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From precedent to protocol: Rethinking legal authority in the age of blockchain and AI

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Abstract

This article analyzes how modern technologies, including blockchain and artificial intelligence (AI), affect the concept and nature of authority in law. Legal systems have, for most of legal history, deferred to authority based on precedent, meaning that the past decisions of courts uniquely determined outcomes of disputes. However, technologies such as blockchain, which may support peer-to-peer and decentralized networks, which will transform legal decision-making from one of reliance and appeal to precedent to one of approaches, have challenged the current authority of law based on precedent. Whether blockchain provides access to immutable and transparent records of events, which offer decentralized authority that does not rely on intermediaries playing a direct role, or whether AI allows for more efficient and data-driven law, AI also provides ways to consider accountability, bias, and transparency, as well as the limits of understanding what 'transparency' means in the decision-making process. This article will consider not whether modern technologies will replace or supplement the present legal system, but how we will come to define legal authority on protocols and algorithms, rather than past precedent of law. The linear appeal to legal precedent as our understanding of legal authority prompted the need for this examination of modern technologies and the pieces that contribute to the establishment of authority in legal governance, while maintaining the principal values of fairness, accountability, and justice.

Keywords: Legal Authority; Blockchain; Artificial Intelligence; Smart Contracts; Decentralized Systems; Legal Precedent

1. Introduction

The merging of law and technology is rapidly developing the shape of the legal landscape, especially regarding developments of artificial intelligence (AI) and blockchain technologies [1]. AI first entered the legal field to perform simple repetitive tasks such as document review or legal research, but it is advancing to a more substantive legal decision-making process. AI technologies such as ROSS Intelligence and Lex Machina utilize machine learning to analyze massive amounts of existing legal data, allowing them to predict legal outcomes, inform litigation strategy, and in some cases decide certain legal controversies [2]. This even raises more fundamental questions about legal authority: how can legal authority based upon human interpretation be maintained in a system taken over by algorithms and automated systems, which governs legal decision making? [3] The advent of AI combined with the decentralized nature of blockchain will be a watershed moment in opening up legal governance. The transparent and immutable characteristics of blockchain enable smart contracts, or self-executing agreements, that automatically execute legal transactions without human intermediaries. Collectively AI and blockchain are innovating a future in which legal processes will be controlled by data-driven algorithms and decentralized protocols instead of established legal systems

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and human judges. These changes will challenge the underlying principles of legal decision making based on precedent and judicial discretion.

