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The Use of Algorithms to Support Judicial Decision-Making in Criminal Matters with a Special Focus on Trial Decisions*

Wykorzystanie algorytmów do wspomagania sądowego procesu decyzyjnego w sprawach karnych, ze specjalnym uwzględnieniem decyzji procesowych

ABSTRACT

The article focuses on comparing human and artificial intelligence (AI) in legal decision-making in the realm of criminal justice, through addressing the limitations and potential of AI in the various stages of legal proceedings. While AI may be capable of assessing certain aspects of such procedures, its utilization remains narrow and cannot replace the nuanced judgment and contextual understanding provided by human decision-makers. As such, some of the main points to be discussed herein include exploring the domains in which AI could support specific steps in the decision-making processes within the criminal justice system, such as identifying elements of crimes through statistical patterns, reviewing the legality of judicial documents and potentially helping with routine decisions. The paper also highlights the limitations of AI, emphasizing its constraints in understanding context, meaning and causality, which are crucial in legal interpretations. The challenges presented by ethical and philosophical dilemmas surrounding the integration of AI into the justice system are also discussed, suggesting that while AI might aid in specific tasks, fundamental aspects of legal decision-making rooted in centuries-old axioms, such as individualised judgments and the consideration of human

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values like fairness and justice, remain beyond the capabilities of current AI systems. Finally, deliberation of the ongoing debates within the European Union regarding the utilization of AI, particularly legislation and regulation of ethical use in legal systems, highlighting the need for stringent rules and supervision to ensure accountability and to prevent potential misuse of AI technologies.

Keywords: digitalisation; criminal justice; algorithmic decision-making; trial phase

INTRODUCTION

In recent decades, rapid technological development in all areas of life has resulted in a novel digital revolution, with artificial intelligence (AI) becoming ever more powerful and spreading into the physical world, eventually cultivating the study digitalisation and the challenges it presents into the mainstream focus of legal research. Generally, the first wave of research was inspired by the emergence of a given method or procedure founded on technological advances, or the manifestation of new uses of digitalisation in both the private and public spheres, which thus contributed to focusing research on the new challenges these technologies generate. The emergence of interest in the available studies and the presence of unconcealed criticism has not hindered or limited the application of such solutions, while the caveats of the "Digital Wild West", non-regulation or the explicit lack thereof, will most definitely result in fundamental problems in the lives of individuals and communities.

Since the latter half of the 2000s, literature has transpired, addressing the challenges of digitalisation regarding general social, ethical and legal,[1] due in part to the rise of algorithms, their application and the mostly favourable reception of AI in general, i.e. outside the narrow technological profession. Advancing further, by and since the 2020s, AI is no longer an obscure or preposterous concept for the general population. This rapid development of AI has disembarked the encounter with the Collingridge dilemma, the double-bind paradigm that fails to bear the "proceed with caution" label.[2] In the early stages of the development of any type

[1] The international literature on the subject has flourished essentially since the second half of the 2000s. It is not possible to give an exhaustive list of topics, authors and publications, but only a few examples. See K. Ashley, *A Brief History of Changing Roles of Case Prediction in AI and Law*, "Law in Context" 2019, vol. 36; A. Zavrsnik, *Algorithmic Justice: Algorithms and Big Data in Criminal Justice Settings*, "European Journal of Criminology" 2019, vol. 18(5), pp. 623–642; T. Sourdin, *Judge v Robot? Artificial Intelligence and Judicial Decision-Making*, "UNSW Law Journal" 2018, vol. 41(4), pp. 1114–1133; Zs. Fantoly, Cs. Herke, B. Szabó, *The Role of AI-based Systems in Negotiated Proceedings*, "e-Revue Internationale de Droit Pénal" 2023, vol. 7(18), pp. 2522–2945.

[2] "Attempting to control a technology is difficult (…) because during its early stages, when it can be controlled, not enough can be known about its harmful social consequences to warrant controlling its development; but by the time these consequences are apparent, control has become costly and slow" (D. Collingridge, *The Social Control of Technology*, New York 1980, p. 19).

of new technology, its future impact on society and the environment is difficult to predict or comprehend, due to uncertainty, limited information and so many unforeseen complexities that may arise. The other side of the quandary is that once the given technology becomes entrenched and widely used, its increasingly difficult to control, regulate or change, as through its adoption, it is embedded in the structures and behaviours of society, and in general, those who use the technology. The regulation of technology poses a significant challenge for policymakers, who are often forced to make decisions based on limited information that is difficult, if not impossible, to reverse later. While some codification has already generated pioneering standards, many instruments are under development to address further, more binding regulation in national and international political and legislative areas[3] as well as in civil society, the business world[4] and the activist scene,[5] e.g. the Digital Humanism Initiative, geared toward preserving responsibility in light of technological advancement. In addition, the scientific community has stepped forward and begun to express its views as well, with a science-based activist approach whilst focusing on the intersection of the crossroads – the human role at the centre of it all.[6] At this point, policymakers' efforts have remained incomplete. The tsunami of relevant research and experiments demonstrates society's arrival in the future, now. It is evident that the parallel progress of the aforementioned processes provides an advantage that enables academic research results to be integrated into regulatory models, which presents an exceptional opportunity for legal scholars to collaborate with policymakers.

[3] General Assembly UN, Roadmap for Digital Cooperation A/74/821, 29 May 2020; European Ethical Charter on the Use of Artificial Intelligence (AI) in Judicial Systems and their environments, adopted at the 31st plenary meeting of the CEPEJ (Strasbourg, 3–4 December 2018); European Parliament resolution of 6 October 2021 on artificial intelligence in criminal law and its use by police and judicial authorities in criminal matters, 2020/2016(INI), OJ C 132/17, 24.3.2022; Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence (OJ EU 2024/1689, 12.7.2024), hereinafter: the AI Act.

