules with the newly derived ones, thereby forming effective statistical associations across multiple categories of verified datasets, to make sensible and accurate predictions.

## THE CONCEPT OF PREDICTIVE JUSTICE

The art and science of prediction has always been fundamentally intrinsic to the domain of dispute resolution. Judicial precedents, legal principles and doctrines, and legislative statutes and orders are meticulously examined to ensure fairness and transparency. Predictive justice refers to the use of machine learning algorithms for analysing large volumes of legal and judicial data, to make predictions about the probable outcomes of legal disputes, with as much accuracy as possible.

As per Professor Bruno Dondero, "It is about trying to predict, with the least possible uncertainty, what the response of court X will be when confronted with case Y".[2] As stated previously, the availability of credible and bona fide sources of data is essential for the algorithm to function optimally. So far as the legal domain is concerned, a primary source of data is the letter of law itself. Majority of contemporary legal systems draw their legitimacy from authoritative legal doctrines that have been expressly codified in the form of official legal documents such as the Constitution, administrative procedures, judicial precedents, landmark judgements, statutes, orders, rules, reports and decisions of the court. The text and subject matter of the bare acts and legal documents serve as the raw data that is fed into the algorithm, and is subsequently organized, structured, categorized and statistically analysed for the purpose of identifying patterns and drawing computational inferences.

## PREDICTIVE JUSTICE & SUPERVISED LEARNING

In supervised learning, the system functions under the control and supervision of an instructor who supplies a large set of input pairs (also known as the learning algorithm) to the system, each of which contains accurate solutions to specific problems. Based on the information provided by these input pairs, the machine learning system develops a model that enables it to form statistical associations between different features of the input pairs and the probable outcomes. The learned algorithm is then employed by the system to analyse new cases and generate accurate responses.

In context of predictive justice, the learning algorithm would consist of past cases and precedents, and each input pair would contain the description of a case in the form of facts, legal issues, and the arguments advanced by the parties to the matter; and the judgement pronounced by the court. Therefore, the predictions shall not be used to determine the decisions of the court, but would merely serve as recommendations to ensure fair administration of justice, and enhance efficiency and transparency.

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[2] Saliha Yassine, Mustapha Esghir, Ouafaa Ibrihich, "Using Artificial Intelligence Tools in the Judicial Domain and the Evaluation of their Impact on the Prediction of Judgments" 220 *Procedia Computer Science* 1021 (2023)

## PREDICTIVE JUSTICE & NATURAL LANGUAGE PROCESSING

Antoine Garapon, a French jurist, has defined predictive justice as "The capacity of the machines to convert quickly, the applicable law into the natural language, in order to treat a court case and to anticipate the probability of the decision which can occur".[3] The term 'Natural Language' refers to the ordinary language associated with human communication. Thus, books, letters, articles, contracts and other forms of legal texts are classified as natural language documents because they are expressed in languages that can be comprehended by humans.

On the other hand, 'Formal Language' consists of encrypted computational codes that can only be processed by machines such as computers. Therefore, 'Natural Language Processing' enables large, pre trained models to recognize, analyse and understand human language. For predictive judicial analysis of civil, criminal or constitutional matters, these models are exposed to large volumes of textual data collated from multiple sources such as judicial records, case repositories of High Courts and the Supreme Court, journals and legal research databases. When the details of a certain case, such as the nature, key facts and subject matter of the dispute, are fed into the model, it can predict the likely outcome of the case, to a certain extent, by inferring statistical associations between judicial trends and precedents; and recurrent citations or legal arguments.[4]

## CHALLENGES FACED BY THE INDIAN JUDICIAL SYSTEM

The Indian judicial system is plagued by multiple challenges. The current landscape of dispute adjudication and justice administration in India is pervaded by procedural complexities and most importantly, an extensive backlog of pending cases. As of April 2018, there are over three crore cases pending across the Supreme Court, the High Courts, and the subordinate courts (including district courts).[5] Excessive pendency eventually leads to delayed, and sometimes inefficient administration of justice. Further, the Indian judicial system grapples with a series of institutional hurdles.

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3 Myltseva Veronika, "The Legal Nature and Principles of The Predictive Justice" 11 *Law of Eastern European States (ReOS)* 59 (2019)

4 Federico Galli, Giovanni Sartor, "AI Approaches to Predictive Justice: A Critical Assessment" 5 *Humanities and Rights Global Network Journal* 165 (2023)

5 Roshni Sinha, "Vital Stats: Pendency of Cases in the Judiciary" *available at* https://prsindia.org/policy/vital-stats/pendency-cases-judiciary (PRS Legislative Research, 2018)

First, there is an acute shortage of judges. Despite recurring vacancies in lower courts across the country, incessant delays and inconsistencies in recruitment and appointments eventually lead to a skewed Judges to Population Ratio. As per the recommendations of the Law Commission, there ought to be at least 50 judges per million population. On the contrary, as of 2021, the number of judges per million population (with respect to the sanctioned strength of judges) is 21, far below the global average.[6]