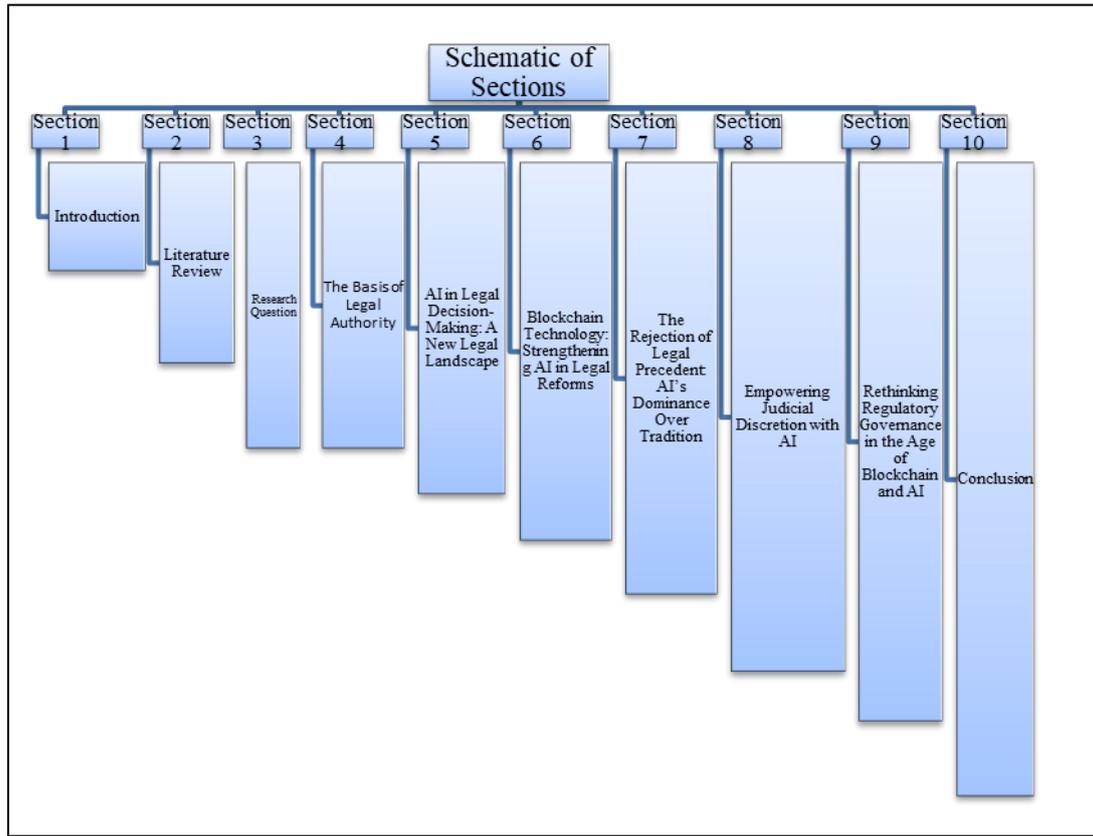


Figure 1 Schematic of sections.

2. Literature Review: Evolving Legal Authority in the Age of Blockchain and AI

With technological advancement, the legal field is in the midst of a transformation with the advent of AI and blockchain technology. The two modern technologies will force their way into the legal system, creating new possibilities for rapid and efficient decision-making, as well as the automation of legal processes. The rise of legal technology, specifically AI and blockchain, poses a challenge to legal authority, based on precedent, human judgment, and centralized authority [4]. This article reviews the contemporary literature on AI and blockchain technology as applied in a legal context and its broader implications of legal authority, and whether AI and blockchain create new laws that disrupt traditional notions of law.

2.1. AI in Legal Decision-Making

AI is becoming increasingly essential in making certain legal determinations, such as during legal research and predicting the likely outcome of cases. AI systems that embed large language models such as "Agents Bench", to simulate and enhance judicial deliberation will assist in improving transparency and the efficiency of decisions, giving more reliably consistent and objective results compared to human judges [5]. According to Friar and Linna, AI has introduced numerous new concerns about accuracy and ethical compliance in judicial reasoning [6]. They especially call attention to the significant need for transparency and accountability in AI judicial reasoning, noting that explainability is a required attribute of AI systems to assure fairness and reliability in judicial making. In broad terms, all these points to the need for developing and adopting a regulatory structure that will provide ethical parameters for AI performance.

2.2. Blockchain Technology in Legal Systems

Blockchain technology has many positive features due to decentralization and immutability. In a legal context generally, and through smart contracts specifically, it will increase accountability, transparency, efficiency, and security in a legal context, encoding and enforcing legal contracts while minimizing or removing the need for third parties, like lawyers or the courts. Bassan points to the ability of blockchain to automate, verify, and secure obligations, thereby diminishing

fraud and making the legal process more efficient, thus providing greater efficiency and overall access to legal environments [7]. On the other hand, blockchain's application to legal settings has some uncertainty and challenges, mostly in regard to privacy and regulatory compliance. Adep looked at how blockchain may protect legal documents and AI may help to minimize fraud as well as verify the authenticity of legal documents [8]. While blockchain would seemingly solve the secure storage of illuminated records, the transparency of its transaction data and ease of access would seem to be barriers to compliance with confidentiality norms that are essential in traditional legal systems due to privacy concerns about sensitive legal information.

2.2.1. Research Questions

How does the integration of blockchain and AI challenge traditional legal authority, particularly the reliance on precedent and human judicial discretion?