[4] See Future of Life Institute, *Pause Giant AI Experiments: An Open Letter*, 22.3.2023, https://futureoflife.org/open-letter/pause-giant-ai-experiments (access: 15.12.2024); U.S. Chamber of Commerce, *Open Letter to State Leaders on Artificial Intelligence*, 29.11.2023, https://www.uschamber.com/technology/open-letter-to-state-leaders-on-artificial-intelligence (access: 15.12.2024); C. Metz, G. Schmidt, *Elon Musk and Others Call for Pause on A.I., Citing 'Profound Risks to Society'*, 29.3.2023, https://www.nytimes.com/2023/03/29/technology/ai-artificial-intelligence-musk-risks.html (access: 15.12.2024).

[5] See Fair Trials, *Artificial Intelligence (AI), Data and Criminal Justice*, https://www.fairtrials.org/campaigns/ai-algorithms-data (access: 15.12.2024).

[6] The Digital Humanism Initiative (https://caiml.org/dighum) is an international collaboration seeking to build a community of scholars, policy makers and industrial players who are focused on ensuring that technology development remains centered on human interests. See E. Prem, *Principles of Digital Humanism: A Critical Post-Humanist View*, "Journal of Responsible Technology" 2024, vol. 17.

The digitalisation processes and efforts affecting the legal system of society, and in a narrower approach, its justice system (broadly, the criminal procedural ecosystem[7]), appear along two main strands. On the one hand, "digital" developments have emerged (e-filing, automatic case allocation, databases, etc.) relevant to the organisation and administration of the judiciary, its workflows, human resources, both internal and external communication processes, all of which require considerable investment in infrastructure and capacity upon implementation, but support efficiency in the long term and do not require much real legal research to execute.

On the other hand, upon closer examination, digitization processes that are substantively linked to the core functioning of the criminal justice process in its entirety should be examined, but in a twofold approach. The possible application of technological developments in the field of evidence should be delved into separately from digitization efforts in the field of judicial decision-making. In the former case, technological advances precede the decision-making process, by helping expedite the acquisition of evidence, provide structure and improve efficiency for gathering evidence. Examples include solutions applicable in fact finding (facial recognition, voice recognition, motion detection, etc.) and evidence gathering. Digital support for judicial decision-making runs counter to the former, because an algorithmic solution facilitates and, in some cases, may replace the evaluation process (i.e. reasoning, explanation) and where possible, could summarize judges' activities or, e.g., AI-based virtual assistants could be present during judicial hearings and take minutes.

The fundamental question that remains concerns the extent to which algorithmic decision-making methods could facilitate or possibly even go as far as to replace the decision-making aspirations of human judges. This initial question suggests that the two types of decision-making mechanisms (human vs algorithmic/artificial) are comparable, but only from a limited perspective. Human intelligence – and therefore, human decision-making processes – may be imprecise, tend to be biased, subjective, and can be inconsistent, and they take time. Contradictorily, AI is precise and fast; human intelligence recognizes connections based on cognitive understanding and can also make decisions intuitively, while AI has no intuition whatsoever, but can perform rapid calculations and determine statistical probabil-

[7] This study does not cover the entire criminal justice ecosystem, so the detection, investigation and prosecution disciplines are excluded. There is a vast literature on this issue. For some of the main findings, see N. Shah, N. Bhagat, M. Shah, *Crime Forecasting: A Machine Learning and Computer Vision Approach to Crime Prediction Prevention*, "Visual Computing for Industry, Biomedicine, and Art" 2021, vol. 4(9); F. Miró-Llinares, *Predictive Policing: Utopia or Dystopia? On Attitudes Towards the Use of Big Data Algorithms for Law Enforcement*, "Revista de Internet, Derecho y Politica" 2020, no. 30, pp. 1–18; W. Hardyns, A. Rummens, *Predictive Policing as a New Tool for Law Enforcement? Recent Developments and Challenges*, "European Journal on Criminal Policy and Research" 2018, vol. 24, pp. 201–218.

ity and – if so instructed – can make random decisions as well. Intrinsically, one possesses human-like intelligence, whereas the other is artificially non-intelligent. Artificial intelligence is impersonal, lacking human traits necessary for independent decision-making, and thus can be considered artificially unintelligent. However, justification does support choosing to consider AI capable of making decisions. If the application and interpretation of the law in its purpose and function do not change significantly in the future, the choice to consider AI will not represent significant challenges for legal scholars or future lawyers, or at least not in the sense imagined today.

The paper focuses on the trial phase of the criminal justice ecosystem, whilst including other similar or related procedural stages, wherein the adjudicator, the judicial panel (with the participation of laypersons) brings the final decision on criminal responsibility and the sentence. The approach involves first identifying the types of judicial decisions and then determining which types could tolerate being issued by some form of algorithmic analysis. The specific question to be addressed is two-fold: first, can the decisions normally made by (human) judges during the trial phase be identified, and second, among the decisions identified, which ones could be considered suitable algorithmic decision-making (or AI). To answer these questions, a brief deconstruction of the fundamental ideas of criminal justice is necessary.[8]

For the purpose of this paper, the terms "algorithm" or "algorithmic decision-making solution" are set to be defined as algorithmically controlled automated decision-making, or decision support systems are procedures in which decisions are initially, partially or completely, delegated to another person or corporate entity, who then in turn uses automatically executed decision-making models to perform an action.[9] "The algorithm itself is the expression of the sum of the objectives and perspectives of those who input the necessary data, needed to deploy the algorithm".[10] The use of the term "artificial intelligence" refers to sophisticated algorithms with machine learning capabilities. In this paper, the terms are sometimes

[8] The literature has incorporated the term "robot judge" to this theme, with the constraint that here "robot" does not mean an object with a separate physical body and controlled by an algorithm, but rather a "machine" decision-making embodied by an algorithm.