Secondly, inadequate budgetary allocation leads to infrastructural deficits. Courts across India lack the requisite resources and technological capabilities that are essential for the administration of justice and delivery of quality judgements. Certain matters that are brought forth in the courts tend to be inherently complex, and it has often been observed that the system is inept to resolve such cases in a timely fashion. This issue is further exacerbated by the inadequate integration of technology within the judicial domain. At present, court management systems have been crippled by primitive digital infrastructure, inconsistent data management, lack of standardized digital repositories, and minimal utilization of advanced analytical capabilities.[7]

Thirdly, the arbitrary exercise of judicial discretion (with respect to sentencing, bail, remand, and injunction, etc.), and the lack of standardized interpretation and application of legal statutes, doctrines, and judicial precedents have been heavily criticized. Therefore, it is in context of these challenges that the potential benefits of incorporating predictive justice analytics within the domain of dispute adjudication, must be objectively assessed and examined.

## THE USE OF PREDICTIVE JUSTICE MODELS FOR ENHANCING JUDICIAL EFFICIENCY

While the use of AI driven models for the purpose of justice administration is seen as a recent development, the roots of the discourse around the concept of predictive justice extend deeper into the past.

In 1963, Lee Loevinger, a renowned American lawyer, proposed the concept of ‘Jurimetrics’ as a new branch of science concerned with the quantitative analysis of judicial behaviour, the application of communication and information theory to legal expression, the use of mathematical logic in law, the retrieval of

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6 Press Information Bureau (PIB) Delhi, “Inadequate Fast Track Courts and Vacancies in Courts” (Ministry of Law and Justice, 2022)

7 Dr. Rahul Kailas Bharati, “Predictive Justice in Indian Courts: Machine Learning Approaches to Case Outcome Forecasting” 25 *International Journal of Machine Learning* 255 (2024)

legal data by electronic and mechanical means, and the formulation of a calculus of legal predictability.[8] The interplay of technology and justice presents an exhaustive range of possibilities for enhancing efficiency and fairness.

First, predictive justice models can eliminate factors that are irrelevant to the merits of a particular case and boost legal certainty, thereby fostering fairness and transparency in the judicial decision making process. This ensures a standardized approach towards the interpretation and application of laws in the courts, while keeping a check on the inconsistent exercise of judicial discretion, since the proposed outcomes and decisions shall be rooted in objective analysis of facts and precedents, rather than subjective judgement.

Secondly, predictive justice models facilitate the analysis of large volumes of raw, unindexed data in a coherent and structured manner. By utilizing data driven insights to ensure that the suggested outcomes are free from arbitrary biases and other extraneous influences, these models can reinforce public trust in the judicial system. Therefore, predictive judicial analysis of disputes can bring about equity and uniformity within the legal framework.

Thirdly, the deployment of predictive justice models can substantially democratize access to legal knowledge and information. These models are capable of facilitating seamless dissemination of information relevant to the administration of justice, thereby allowing individuals from diverse backgrounds to gain insights into legal processes, rights, and obligations using advanced legal research databases and AI driven search engines that were previously difficult to access. As a result, enhanced access to knowledge and information shall enable the members of the civil society to become more resilient and united in their pursuit of justice. It empowers the citizens to effectively navigate the complex landscape of legal procedures and judicial protocols.

Lastly, predictive justice models can substantially alleviate the administrative burden on public service institutions and foster a healthy and meaningful discourse around law and policy between the state and the citizens, thereby encouraging active community advocacy.

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[8] Myltseva Veronika, "The Legal Nature and Principles of The Predictive Justice" 5 *Law of Eastern European States (ReOS)* 59 (2019)

## THE USE OF PREDICTIVE ANALYTICS FOR THE ADMINISTRATION OF JUSTICE: ETHICAL CONCERNS & LEGAL CHALLENGES

Advocates and proponents of predictive justice swear by its transformative potential within the judicial framework. However, the proposed use of predictive algorithms for the administration of justice has generated waves of apprehension and scepticism across the fraternity.

According to the findings of the European Commission for the Efficiency of Justice (CEPEJ), the implementation of predictive justice models within the judicial domain is far from feasible. This is because it is not possible for a machine to replicate legal reasoning. It does not explain the literal meaning of the law, the intent of the legislature, or the behavioural patterns of judges. It merely provides a statistical context in terms of probability. These contentions are based on the assumption that machines can be intelligent, but they cannot outperform humans because they lack wisdom and abstract reasoning abilities.

Secondly, it has been argued that the accuracy of the probable outcomes tabled by predictive justice models is directly proportional to the authenticity and integrity of the data that is fed into the algorithms, according to which the predictions are made. This has given rise to concerns regarding algorithmic bias, which basically refers to the erroneous assumptions made by AI driven models that lead to discriminatory outcomes. If the learning algorithm is vitiated by discrepancies or arbitrary assumptions, there is a strong possibility that these biases shall be augmented to a great extent.

