# JUDGING IN THE FUTURE: LEVERAGING AI IN THE COURTROOM TO ENHANCE THE CRIMINAL JUSTICE SYSTEM

Dr. Sukriti Yagyasen, St. Joseph's College of Law, Bengaluru

## ABSTRACT

In an era where technological advancements are reshaping every aspect of society, the criminal justice system stands at the forefront of innovation. "Judging in the Future" embodies the proactive approach of embracing emerging technologies to address longstanding challenges within the legal sphere. By incorporating artificial intelligence (AI) into courtroom proceedings, we embark on a journey towards a more efficient, fair, and transparent justice system. This paper will try to analyse this aspect.

AI's potential to revolutionize the legal landscape is profound. Through advanced algorithms and machine learning, AI can assist judges in analysing complex legal data, identifying patterns in case law, and predicting outcomes with greater accuracy. This augmentation of judicial decision-making not only expedites the trial process but also ensures consistency and impartiality in verdicts.

However, the integration of AI into the criminal justice system is not without its complexities and ethical considerations. Questions regarding data privacy, algorithmic bias, and the preservation of human rights loom large. Therefore, as we navigate this technological frontier, it is imperative to uphold principles of fairness, accountability, and transparency.

By leveraging AI in the courtroom, we have the opportunity to enhance the criminal justice system's effectiveness while upholding the fundamental principles of justice. Through collaborative efforts between legal experts, technologists, and policymakers, we can pave the way for a future where justice is not only blind but also empowered by the insights of artificial intelligence.

**Keywords:** Policy, Artificial Intelligence, Criminal Law, Judiciary, Compassion, Professional Ethics.

## Judging in the Future: Leveraging AI in the Courtroom to Enhance Criminal Justice System

Popular media often portrays artificial intelligence ("AI")[1] as if it were an independent actor making its own decisions. This tendency to anthropomorphize AI is understandable—after all, algorithms sometimes produce results that are strikingly different from what their designers expected, giving the impression of autonomy.

Take, for example, an algorithm that was instructed to sort data. Instead of performing the task as intended, it deleted the entire dataset—apparently reasoning that data which no longer existed could not be considered unsorted. While amusing, such outcomes can give the illusion that the algorithm was "thinking" for itself.[2]

In reality, however, the algorithm was not being clever or playful. It was simply carrying out the instructions programmed by its human creators, who had not anticipated that their design might interpret the directive in this unintended way. Placing the focus on the algorithm as the decision-maker obscures the fact that responsibility ultimately lies with humans and the institutions shaping these technological choices.

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[1] This Article defines artificial intelligence as a class of technologies that rely on some form of automated decision making executed by a computer. AI, as used in this Article, includes both AI-driven robots and AL algorithms that lack a bodied form, whether they employ machine learning or another method. *See* Jack M. Balkin, *The Path of Robotics Law,* 6 CALIF. L. REV. CIR. 45, 45-46 (2015) ("I do not distinguish sharply between robots and artificial intelligence (AI) agents. As innovation proceeds, the distinction between these two kinds of technologies may be far less important to the law .... "); Andrew Tutt, *An FDA for Algorithms,* 69 ADMIN L. REV. 83, 85 n.2 (2017) (noting a "terminological divide in legal scholarship" wherein "[s]ome of the most prominent authors in the field prefer to conceive of algorithmic regulation as the problem of regulating robots" and asserting that "algorithms are the appropriate unit of regulation"). The understanding used in this Article thus applies "regardless of whether [the particular technologies under consideration] are physical robots, such as care robots or driverless cars, or software systems, such as medical diagnosis systems, intelligent personal assistants, or algorithmic chat bots, in real, virtual, contextual, and mixed-reality environments." INST. OF ELEC. ELEC. ENG'RS, ETHICALLY ALIGNED DESIGN: A VISION FOR PRIORITIZING HUMAN WELL-BEING WITH AUTONOMOUS AND INTELLIGENT SYSTEMS 17, (1st ed. 2019), https://standards.ieee.org/content/dam/iee e-standards/standards/web/documents/other/eadl e.pdf [https://perma.cc/MC7P-KZJX].