[9] More to this question, see C. Coglianse, D. Lehr, *Regulating by Robot: Administrative Decision Making in the Machine-Learning Era*, "The Georgetown Law Journal" 2017, vol. 105, pp. 1147–1223; M. Spielkamp (ed.), *Automating Society: Taking Stock of Automated Decision-Making in the EU. A Report by AlgorithmWatch in Cooperation with Bertelsmann Stiftung, Open Society Foundations*, January 2019, https://algorithmwatch.org/en/wp-content/uploads/2019/02/Automating_Society_Report_2019.pdf (access: 12.12.2024), pp. 62–63.

[10] L. Catá Backer, *And an Algorithm to Bind Them All? Social Credit, Data Driven Governance, and the Emergence of an Operating System for Global Normative Orders*, "Entangled Legalities Workshop", 24–25 May 2018, Geneva, https://ssrn.com/abstract=3182889 (access: 12.12.2024), pp. 19–20.

used interchangeably, but where distinction is to be made between output that can be obtained through input via machine learning and output that can be generated based on programming rules, a specific reference highlights this fact.

This paper limits approaching the application of algorithms to the perspective of the authorities acting in the criminal trial. The possible use of AI-supported analysis by the defense may – perhaps – also be relevant in the context of evidence, but since there is no similar decision-making competence in criminal proceedings for either the accused or the defense lawyer, this shall not be a topic addressed herein. It should further be noted that although the possible use of software or AI tools to calculate and assess the verdicts of criminal courts according to statistical probability, e.g., is a topic of interest that should receive further exploration,[11] the present paper does not discuss these subjects, although without doubt, AI in these realms could be capable of increasing trust in law and justice, in the administration of justice and the rule of law in society through predictability.

RESEARCH METHODS

A multifaceted approach was incorporated into conducting research, which comprised an exploration of literature and a review of publications from various fields, including criminal law, legal theory and organizational criminology. This methodological diversity enhances the depth and breadth of the analysis. Research involved a comprehensive exploration of scholarly articles, books and other academic sources related not only to criminal law, but also procedural law. By delving into published works, new insights and perspectives enabled the acquisition of a thorough understanding of established legal principles, recent developments and debates within the realm of criminal law and digitalisation, and particularly the convergence of these two areas. This research serves as a foundation for the analysis and situates the present paper within the larger academic discourse. Incorporating legal theory into the research methodology adds a conceptual framework to the analytical approach mentioned above. Legal theory stipulates abstract principles and perspectives that contribute to the interpretation and deeper critical examination of legal issues. The integration of theoretical concepts adds rigor to the analysis, allowing for a more nuanced understanding of the legal aspects under consideration herein. The inclusion of organizational criminology works demonstrates a multidisciplinary approach to research and enriches the analysis by considering the organizational structures of criminal procedural ecosystems, and the dynam-

[11] See https://ilas.io (access: 15.12.2024) for a "weather forecast" for the criminal case. Further example of research in this direction, see C. Jiang, X. Yang, *Legal Syllogism Prompting: Teaching Large Language Models for Legal Judgment Prediction*, 2023.

ics that may influence or intersect with legal frameworks. This interdisciplinary perspective broadens the scope of the paper and provides a holistic view of the issues addressed. In summary, the research methodology for analytical legal papers involves a thorough examination of published works in criminal law and criminal procedural law, along with the integration of legal theory for conceptual depth, and the incorporation of organizational criminology works to bring a multidimensional perspective to the analysis.

RESEARCH AND RESULTS

1. Application of algorithms to support human decision-making

At present, AI can be utilized to support decision-making processes that would otherwise be carried out by natural (or human) intelligence. Among the reasons to consider using AI to replace natural intelligence decision making processes include better, faster and more efficient. But can it sincerely be declared that AI can be better, faster or more effective? It appears to be the case that the answer is yes, but with limitations. Although AI is viewed as a replica of human and analytical decision-making abilities, this assumption is in essence incorrect, because it's an elementary conjecture, since:

- we don't precisely know how human thinking works;
- AI systems perform decision making through probabilistic reasoning and analysis by recognizing formal patterns in data; therefore, AI and human thinking cannot be compared;
- AI is inadequate in understanding context and meaning and is unable to recognize causality;
- and last, but definitely not least, AI relies on learning data and its "trainers".[12]

As a result, any AI system or process can only be better, faster or more effective to a limited extent compared to natural intelligence. However, algorithm-based data analysis and AI could compensate for or at least mitigate some of the weaknesses of human decision-making, such as preconceptions, biases and prejudices, as well as factors influenced by one's state of mind, emotions, expectations and demands of third parties, such as the media, politics and public opinion.[13] As T. Preuß correctly summarizes, the same applies to cognitive distortions that influence human

[12] What is meant are dependencies on, on the one hand, training data with all the bias structures and questions that lie within it, which cannot be discussed in detail here, and, on the other hand, on those that use the training specifications and algorithms to determine from which starting point an AI learns.

[13] See D. Nink, *Justiz und Algorithmen*, Berlin 2021, pp. 130–133.

decisions, such as the anchoring effect, the backfire effect, the hindsight bias, and the confirmation bias.[14]

Artificial intelligence is notably faster and more effective when large amounts of learning data are available that would otherwise have to be analyzed and evaluated by humans. The role of humans is diminishing in data processing and analysis, becoming basically obsolete, and the growing erosion of the need for human participation is becoming more and more evident example of speed and effectiveness can be noted in the achievement of a probabilistic[15] outcome.

2. Application of algorithms within the criminal justice ecosystem

In Europe, the European Union and EU bodies play a significant role in creating a pan-European regulation for AI and related software. Following the goals and ideas of the European Commission, the EU will develop an AI strategy that people trust. To enhance confidence in the strategies, they must be based on the values of the EU, which includes not only strengthening the acceptance of AI-based solutions among citizens but also encouraging companies to develop and disseminate AI solutions.[16] According to the Commission, the strategy would be founded on the principle that any AI system introduced on the market must be monitored by the authorities, while the users themselves are to ensure human supervision and control. AI providers and users are then required to report serious incidents and malfunctions. As such, the Commission also pursues a functional approach, in order to establish strict rules for the application, development and use of AI systems (and AI-based products), through the regulation of the common market.