In what ways can AI-driven legal systems, supported by blockchain, redefine governance and legal decision-making in both centralized and decentralized frameworks?

3. The Basis of Legal Authority: Precedent, Discretion and Governance

Historically, legal authority has centered upon precedent, discretion of judges, and governance through regulation [9]. Each of these legal concepts worked to shape the legal order of various countries while affording consistency, stability, and justice in a legal system. Patterns of technological change, including AI and blockchain, are beginning to assess the elements of legal authority. This section will examine the elements of legal authority by first defining precedent, judicial discretion, and governance through regulation, as well as notifying legal inefficiencies within the state legal order.

3.1. Understanding Legal Precedent in Traditional Law

Legal precedent, under the premise of *stare decisis*, is a basis many legal systems have relied upon, particularly in common-law systems [10]. Legal precedent supports the idea that there should be a continuing rule to respect or abide by results in similar cases, thus giving the law consistency and predictability. Precedent essentially is based on the explaining value of "precedent" to indicate the learning value associated, or accrued, from the historical past in a judiciary, i.e., the past decisions of the court demonstrate the learning value that allows further rulings to govern future decisions for guidance in respecting the same relativism and a desire for stable and fair law [11]. In a normative legal framework, precedent functions both as a clarifying agent of legal authority of deciding a decision and assists in an orderly progression of law, though precedent usage in a legal framework is limited. For instance, Dworkin claims that strict adherence to precedent and reliance on a prior decision or case law will assuredly result in a bad result or a negative outcome because a prior rule may be obsolete, or not necessarily even properly decided [12]. Reliance on precedent also appears to continue to deduct or rely on legal rules established in History regarding what a court ruled in favor of for expected outcomes when there may be new enacted or emerging values as a society toward dealing with real-time issues in a modern context.

3.2. Judicial Discretion: Algorithmic Objectivity Challenging Human Interpretations

Judicial discretion has been a natural part of any legal issue and of humanity's practice of law [13]. Judges will use discretion in interpreting the meaning of the law and the application to a case, considering legal issues when applying a set of facts. Judges will be flexible with the acceptance of nuance with respect to intent and the social consequences of their decision, which are an important part of justice and any legal decision. The traditional way of deciding cases is now being faced with decision making made by AI [14]. AI-based systems, including COMPAS or ROSS Intelligence use large datasets to analyse and recommend decisions-based data analysis and do not rely on human judgment; and can also make rational consistent decisions that are efficient and objective in analyzing responses in comparison to the full spectrum of human cognitive bias or emotional thought contributing to the variation in each decision [15][16].

3.3. Regulatory Governance: Centralization vs Decentralization

The system of regulatory governance has predominantly been centralized under various national and international authorities that possess legal jurisdiction. Centralized regulation provides consistency, authority, and guarantees consistent application of the law across jurisdictional lines, as well as assurance that elected officials are enacting policies that are carried out by regulatory enforcement officials while having some level of influence about how that law is federated [17]. Blockchain holds potential for some decentralized governance, as once securely maintained, transactions and instruments can be processed and validated without the need for intermediaries. Decentralization can reduce some oversight by government and regulatory agencies. Smart contracts automate the performance and enforcement of agreements subject to the computer program or coded instructions [18].

3.4. The Inefficiencies of the Traditional Legal System

Although the traditional legal system has existed for many years, it is increasingly perceived as inefficient, slow, and expensive. Court cases often involve extended periods, expensive fees, and much waiting time, while case backlogs across many jurisdictions result in delayed justice. Additionally, the nature of the law's language and reliance on human judgment can lead to some inconsistencies in decision-making, reducing entirely the law's accessibility for all individuals and institutions [19]. The advancements in AI and blockchain technologies have the potential to improve on those inefficiencies. For example, AI-powered processes can help expedite legal research and decision-making, while reducing manual work [20]. For instance, systems such as ROSS Intelligence allow lawyers to instantly search through multiple legal databases, significantly reducing the time spent conducting legal research [21]. In addition, blockchain technologies can help automate legal contracts through smart contracts, thus speeding up contract execution and eliminating third-party contract management [22].