[2] *See* Joel Lehman et al., *The Surprising Creativity of Digital Evolution: A Collection of Anecdotes from the Evolutionary Computation and Artificial Life Research Communities,* ARXIV 7 (Nov. 21, 2019), https://arxiv.org/pdf/1803.03453.pdf [https://perma.cc/2U68-SCX9] (documenting research results that differed from what data scientists expected).

instructed to sort data. Instead of performing the task as intended, it deleted the entire dataset—apparently reasoning that data which no longer existed could not be considered unsorted. While amusing, such outcomes can give the illusion that the algorithm was "thinking" for itself.

In reality, however, the algorithm was not being clever or playful. It was simply carrying out the instructions programmed by its human creators, who had not anticipated that their design might interpret the directive in this unintended way. Placing the focus on the algorithm as the decision-maker obscures the fact that responsibility ultimately lies with humans and the institutions shaping these technological choices. This human–machine dynamic is crucial to understand when discussing the deployment of AI in socially significant spaces such as the criminal justice system.[3]

As courts around the world begin experimenting with AI to support judicial processes, the promise of technology in enhancing efficiency, transparency, and access to justice grows stronger. Yet, the dangers of treating algorithms as autonomous actors—while overlooking the human choices embedded in their design—remain ever present. The real task, therefore, is not to imagine AI as replacing the role of judges, but to examine how it can responsibly complement judicial reasoning. This article explores how AI might be leveraged in the courtroom to strengthen the criminal justice system,[4] while critically assessing the risks, safeguards, and ethical considerations that must accompany its adoption.

## 1. Administering Artificial Intelligence

Administering AI requires more than simply borrowing old regulatory models and applying

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[3] *See, e.g.,* Jennings Brown, *UPS Has Been Delivering Cargo in Self-Driving Trucks for Months and No One Knew,* GIZMODO (Aug. 15, 2019, 12:50 PM), https://gizmodo.com/ups-has-been-deliveringcargo-in-selfdriving trucks-fo-1837272680 [https://perma.cc/2TR7-6VQD]; Megan Rose Dickey, *Nuro and Kroger Are Deploying Self-Driving Cars for Grocery Delivery in Arizona Today,* TECHCRuNCH  (Aug. 16, 2018, 5:00 AM), https://techcrunch.con2018/08/16/nuro-and-kroger-are-deploying-self-driving-cars-for-grocery-delivery-in arizona-today [https://perma.cc/PP5E-WTMG].

[4] *See* U.S. DEP'T OF TRANSP., PREPARING FOR THE FUTURE OF TRANSPORTATION: AUTOMATED VEHICLES 3.0 (2018) ("AV 3.0 [p]rovides [n]ew [m]ultimodal [s]afety [g]uidance [that] . . . [a]ffirms the approach outlined in *A Vision for Safety 2.0* and encourages automated driving system developers to make their Voluntary Safety Self-Assessments public to increase transparency and confidence in the technology."). In January 2020, the DOT issued a request for public comments on a draft version of AV 4.0. Notice of Request for Comments: Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0 (AV 4.0), 85 Fed. Reg. 7011 (Feb. 6, 2020). This draft, in keeping with earlier versions of these guidance documents, indicates that the government will "promote voluntary consensus standards as a mechanism to encourage increased investment and bring cost effective innovation to the market more quickly." *See* NAT'L SCI. & TECH. COUNCIL & U.S. DEP'T OF TRANSP., ENSURING AMERICAN LEADERSHIP IN AUTOMATED VEHICLE TECHNOLOGIES 29 (2020).

them to a new technology.[5] While comparisons to areas like pharmaceuticals or environmental regulation are useful, AI is different in important ways. Its speed, complexity, and unpredictability mean that traditional oversight tools—such as licensing or sector-specific compliance checks—struggle to keep pace. Instead of waiting until problems surface, regulation has to move earlier in the process, focusing on the data, design choices, and incentives that shape AI systems.[6] This kind of forward-looking approach is essential if we want AI to reflect public values rather than being driven solely by private interests.