However, the European Parliament raised a broad array of concerns in its resolution of 6 October 2021 on artificial intelligence in criminal law and its use by police and judicial authorities in criminal matters.[17] Because AI cannot be considered an end in and of itself, the resolution outlines a broader ban on the use of AI, namely with the aim of applying AI to serve as a tool for serving people, and to limit its applicability in certain aspects, e.g. the ban on using AI and related technologies for proposing of judicial decisions (No. 16), prohibiting the use of automated analysis and/or recognition of human characteristics, such as gait, fingerprints, DNA, voice, and to prohibit other biometric and behavioural signals in publicly accessible spaces

[14] T. Preuß, *Digitalisierung im Strafverfahren*, "Juristenzeitung" 2023, vol. 23(3), pp. 68–78.

[15] I. Hunt, J. Mostyn, *Probability Reasoning in Judicial Fact-Finding*, "The International Journal of Evidence & Proof" 2019, vol. 24(1), pp. 86–87; D. Shaviro, *Statistical-Probability Evidence and the Appearance of Justice*, "Harvard Law Review" 1989, vol. 103(2), pp. 552–554.

[16] European Commission, *Excellence and Trust in Artificial Intelligence: Trustworthy Artificial Intelligence (AI)*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/excellence-and-trust-artificial-intelligence_en (access: 14.12.2024).

[17] 2020/2016(INI), OJ C 132/17, 24.3.2022.

(No. 26), and banning of private facial recognition databases in law enforcement (No. 28). The European Parliament calls on the Commission to ban all processing of biometric data, including facial images, for law enforcement purposes in all EU member states by legislative and non-legislative means and, if necessary, through infringement procedures (No. 31).

It should be emphasized that without such regulations in place and in the absence of enforcement measures, markets in the private sector will relentlessly pursue developments, as will manifold industries, and researchers in many fields of sciences. Legal research is an absolute necessity, and particularly essential to support the future legal design.

The application of algorithmic solutions can be fundamentally different depending on the stage of the criminal justice ecosystem in which they are to be applied. Algorithmic decision-making solutions can be implemented for prevention, detection, investigation and the prosecution of crimes, in court proceedings and during sentencing. The purpose of criminal justice is to punish the perpetrator of a crime, i.e. one who violates the co-existence rules of society (retaliation), and to prevent that person or anyone else from committing another (new) crime (prevention goal and deterrence objective). Beyond doubt, algorithmic solutions are to some extent present in the full spectrum of criminal justice, in the most general sense, supporting human decision-making with a purpose appropriate to their use. But, as identified and demonstrated separately[18] the criminal justice ecosystem has specific features that should make researchers and developers – at least – cautious about whether and how to develop algorithms or specific AI for criminal justice purposes. The following main conceptual challenges regarding the application of algorithms were identified, which include: the adaptation traps; the system-immanent non-mathematizable values; the "bad" subjectivity (i.e. of the judge); the purity of data and algorithms (i.e. "you are what you eat")[19] – these serve as anti-factors for the development of algorithmic solutions within the realm of criminal justice. More specifically, the criminal justice ecosystem aims to establish criminal responsibility and to punish the perpetrator for wrongdoing, and is shaped by conventional, self-evidently true principles, or axioms:

- Axiom #1: In criminal cases, humans are the decision-makers (laypersons on the panel or expert judges), and any errors can be rectified through procedural law;
- Axiom #2: Criminal responsibility is a personalized factor; the responsibility will be established for individuals based on their individual behaviours;

[18] K. Karsai, *Algorithmic Decisions within the Criminal Justice Ecosystem and Their Problem Matrix*, "Revue Internationale de Droit Pénal" 2021, vol. 92(1), pp. 13–30.

[19] *Ibidem*.

- Axiom #3: A decision is made retrospectively, based on past truth, facts and reality (ex post facto);
- Axiom #4: Sanctions are personalized, specific to the individual.

Traditionally, and especially in the current era of digital transformation, scientific research, coupled with the opportunities created by technological progress, has triggered scepticism regarding the limitations of these axioms, raising some questions in the process:

1. Whether or not human decision-making philosophically and morally is necessary?[20]
2. Are slanted factors shaping the human judge's decision through the judicial deliberation process, and if so, which ones?[21]
3. Can aggregating information about the past actions of others into a large data set and analysing these data algorithmically truly predict the future actions/behaviour of a given individual in the group?[22]
4. Can individualised (psychological) profiling and risk analysis generate measures that constitute an interference with basic human rights, i.e. individual freedom in the light of acts not yet committed?[23]
5. Can taking into account the inherent limitations of a necessarily (i.e. *nulla poena sine lege*) finite number of penalty types and their modalities of application, lead to the development of a penalty matrix applicable in comparable cases (if any)?

If such questions can be credibly answered, then the slow paradigm shift can be kept under control in a scientific sense, a sort of checks and balances system to narrow the fine line defined by the Collingridge dilemma. If successful, the use of

[20] A. Freiberg, *Post-Adversarial and Post-Inquisitorial Justice: Transcending Traditional Penological Paradigms*, "European Journal of Criminology" 2011, vol. 8(1).

[21] N. Peršak, *Automated Justice and Its Limits: Irreplaceable Human(e) Dimensions of Criminal Justice*, "Revue Internationale de Droit Pénal" 2021, vol. 92(1), pp. 225–241; eadem, *Beyond Public Punitiveness: The Role of Emotions in Criminal Law Policy*, "International Journal of Law, Crime and Justice" 2019, vol. 57, pp. 47–58; S.A. Bandes, J.A. Blumenthal, *Emotion and the Law*, "Annual Review of Law and Social Science" 2012, vol. 8(1), pp. 161–181.