Thirdly, there have been apprehensions regarding transparency and accountability. It has been argued that the use of predictive algorithms shall lead to erosion of public faith within the judiciary because it is difficult to identify, interpret and understand the processes and methods adopted by the model to arrive at a particular conclusion.

However, one of the most acute concerns relates to the probable emergence of a scenario characterized by ‘robotic justice’ and ‘robot judges’. These fears are based on the assumption that the use of predictive analytics within the realm of justice administration, shall lead to machines entirely substituting human judges. Further, it has been argued that this can give rise to automation bias, which refers to the human tendency to arbitrarily conform to the outcomes proposed by the algorithm, without actively challenging or engaging with the rationale behind the

probable outcome. In other words, the predictions made by the model can have an a detrimental effect on the independence of the judiciary.

The judges, who are already overwhelmed by an extensive backlog of pending cases, may be tempted to blindly follow the automated predictions, in a bid to wrap up and conclude the case quickly and move on to the matter. This shall adversely affect the justice delivery mechanism as well as the quality of judgements rendered.

It is pertinent to examine whether an algorithm that has been trained on the basis of textual precedents, is reliable and capable enough to make predictions, because the text and subject matter of a judgement does not always and necessarily represent the legal and factual reality of the dispute.[9] It is important to understand that judgements are not reports or descriptive accounts that present the facts of a particular case and the contentions put forth by the parties to the dispute. Lastly, the implementation of AI driven technologies has wide ranging financial implications. These technologies can be far too complex for an average citizen to comprehend. Hence it can alienate many potential litigants, thereby making them averse to the idea of approaching the courts.[10]

## REGULATING THE USE OF PREDICTIVE ANALYTICS WITHIN THE JUDICIAL DOMAIN: RECOMMENDATIONS & WAY FORWARD

The fundamental ethical challenge with respect to the implementation of AI driven technologies within the judicial domain revolves around the adoption of adequate measures to strike a fine balance between scientific advancement and a commitment to the sacred principles of justice, such as transparency, accountability, and fairness. In the absence of a regulatory framework to address the challenges posed by the use of predictive algorithms, the preservation of constitutional principles such as justice and equality becomes inevitable. In order to address the concerns expressed against the implementation of predictive algorithms within the judicial realm, several recommendations have been proposed to ensure that the principles of equity and natural justice are duly preserved.

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9 Federico Galli, Giovanni Sartor, "AI Approaches to Predictive Justice: A Critical Assessment" 5 *Humanities and Rights Global Network Journal* 165 (2023)

10 Bhishm Khanna, "Predictive Justice: Using AI for Justice" (Atlas - CPPR South Asia Public Policy Challenge) *available at* https://www.cppr.in/articles/predictive-justice-using-ai-for-justice (Centre for Public Policy Research, 2020)

First, the legal and ethical challenges with respect to lack of trust and accountability can be tackled by adopting alternate approaches such as Explainable AI (also known as XAI). By providing meaningful insights into the methods and techniques employed by the algorithm to arrive at a particular decision, XAI can enable the judges to objectively assess the rationale behind the predictions made by the algorithm, thereby fostering transparency and procedural sanctity.

Second, the learning algorithm must scrutinised by external auditors at regular intervals to prevent algorithmic determinism. Hence, a regulatory committee must be constituted to evaluate the integrity and reliability of the data that is used by the algorithm to generate outcomes. The said committee must be governed by a board of experts who possess the legal, technical, and scientific prowess to facilitate the implementation of predictive algorithms and to interpret the recommendations made by the algorithm with reasonable accuracy and fairness. Therefore, a set of rules and principles ought to be formulated to ensure that human dignity is safeguarded and upheld.

Third, the assumption that predictive algorithms shall entirely neutralize human intervention within the judiciary by making decisions on behalf of the judges, is nothing but a baseless fallacy. This is because the algorithm merely provides a standardized context for reference, within which the legally established procedures and principles for the administration of justice, must be adhered to by the judges. Further, judges and judicial officers must be trained to comprehend and interpret the predictive cues generated by the algorithm.

## CONCLUSION

The object of this paper was to examine the scope of the application of predictive algorithms within the realm of dispute adjudication. Predictive justice models should not be regarded as tools for achieving perfectly ideal, utopian outcomes. The predictions made by these algorithms are driven and influenced by the information that is supplied to them. Therefore, efforts should be made to strike a balance between algorithmic precision and human reasoning. While technological advancements can effectively address the challenges faced by the Indian judicial system, it is crucial to incorporate human judgment in order to ensure fair and equitable results. Furthermore, these models have to be continuously assessed and monitored so as to weed out any discrepancies that might emerge with the passage of time.

In order to foster transparency and accountability, the state must develop a regulatory mechanism to deal with the ethical considerations emanating from the

use of predictive algorithms. Equal access to justice is an essential attribute of a democratic polity. Therefore, policymakers, technical experts, and members of civil society should call for adequate checks and balances to ensure that the trust bestowed by the general public upon the judiciary remains intact.