Some of this responsibility naturally falls on administrative agencies, which can create rules, demand transparency, and require algorithmic impact assessments before technologies are widely deployed. These tools work like early warning systems, helping to spot risks such as bias, poor-quality data, or cybersecurity weaknesses before they cause harm. But they cannot work in isolation. AI cuts across so many sectors—from healthcare to finance to criminal justice—that no single regulatory model will be enough. Agencies need both flexibility and technical expertise to respond to AI's fast-changing nature.

Courts, too, have a crucial role in keeping AI accountable. Judges are often where the human consequences of technology first become visible—whether in disputes about the use of predictive policing, the fairness of risk-assessment tools, or the admissibility of algorithmic evidence. The judiciary does not regulate AI directly, but it does act as a powerful check on both government agencies and private developers. By insisting that algorithmic tools comply with constitutional protections and principles of fairness, judges ensure that the use of AI does

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[5] Technology law scholars have not yet robustly explored collaborative governance for AI. As Margot Kaminski observes, the literature on collaborative governance and algorithms tends to be limited to a specific context, such as health law, *see, e.g.,* W. Nicholson Price II, *Regulating Black-Box Medicine,* 116 MICH. L. REV. 421 (2017) [hereinafter Price, *Regulating Black-Box Medicine],* or copyright law, *see, e.g.,* Maayan Perel & Niva Elkin-Koren, *Accountability in Algorithmic Copyright Enforcement,* 19 STAN. TECH. L. REV. 473 (2016). *See* Margot E. Kaminski, *Binary Governance: Lessons from the GDPR's Approach to Algorithmic Accountability, 92* S. CAL. L. REV. 1529, *1535* n.8 (2019). Relatively few works specifically discuss collaborative governance and algorithms. *See* Michael Guihot et al., *Nudging Robots: Innovative Solutions to Regulate Artificial Intelligence,* 20 VAND. J. ENT. *&* TECH. L. 385 (2017); Kaminski, *supra.* This Article goes beyond an initial survey of collaborative governance as a regulatory option and focuses in greater depth on systemic AI development and deployment choices with both "virtual" and "real" consequences, including the prospect of physical harm. Blending analytic tools from administrative law, collaborative governance, and cyberlaw, it is the first account to not only assess the available regulatory toolkit, but also take a hard look at the public-private institutional dynamics and incentives that might make collaborative governance more or less feasible in both the immediate and longer term.
[6]    NATHAN    BENAICH    &    IAN    HOGARTH,    STATE    OF    AI    REPORT    42    (2019), https://www.slideshare.net/StateofAIReport/state-of-ai-report-20 19-151804430 [https://perma.cc/Q3ZQ -4TYK] (reporting fifty-seven first author papers by Google-affiliated authors at NeurIPS 2018, as compared to forty-four by MIT and thirty-eight by Stanford).

not erode the rule of law.

Taken together, these roles suggest a hybrid model of governance. Agencies bring technical expertise and proactive oversight, while courts safeguard individual rights and provide democratic legitimacy. Neither can succeed alone, but together they can build a framework that balances innovation with accountability. Such an approach prevents AI from becoming a form of private rulemaking by powerful companies, and instead grounds it in principles of transparency, fairness, and justice.