[22] One example is the COMPAS software and other similar products of the U.S. justice business. In this case, the predictability of criminal recidivism is examined using AI-based systems and is not based on an ex post facto assessment. The statement on the risk of recidivism among criminals is clearly not a retrospective assessment of an offense and the behaviour of the offender, but rather a consideration that has yet to be made about a future offense that has not yet been committed. However, it is essential to understand and continually remind ourselves that the mere fact that some states in the USA, e.g., use AI to estimate the probability of recidivism does not mean that the decisions are correct or even good. Indeed, scientific research should be conducted using conventional means to prove that these decisions were good and correct when they were made. If such research subsequently confirms this, then – and only then – could we claim that the AI's decisions were correct.

[23] For example, see Cs. Herke, Zs. Fantoly, *A mesterséges intelligencia a hatékonyabb büntetőeljárás szolgálatában*, "Magyar Jog" 2023, vol. 48(4), pp. 223–228.

algorithmic decision-making in the criminal justice system can be supported with little concern, given its many rational advantages. Since in addition to supporting the work of human professionals, AI could enable streamlined workflow, increase cost-effectiveness and preserve manpower for processes where human-input is indispensable, and in addition, would contribute to ensuring uniform and predictable sentencing practices across any country. Since numerous research has underpinned the influences of skewed individual aspects on judicial decisions, algorithmic solutions in criminal justice could serve to counter such malfunctions of human adjudications. Further, the rise of learning algorithms (e.g. by the accumulation of data) and the existence of data (digitalisation of court cases) facilitate the detection of patterns, if present. As V. Franssen and A. Berrendorf stated, "a robot judge potentially has several advantages over the human judge, in particular in terms of consistency in decision making, reliability, cost and speed".[24]

3. Algorithms in the criminal trial

The judge's task is to adjudicate,[25] i.e. to reach a decision in a dispute between two or more parties through comparing the facts and applying relevant law. In actuality, both the fact-finding phase and the stage of actual application of the law (the legal justification of the decision) are considered to be part of the decision-making task, as are the determination of both questions of fact and questions of law. It is the responsibility of the criminal court to establish or exclude criminal liability and, in the former case, to impose the penalty. However, this final decision involves several other intermediate decision processes. Decision-making is an act carried out mentally, allowing judges to make their own decisions from a legal perspective, retarding not only the correctness and any other aspect of statements and proposals, but also concerning the discovery of facts (whether they are relevant or not), and the conclusion of the law.

Throughout his/her executive function, the judge is under constant pressure to make decisions that comply with the law, which means that the judge must be familiar with the applicable legislation and be able to proficiently identify and interpret the realities that constitute compliance with the law. This also incorporates the decision on criminal liability, since once the facts have been established, liability must also be determined in the event of the existence of a "legal disposition" (i.e. a historical situation that fully exhausts the legal disposition). This includes, of

[24] V. Franssen, A. Berrendorf, *The Use of AI Tools in Criminal Courts: Justice Done and Seen to Be Done?*, "Revue Internationale de Droit Pénal" 2021, vol. 92(1), p. 207.

[25] T.J. Capurso, *How Judges Judge: Theories on Judicial Decision Making*, "University of Baltimore Law Forum"1998, vol. 27(1), pp. 5–16.

course, determining whether the facts of the case correspond to those of the possible grounds for non-criminalisation and the legal consequences of this.

At the trial stage, judicial decision-making procedures can be broken down into the following decision-making phases or sub-processes:

- interpretation of law (generally);
- fact-finding decisions and establishing the relevant factual circumstances (determination of their relevance);
- subsumption and application of law;
- legality check, to ensure compliance of the performance with procedural expectancy;
- judgment, i.e. verdict on establishing criminal responsibility;
- sentencing, imposition of the penalty;
- judicial decisions in supplementary questions (e.g. procedural costs, court fees, etc.);
- textual composition of the verdict itself.

The following section explores the possibility of applying AI to support these decision processes at an abstract level. The first part provides a summary in a table format, followed by a detailed analysis of each phase.

Table 1. Algorithmic decisions in the trial

Algorithmic decisions	If	If yes / partly – how	If not – why	Remarks
Interpretation of law	no		AI cannot understand the meaning of standard legal texts	meanwhile statistical relations cannot substitute the meaning of the legal text
Fact-finding and establishing the factual elements of the offence	yes	if the fact-finding is based on statistical datasets		e.g. image recognition, sound recognition, etc.
	no		AI cannot understand the meaning of the elements of the offence	e.g. commission for financial gain, with weapon, etc.
Subsumption/application of law	no		AI cannot understand the meaning of standard legal texts	if strong AI is not developed
Legality check of the procedure	yes	if mandatory components of a judicial document need to be checked		mandatory components of a text can be checked syntactically (and statistically)
	no	the merit of the decision, reasoning	statistical ways of thinking cannot check immanent reasons or the compliance of subsumption	we can only accept algorithmic decision-making within this scope if we shift towards accepting statistical decisions instead of what currently exists, namely, considering judicial conviction as the basis for decision-making (i.e. algorithmic vs human decision-making)

Algorithmic decisions	If	If yes / partly – how	If not – why	Remarks
Judgment (guilty/not guilty)	no		the criminal responsibility is not established according to statistical rules	we can only accept algorithmic decision-making within this scope if we shift towards accepting statistical decisions instead of what currently exists, namely, considering judicial conviction as the basis for decision-making (i.e. algorithmic vs human decision-making)
	yes	decisions that have both a relatively limited number of starting criteria and limited outcome		e.g. in Hungary: criminal judges calculate criminal proceedings costs themselves
Sentencing	yes	if the sentencing factors could be categorized and clearly scaled		AI could be introduced for certain crimes (petty crimes)
	no		if and because sentencing contains non-mathematizable factors	reason: statistical relations (probability, good approximation) are not accepted in the questions of guilty/not guilty and in determination of sentencing
Composition of the judgment	yes	gramatically and syntactically correct texts can be compiled using large neural language models		

Source: own elaboration.