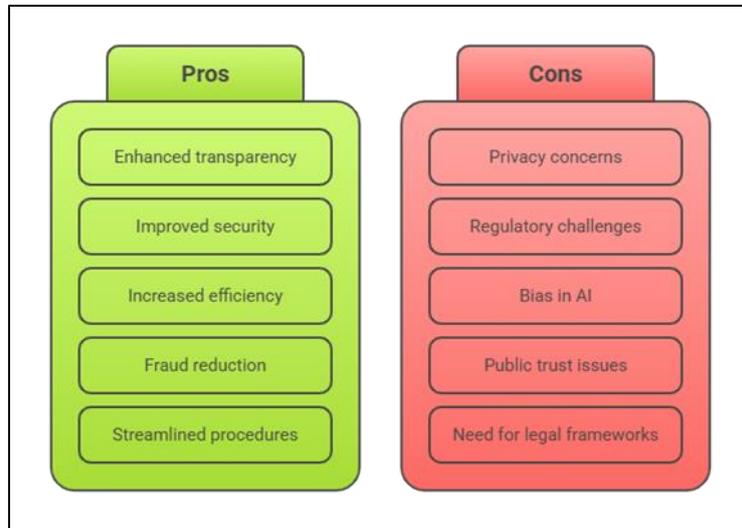


Figure 2 The advantages and disadvantages of applying blockchain to legal environment, which distinguishes the advantages of increased transparency, and better data security, from the disadvantages of privacy issues, and regulatory factors [23].

3.5. AI in Legal Decision-Making: A New Legal Landscape

The emergence of AI in legal systems has arisen to meet the increased expectation of efficiency, consistency, and accuracy in public and private legal systems. Advances have been made in AI technologies, particularly in machine learning, natural language processing, and predictive analysis with the aim of aiding legal professionals, for example, in legal research, reviewing contracts, predicting the outcome of litigation in the trial stage, and making decisions [24]. AI technologies are transforming the operational processes of law firms, courts, and legal departments beyond what is feasible through human legal professionals, capable of sorting, analyzing, and processing vast amounts of data much faster than would be possible through traditional economies [25]. Tools like the ROSS Intelligence software are already offering a legal researcher the ability to analyze and evaluate complex legal texts [26]. Beyond legal research, predictive AI algorithms are now being used to attempt to predict the outcome of legal disputes so that lawyers can develop strategies before trial and provide clients with better information about their uncertainty. As discussed in Kolkman's report, "AI's role in the law has substantially increased efficiency in the workflow, particularly the time associated with research, litigation, and resolving disputes"[27]. This is applicable not only to private-sector law firms, but it is now being used in governmental legal systems to help with administering mundane administrative tasks and streamline administrative processing.

One area of notable impact is around decision-making, particularly with predictive algorithms that are being used for parole and sentencing decisions, such as the COMPAS algorithm in the courts in the United States [28]. Correctional Offender Management Profiling for Alternative Sanctions, or COMPAS evaluation, uses data points such as age, past criminal offenses, family history, etc., to assess and predict the risk of a person recidivating, or reoffending, and to steer judges into better decisions than if they simply made these decisions on their own [29]. To enhance efficiency in the court system, COMPAS automates the risk assessment process to make it more efficient and fair [30]. These changes illustrate how use of AI can enhance access to, and accuracy in, the legal process, while providing a more objective and data-driven standard than traditional methods.

In civil law countries, which typically regard the written codes as the basis for a legal order instead of judicial decisions, AI begins to occupy a partial role in the formation of new precedents, potentially AI-generated [31]. A good example of this is ROSS Intelligence, an AI-legal research tool that lawyers can utilize as a means to analyze case law and identify relevant precepts to support the development of a new application of law [32]. ROSS can process massive amounts of legal information including statutes, regulations, and case law to identify relevant patterns which may be useful to assist legal practitioners in formulating their arguments. The potential of AI to create new precedents is particularly profound in civil law orders because courts typically create new precedents from interpretations of the law based on each case [33]. AI has the potential to ease the establishment of a precedent for how the law should change to respond to new circumstances. For instance, ROSS Intelligence has been utilized by legal teams in uncovering flaws in the interpretations of the law and suggesting alternate precedents that could change those conceptions.