## 2. Artificial Intelligence and Evidence Appreciation- Challenges in Judicial Evaluation of AI-Generated Evidence

The growing use of artificial intelligence (AI) systems powered by machine learning (ML) to collect and process information brings new challenges for the courtroom. Admitting such evidence raises questions not only about the general reliability of electronic evidence but also about the inherent limitations of ML. Treating AI systems as automatically reliable oversimplifies the issue—software can produce subtle errors that are not immediately apparent. This challenge is compounded by the fact that ML and AI operate in ways that are often non-transparent, making it difficult to prove or disprove their reliability. Moreover, because AI systems generate outputs based on datasets containing embedded human judgments, applying traditional rules such as hearsay may need to be reconsidered. Courts will need clear procedures to authenticate electronic evidence, especially in an era of "deepfakes" and digitally manipulated data. The use of predictive coding and other AI tools in discovery further highlights the importance of examining software code and ensuring transparency before relying on such evidence in legal proceedings.[7]

These challenges highlight why AI cannot replace human judges in legal proceedings. Unlike a judge, an AI system cannot interpret the law, weigh competing arguments, or consider the broader social and ethical implications of a case.[8] Its outputs are limited to patterns found in data and the instructions it has been given, which means it can replicate biases, overlook

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[7] David Poole, Alan Mackworth & Randy Goebel, *Computational Intelligence: A Logical Approach* (Oxford University Press, 1998) at p 1.
[8] "The Life Scientific" *BBC Radio 4 (5* November 2019), presented by Prof Jim Al-Khalili and produced by Anna Buckley, with Demis Hassabis speaking about artificial intelligence.

context, or misinterpret nuanced human behaviour.[9] Judicial reasoning requires judgment, discretion, and accountability—qualities that AI, no matter how sophisticated, cannot possess. While AI can support courts by organizing information or identifying patterns, the ultimate responsibility for assessing evidence, applying the law, and ensuring justice must remain firmly in human hands.[10]

### 3.   Ensuring Transparency in Judicial Decision-Making vs. AI Black Boxes

Predicting judicial outcomes with precision is inherently difficult—a phenomenon known as **legal uncertainty**. As Professor Anthony D'Amato explains[11], some legal rules may have expected outcomes near 50%, making them barely distinguishable from random chance.[12] Factors contributing to this uncertainty include the ambiguity of legal language, the use of open norms like the "reasonable person" standard, and the evolving nature of society and technology.[13]

By conceptualizing legal uncertainty in terms of mathematical function maximization, it is possible to visualize the range of legally valid outcomes for a given dispute. AI "black boxes" can generate multiple plausible solutions, reflecting this uncertainty more transparently than traditional single-outcome judgments. If judges were to communicate all legally defensible solutions, they could reduce the hidden, human "black box" element in decision-making, enhancing both transparency and predictability.[14]

Yet, AI cannot replace the human judge. Judicial decision-making requires interpretation, discretion, and accountability. Judges must weigh not only legal validity but also social

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[9] Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies* (Oxford University Press, 2014) at p 18 (all three definitions). See also Kathleen Walch, "Rethinking Weak vs. Strong Al" *Forbes* (4 October 2019).

[10] For examples, see *Electronic Evidence* (Stephen Mason & Daniel Seng eds) (Institute of Advanced Legal Studies for the SAS Humanities Digital Library, School of Advanced Study, University of London, 4th Ed, 2017), open access in the Humanities Digital Library <http://ials.sas.ac.uk/digital/humanities-digital-library/observing-law-ialsopen- book-service-law/electronic-evidence> (accessed 15 July 2020) (hereinafter *"Electronic Evidence* (4th Ed)").

[11] Arnaud Raynouard & Anne-Julie Kerhuel, *Measuring the Law: Legal Certainty as a Watermark,* 8 INT'L J. DISCLOSURE & GOVERNANCE, 360,362 (2010).

[12] *See generally* John F. Davis & William L. Reynolds, *Juridical Cripples: Plurality Opinions in the Supreme Court,* 23 DUKE L.J. *59* (1974) (arguing that legal uncertainty inhibits a court's leadership role and its ability to develop laws).