DISCUSSION

1. The use of AI in the interpretation of criminal norms? Overruled!

Legal interpretation, i.e. determining the meaning of the normative text, is at present unattainable – primarily for two obvious reasons. On the one hand, crime itself is a normative category. Each crime committed is unique, and the necessary interpretation of the abstract norms that make the application of criminal law possible requires individual evaluation on the part of the judge. On the other hand, system-immanent values only gain their meaning through interpretation (fair trial, human dignity, proportionality, social developments, social harmfulness, purpose of law, etc.). Algorithms are incapable of accomplishing interpretation in this reasoning, and thus cannot be applied, because humans are not able to mathematize such information. Humanity, human dignity or justice (etc.) cannot be transformed[26] into correct mathematical formulas, so these must remain "incomprehensible" for algo-

[26] S. Golla, *In Würde vor Ampel und Algorithmus – Verfassungsrecht im technologischen Wandel*, [in:] *Verfassungen – ihre Rolle im Wandel der Zeit: 59. Assistententagung Öffentliches Recht*, eds. P.B. Donath et al., Frankfurt am Main 2019, p. 183.

rithms.[27] With D. Nink, "the considerations and evaluations of justice integrated into the interpretation of the law are not based on exact knowledge. The ideas of justice and correctness are not clear mathematical formulas".[28] S. Gless and W. Wohlers added that "judges have to fill in open legal concepts, exercise discretion, and sometimes they may even have to grant mercy before justice".[29] Furthermore, as M. Górski pointed out, "AI seems unable to develop an interpretation of the law that adequately takes into account the ever-changing social landscapes surrounding the processes of 'doing justice'. Ignoring this obstacle and pressing ahead with AI-driven judgment risks an algorithm applying the law correctly from a strictly formal point of view, yet completely missing the mark when it comes to the societal sense of fairness and justice (the risk of an overly positivistic AI judge). This sense of fairness and justice is based heavily on perceptions of various social phenomena".[30]

2. Artificial intelligence in fact-finding and evidence? Perhaps!

The fact-finding[31] phase and the steps of establishing the elements of the offence (constituents of the disposition, i.e. who, what, when, where, why, and how) could be supported by AI, if the statistical methods used precipitate fact finding, e.g. through image recognition, identification of counterfeit goods, analysis of media with child pornographic content, the detection of fraudulent activities such as accounting (etc.), or automating witness interviews with the use of chatbots capable of extracting the most relevant facts from the texts. But as S. Tober emphasizes, such uses of AI are bounded by limitations: "Facts are not objects that extend in space and time but must first be conceptually coded. The applicable norm must already be considered here because the facts express what can be considered as an application of a norm by designating terms that can be subsumed under the norm. It turns out that a fact itself is only a conceptual model of reality that shortens it in terms of the features relevant to the application of the standard. Can an immovable object be a tool? This question cannot be answered using logic".[32]

The fact-finding is closely linked to the activity of taking evidence – this is not considered here as a separate decision-making process, given that the judges

[27] K. Karsai, *op. cit*.

[28] D. Nink, *op. cit.*, p. 117.

[29] S. Gless, W. Wohlers, *Subsumtionsautomat 2.0 – Künstliche Intelligenz statt menschlicher Richter?*, [in:] *Festschrift für Urs Kindhäuser zum 70. Geburtstag*, eds. M. Böse, K.H. Schumann, F. Toepel, Baden-Baden 2019, pp. 147–165.

[30] M. Górski, *Why a Human Court? On the Right to a Human Judge in the Context of the Fair Trial Principle*, "Eucrim" 2023, no. 1, p. 87.

[31] For example, see E. Bell, *An Introduction to Judicial Fact-Finding*, "Commonwealth Law Bulletin" 2013, vol. 39(3), pp. 519–552.

[32] S. Tober, *Ist Normanwendung automatisierbar?*, MMR 2021, p. 779, 780.

establish and include in the facts of the case those facts that they consider proven. In algorithmic fact-finding, the adequacy of the evidence in establishing a fact is no longer an issue since a logical link is assumed. For example, if we train an AI to identify sexual acts in seized video footage, then in the case of a hit, we assume and take as evident that there is a sexual act in the video footage, one that we trained it to identify. (Here we will not address possible errors in the probability since we will not be working with poor algorithms anyway.)

3. Artificial intelligence in subsumption? Out of the question!

Subsumption, i.e. the concrete application of the norm as part of legal decision-making and the connection between the facts and the criminal law norm, cannot be carried out algorithmically. Artificial intelligence in itself is incapable of establishing any sort of rational connection to any norm; it can only relate syntactically to normative texts, without providing a rational explanation. Even assuming that in the case of subsumption, human decision-making processes are capable of establishing liability if all conditions are met, and is therefore not causal, because both the content and context of the norm are taken into consideration.[33] In contrast, algorithmic decision-making would be causative in terms of logic, based on an "if this, then that" principle, thus utterly failing to consider the content and context of the legal norm.

Often the legal text of criminal law contains rules which open up a scope for interpretation, since they are often open to interpretation.[34] In concrete terms, in the case of the "takeover" of the subsumption by an AI, the AI-controlled subsumption precisely stipulates the content of the interpretation of the norm and thus creates the subsumption rules itself. With L. Wörner, "code creates law by means of programming, rules are established (…) that have quasi-legislative power".[35] AI-controlled subsumption would not be able to react to individual interpretation details but would create its own normative content without any interpretation scope.

4. Artificial intelligence in the legality check phase? Maybe!

The formal legality check could be carried out using AI solutions, if and to the extent that this checks and balances phase is conducted via the review of physical documents (e.g. judgments, orders, warrants). In other words, AI may be capable of determining whether a given judicial decision or other document contains the

[33] *Ibidem*, p. 782. Similarly D. Nink, *op. cit.*, pp. 37–38.

[34] V. Franssen, A. Berrendorf, *op. cit.*, p. 215.