The Aura model is an AI framework aimed at helping solicitors with various legal functions [34]. The model employs natural language processing (NLP) and machine learning techniques to analyse many legal documents, identify suitable case law and predict potential outcomes in a legal matter based on historical data. The model will support solicitors in a number of tasks including drafting legal documents, automating the process of reviewing contracts and assisting with legal research. The Aura model was designed with the sole purpose of increasing productivity and efficiency in the legal profession through taking away some of the time-consuming components of a solicitor's role to enable the solicitor to address other more nuanced issues of law. The significance of the success of the Aura model is important in demonstrating the practical implications of AI to the legal profession.

4. Blockchain Technology: Strengthening AI in Legal Reforms

4.1. Blockchain's Role in Strengthening AI-driven Legal Systems

Blockchain technology plays a pivotal role in facilitating an AI augmented legal framework by providing a stable, secure, transparent and immutable framework for AI systems to operate on; at the heart of the process of least friction, and most economical and societal benefit, will be the significant benefit of removing intermediaries for specific legal processes with a combination of blockchain and AI [35]. In general, the decentralized and distributed features of blockchain technology enable peer-to-peer transactions and smart contracts that allow for legal agreements to be fulfilled automatically, without the need for traditional intermediaries in the legal process. An example of this trend of integrating blockchain and AI is Ethereum smart contracts. Ethereum is a decentralized protocol that creates smart contracts, which are self-executing contracts with the terms of the agreement written as code [36]. The contracts execute independently and do not require human participation to execute and enforce the agreement. In effect, this minimizes the cost and time associated with legal processes. For example, in real estate transactions, ownership would transfer automatically using Ethereum smart contracts based on coded conditions occurring as agreed, such as transferring a payment once confirmed [37]. This innovation will allow legal professionals to automate processes, or at the very least, ensure more secure request tracking where humans are still involved.

4.2. Decentralized Systems: How Blockchain Enhances AI's Impact

The decentralized characteristic of blockchain complements AI's unique capability to manage copious quantities of data while guaranteeing that the data is secure and open to the entire system [38]. One of the main drawbacks of AI in traditional legal settings is relying on trustworthy, tamper-proof data to appropriately train algorithms and make sound choices [39]. Blockchain has the potential to solve this problem by allowing certainty that the data emerging through the AI ecosystem is secure and tamper-proof [40]. Decentralized ecosystems in the legal space hold various characteristics and benefits, especially in lessening centralized authority, like courts or governance, requiring validation or possibility for decision-making. Moving away from centralization can foster a movement towards a more democratic and fair legal space where individuals can access their legal system, understanding they have some ownership of the decision. With the infrastructure of blockchain, the AI systems accessing data will make legally valid choices based on verified, tamper-proofed data by blockchain technology- therefore, ensuring decisions are accountable to the stakeholders and public systems. Practically, applied blockchain technology to AI enables systems to remain unbiased, in that the data algorithms will not alter the decisions being made, thus ensuring fairness, equality, and consistency in decision-making, a concern in legal systems. As Zhuk points out, integrating AI technology joined with its decentralized features of blockchain, ensures less biased, fair, equitable, and consistent decision-making [41].