[13] D'Amato, *Legal Uncertainty,* 71 CAL. L. REV. 1, 2 (1983)

[14] Kevin Strom, *Research on the Impact of Technology on Policing Strategy in the 21ˢᵗ Century, Final Report* (National Criminal Justice Reference Service, September 2017) <https://www.ncjrs.gov/pdfflilesl/nij/grants/251140.pdf> (accessed 15 July 2020).

acceptability, policy implications, and ethical considerations—tasks that AI cannot perform[15]. While AI can map possibilities and highlight patterns, the ultimate responsibility for evaluating evidence and delivering just outcomes must remain with human judges.[16] This balance preserves fairness, accountability, and public trust, ensuring that AI remains a tool for support rather than a substitute for human judgment.[17]

### 4. Conclusion

- AI has the potential to enhance efficiency, transparency, and access to justice in the courtroom, but it cannot replace the nuanced judgment of human judges.

- Algorithms are not autonomous decision-makers; their outputs reflect human programming, design choices, and embedded biases.

- Machine learning systems pose unique challenges for evidence evaluation, including reliability, transparency, and admissibility, especially in contexts like predictive coding and digitally manipulated data.

- Legal uncertainty is an inherent feature of judicial decision-making, which cannot be fully captured by AI or predictive models. Human judgment remains essential to interpret law, weigh competing arguments, and assess social and ethical implications.

- Conceptual frameworks, such as visualizing legal outcomes as "case-functions" or using mathematical function maximization, can improve transparency and help both judges and lawyers understand the range of legally valid solutions.

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[15] H. KELSEN, PURE THEORY OF LAW (M. Knight trans., The Lawbook Exchange 2d ed. 2009); Giuseppe Dari-Mattiacci & Bruno Deffains, *Uncertainty of Law and the Legal Process,* 163 J. INST. THEORETICAL ECON., 627, 629 (2007) (arguing that the difficulty of predicting law can be attributableto "the natural process of obsolescence due to continual changes in society and technology ... ").

[16] Patrick Perrot (Gendarmerie Nationale, Ministry of Interior, Paris, France), "What about Al in Criminal Intelligence? From Predictive Policing to Al Perspectives" (2017) 16 *European Police Science and Research Bulletin* 65; Walter L Perry *et al, Predictive Policing: The Role of Crime Forecasting in Law Enforcement Operations* (Rand Corporation, 2013), <https://www.rand.org/content/dam/rand/pubs/ research-reports/RR200/RR233/RANDRR233.pdf> (accessed 15 July 2020); Albert Meijer & Martijn Wessels, "Predictive Policing: Review of Benefits and Drawbacks" (2019) 42(12) *International Journal of Public Administration* 1031.

[17] Jason Tashea, *Courts Are Using AI to Sentence Criminals. That Must Stop Now,* WIRED (Apr. 17, 2017, 7:00 AM), https://www.wired.com/2017/04/courts-using-ai-sentence-criminals-must-stop-now/ [https://perma.cc/Z74F-Y865]. (arguing that such artificial intelligence lacks transparency in its decision making process as compared to human judges).

### 5. Recommendations

- **Hybrid Governance Approach:** Encourage collaboration between administrative agencies and the judiciary to ensure AI aligns with public values while maintaining accountability and fairness.

- **Transparent AI Use in Courts:** Develop clear procedures for the authentication, validation, and auditing of AI-generated evidence before it is relied upon in judicial proceedings.

- **Judicial Training:** Equip judges with sufficient understanding of AI systems, their limitations, and potential biases to critically evaluate algorithmic evidence.

- **Visualization Tools for Legal Uncertainty:** Implement frameworks like "case-functions" to map multiple legally defensible outcomes, supporting transparency and informed decision-making.

- **Forward-Looking AI Integration:** Use AI as a support tool to identify patterns, organize evidence, and forecast outcomes, while ensuring ultimate decision-making authority remains with human judges.

- **Ethical and Social Safeguards:** Continuously assess AI tools for potential bias, fairness, and societal impact, prioritizing human oversight over automated decision-making.

- **Resource Allocation:** Provide courts with technical support and infrastructure to manage AI-assisted processes efficiently, minimizing additional workload while maximizing benefits.