[35] L. Wörner, *„Code (Is) Creates Law". Im Programmcode festgelegte Regeln haben quasi-gesetzgeberische Macht oder das Programmieren der Algorithmen ist unsere Freiheit?*, "Politikum, Tatort Rechtsstaat" 2023, vol. 4, p. 65, 69.

necessary and legally required substantial textual elements, particularly considering the recent increase in the proliferation of large language models. This of course assumes that the said content elements contain text components.

However, from a substantive perspective, it would be difficult to suppose that a decision corresponds to the objective legal situation.

Since the examination of whether a decision corresponds to the given facts and legal situation of a case, in turn, requires components of contextual understanding "the subsumption, i.e., the subordination of concrete facts of life to the (abstract) formulation of the facts of a legal norm, applying the legal norm and finding the correct legal consequence".[36] D. Nink provides a compelling example pertaining to the question of inadmissible evidence: "Assuming that a defendant is actually (substantially) guilty, but the only evidence incriminating him is subject to an absolute ban on the use of evidence. The judge must acquit this defendant: The decision, which is substantively incorrect, however, corresponds to the objective legal situation".[37] In such a case, the evidence is deemed inadmissible based on the interpretation of the law, weighing the factual circumstances, and on assumption. Consequently, the evidence cannot be introduced. Since the current inadequacy of AI and other forms of machine learning for the partial actions, especially those that precede later stages of the procedure, it necessarily follows that further phases of the process consisting of these components or based on former stages cannot yet be performed using AI.

5. Artificial intelligence in determining criminal responsibility – the decision of guilty or not guilty? Presumably

With regard to establishing criminal responsibility, or the verdict itself, making a judgment solely on a statistical basis, i.e. based on past cases and patterns, is definitely beyond the bounds of possibility. The data and or patterns of past actions can be examined as two data sets. On the one hand, on the basis of data of persons with similar characteristics or attributes, while on the other hand, based on the known relevant past actions (or behavioural components) of the accused. Both presumptions run counter to the formerly discussed axioms of criminal liability, and for the time being, no scientific consensus has sprouted on the validity of this type of calculation. But even in case of future scientific evidence thereto, the interpretation deficiencies of any AI-controlled subsumption would also be further amplified. However, if in special proceedings the importance of a margin of discretion in the decision is reduced by the legislature or if the actual circumstances of the individual case involve a less complex situation and require subsumption (shortened or accelerated proceedings,

[36] D. Nink, *op. cit.*, p. 114.
[37] *Ibidem*.

administrative criminal proceedings), then at least a scientific examination[38] of the possibility of automated decision-making can be justified. In other words, AI could presumably be implemented to support routine decision-making processes. In Hungary, e.g., it would be entirely conceivable to use AI to determine the costs of criminal proceedings, which today still must be calculated by the judge.

6. Application of AI sentencing? Perhaps!

Application of algorithms to support the sentencing process could be acceptable if the verdict were to have already been made, as the sentencing decision is a separate one, where AI is supposed to assess sentencing based on comparable former cases (case law). This presupposes that the myriad of circumstances to be considered in sentencing are correctly coded for the algorithm, which in turn requires the formulation of the possible types of punishment and their application requirements in a quasi-mathematical formula, as is the case in the U.S. Sentencing Guidelines.[39] However, this approach is inconsistent with the fundamental ideal of free judicial discretion in sentencing. Discretion, in general, exists when the judge is granted freedom of choice regarding the application of the legal rule and is allowed to choose one or more of the sanctioning options provided by the law (*nulla poena sine lege*). The legislature (in continental law jurisdictions) has its own scope for discretion and decision-making since it cannot foresee every specific case and every potentially relevant detail[40] and, in particular, has to formulate criminal provisions abstractly, rather than specifically on a case-by-case basis.

However, in administrative (or regulatory) offence proceedings, or in criminal cases in a simplified procedure where the sentencing factors are less complex, the development and application of algorithms should be the subject of further examination. This applies in cases where there are a limited number of sentencing factors to be considered, and the factors could be classified and clearly scaled both on the input side (factual and legal circumstances of the case to be considered by the

[38] See the research project of the research group "Artificial Intelligence and the Legal Order" at the University of Szeged (Interdisciplinary Center of Excellence for Research, Development, and Innovation) entitled "Possibility of Algorithmic Decisions in Criminal Proceedings for Human Smuggling in Hungary" 2023–2025 (https://u-szeged.hu/ikikk). For a general understanding of the problem, see B. Róbert, *Criminal Legal Tools in the Fight against Irregular Migration in Hungary*, "Jog-Állam-Politika" 2021, vol. 2, pp. 97–111.

[39] United States Sentencing Commission, *Guidelines Manual*, 2024, https://www.ussc.gov/guidelines (access: 14.12.2024); F.O. Bowman, *The Failure of the Federal Sentencing Guidelines: A Structural Analysis*, "Columbia Law Review" 2005, vol. 105(4), pp. 1315–1350; K. Ambos (ed.), *Strafzumessung, Angloamerikanische und deutsche Einblicke*, Göttingen 2020.

[40] D. Nink, *op. cit.*, p. 189.

judge) and on the output side (limited options of sanctioning[41]). The development and application of algorithmic-based sentencing support should be further explored scientifically, as the benefits of its eventual introduction could be significant.

7. Artificial intelligence in the composition of judgment? Partially possible

Composition of the verdict, i.e. drafting the document itself, for its part, would be possible using AI-based solutions, as large neural language models are particularly appropriate for composing grammatically and syntactically correct texts from text modules that, based on proper prior training, contain all substantive and the legally required components of a legal decision.[42] S. Gless and W. Wohlers state that an AI system would be capable of providing a reason for its decision insofar as the decision-making process is documented with adequate programming and the elements of the verdict are limited. However, programming the reasoning part (elements, logic, outcome) would likely involve substantial effort, which may exceed the limits of what is possible. More likely than not, in line with the development stage of AI today, the result would merely prove to be satisfactory only for routine decisions in typical cases.[43]

8. Summary of the results

In summary, algorithmic decision-making solutions in the trial phase of criminal justice could gain acceptance, but further research is necessary, particularly in the cases summarised below. In addition to research, especially in the EU Member States, the new legal environment established by the latest AI Act will need to be treated as a fundamental and hard law framework in the post-research development and designing process, and the relevant decision-making support system will need to be designed to fit appropriately and adequately within the requirements of the new regulatory background.

1. If elements of the crime can be determined statistically.
2. If mandatory components of a judicial document must be checked based on fixed rules.
3. In routine decisions where both input of the starting criteria and the outcome or output are relatively limited in number.
4. For creating grammatically and syntactically correct texts by using large neural language models.

[41] This is the case, e.g., when only imprisonment can be imposed, in which case the duration of the imprisonment offers all possible options, which are necessarily limited.

[42] See A. Deroy, K. Ghosh, S. Ghosh, *How Ready Are Pre-trained Abstractive Models and LLMs for Legal Case Judgement Summarization?*, 2023.

[43] S. Gless, W. Wohlers, *op. cit.*, p. 159.

5. For sentencing, if and to the extent that the relevant rules can be algorithmically coded by categorizing and clearly scaling sentencing factors.

CONCLUSIONS

What lies ahead, what does the future hold and what can be done to raise awareness of the role of those in the legal field, be it scholars or professionals, in the Collingridge dilemma? The philosophical and moral principles and basic mechanisms of criminal justice are anchored in centuries-old compromises and axioms, as discussed before. But have the axioms become obsolete, are the consequence of these principles relevant in the present? Further exploration is necessary to examine whether criminal justice and its processes should continue to follow those traditional principles and retain the centuries-old axiom – or should these be deemed obsolescent and be replaced with new, modern principles? In any case, both current legislative trends and the present-day political discourse manifestly suggest that these axioms should not be replaced, and concurrently, efforts should be exerted to avoid the datafication of criminal justice.

The ideas discussed in the present paper support these final conclusive thoughts: without a paradigm shift, algorithmic decision-making or decision support systems at this moment in time cannot be seated at the table of criminal justice and criminal procedure. Such a drastic shift would affect the fundamental systemic elements of the justice system, taking the way of criminal law thinking along with it. Therefore, this type of development would be accompanied by an entirely different kind and format of justice, for which society has not yet sufficiently prepared. However, "if these tools can provide valuable support to human judges based on reliable, transparent, and verifiable information, criminal justice actors should not deprive criminal justice actors of these instruments".[44] Therefore, it can be unquestionably declared that the introduction of a paradigm shift is not possible in the present social environments, since questioning the above axioms could generate a "legal religious war". However, it is also clear that the experiments conducted so far and the growing acceptance and proliferation (in many countries, in many forms of applications) of AI have generated slow and stealth changes, demonstrating that shifts have indeed been taking place, and upon looking back from the future, its occurrence will probably be pinpointed to this time in history. Historically accepted and proven axioms will not be sustainable in the future, not even in the administration phases of justice, and since datafication can no longer be stopped,[45] steps must be taken to ensure the rise of a "new" form of justice that can conquer the challenges presented by rapid

[44] V. Franssen, A. Berrendorf, *op. cit.*, p. 218.
[45] L. Wörner, *op. cit.*, p. 69.

technological advances, whilst remaining in line with fundamental human rights and basic principles, and lastly, without generating a religious war.

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ABSTRAKT

W artykule skoncentrowano się na porównaniu inteligencji ludzkiej oraz sztucznej inteligencji w procesie podejmowania decyzji prawnych w dziedzinie wymiaru sprawiedliwości karnej poprzez omówienie ograniczeń i potencjału sztucznej inteligencji na rozmaitych etapach postępowania. Wprawdzie sztuczna inteligencja jest w stanie oceniać niektóre aspekty takich procedur, lecz jej wykorzystanie nadal jest wąskie i nie może ona zastąpić zniuansowanej oceny i kontekstowego rozumienia zapewnianego przez ludzi podejmujących decyzje. Jako takie niektóre z omawianych zagadnień obejmują omówienie domen, w których sztuczna inteligencja mogłaby wspierać niektóre czynności w procesach decyzyjnych w wymiarze sprawiedliwości karnej, takie jak wskazywanie znamion czynu zabronionego poprzez wzorce statystyczne, badanie zgodności dokumentów sądowych z przepisami oraz ewentualnie pomoc przy rutynowych decyzjach. Ponadto wskazano ograniczenia sztucznej inteligencji, podkreślając jej braki w zakresie rozumienia kontekstu, znaczenia i przyczynowości, które to elementy mają kluczową wagę dla wykładni prawa. Omówiono także wyzwania stawiane przez dylematy etyczne i filozoficzne dotyczące włączenia sztucznej inteligencji do systemu wymiaru sprawiedliwości, sugerując, że o ile mogłaby pomóc w niektórych konkretnych zadaniach, o tyle fundamentalne aspekty prawniczego procesu decyzyjnego zakorzenione w wielowiekowych aksjomatach, jak zindywidualizowane wyroki oraz uwzględnienie takich wartości ludzkich jak uczciwość i sprawiedliwość, pozostają poza zasięgiem obecnych systemów sztucznej inteligencji. W podsumowaniu zawarto rozważania na temat debat toczonych obecnie w Unii Europejskiej dotyczących stosowania sztucznej inteligencji, zwłaszcza przepisów prawnych w zakresie etycznego wykorzystania w systemach prawnych, podkreślając potrzebę ściślejszych zasad i nadzoru dla zapewnienia odpowiedzialności i zapobiegania ewentualnym nadużyciom technologii sztucznej inteligencji.

Słowa kluczowe: digitalizacja; wymiar sprawiedliwości karnej; decydowanie algorytmiczne; faza procesowa