4.3. Blockchain's Complementary Role to AI in Legal Governance

A growing number of stakeholders recognize blockchain and AI as synergistic technologies that may be particularly suited for legal governance. Blockchain delivers a transparent, secure platform that verifies data with high confidence, while AI interacts with and acts upon that data [42]. Together, they can automate governance processes, such as contract

execution, dispute resolution, and regulatory compliance, with less human involvement. Kleros is an example of a decentralized dispute resolution platform that utilizes blockchain and AI together [43]. The blockchain creates a transparent, immutable record of everything that happens on the platform, so that every action and decision resulting from interactions with the platform is recorded. An AI algorithm evaluates dispute facts and recommends outcomes based on relevant data and past similar legal decisions. In addition, Kleros uses a crowdsourcing approach by which individuals with relevant expertise are selected to evaluate dispute facts. Crowdsourcing ensures that decision-making is based on the knowledge of experts, while the blockchain maintains a record of everything that happens to ensure transparency and accountability, with little or no reliance or involvement of the expert [44]. Kleros illustrates an AI-enhanced, blockchain-based dispute resolution as a scalable, less expensive alternative to court systems, enhancing access to justice with less overhead and fewer gate-keeping costs or barriers to obtain resolution [45].

4.4. The Intersection of Blockchain and AI in Contract Law

In contract law, blockchain and AI technologies are converging in a way that could fundamentally change how contracts are created, executed, and fulfilled [46]. For example, smart contracts, enabled by blockchain technologies, self-execute the terms of a contract once agreed-upon conditions are met, thereby eliminating the need for lawyers or notaries to draw up and execute contracts as traditional legal intermediaries [47]. AI will complement this process by analyzing contract terms, suggesting changes to the contract terms, and predicting potential legal issues related to the terms of the contract based on how the contract is structured and the parties involved in the contract. Propy is an example of an organization using blockchain and AI technologies to create real estate transactions [48]. Propy uses blockchain technology in a secure and transparent way to create immutable records of real estate transactions that can be verified and ensure that the terms of the contract are immutable and verifiable. AI technology is used to analyze the contract terms and automate the contract creation process to comply with local laws while including all the necessary legal boilerplate. Using both blockchain and smart AI will facilitate the execution of contracts and reduce the likelihood of disputes and mistakes. “Together, blockchain and AI will create an appealing combination of secure, transparent, and efficient alternatives to existing systems, where human error, time delays, and disputes arise” [49].

5. The Rejection of Legal Precedent: AI’s Dominance Over Tradition

Although precedent has existed in common law systems for millennia, its limits remain easier to identify now with the rise of an AI-enhanced legal environment. Precedent assumes relevance and applicability of past decisions to present litigated cases, but increasingly complex and global legal issues have diminished the applicability and appropriateness of prior rulings. AI can examine a volume of data and see patterns that are far beyond the capability of a human that may lead to decisions that are contextual, efficient, and without bias [50]. Dworkin argued that because precedent can repeat the law's existence as if it is an image of consistency in law, it may also inhibit its growth through social change [51]. AI systems would remove those restrictions and create a trajectory that could be predicted from data analysis beneficial for decision-making.

5.1. AI as a Tool for Legal Evolution: Moving Beyond Precedent

AI has the potential to transform the legal systems by increasing the rate of change in legal standards to fact patterns and prevalence of varying circumstances and fact patterns. AI-based legal tools like Lex Machina can provide insights and predictions about the likelihood of litigation outcomes using historical outcomes of cases, as well as trends in the law to form a prediction set for forecasted litigation outcomes. Lex Machina exemplifies a transactional legal analysis cadre of AI tool where a machine-learning computer technology is in concert with a vast quantity of data to quickly assess and analyze any data with parameter outcomes in litigation, based on historical case decisions [52]. This process allows lawyers to not only predict the outcomes of legal action but, in fact, create new precedents on the law by providing arguments and strategies based on legal history of the law and prior legal circumstances. Artificial intelligence platforms like Lex Machina are offering a novel variety of legal research and a legal form of analysis of law, while keeping in account a comprehensive factors analysis that affect law in terms of evolution, to social implications to, real policies.

5.2. Decentralized Protocols and Their Potential to Replace Precedent

Blockchain is a type of distributed ledger technology that allows transactions and agreements to be recorded in transparent and immutable ways with no reliance on centralized authority and individual human decision. Within a legal context, blockchain protocols could perform many of the same functions as legal precedent, by automating legal determinations through smart contracts, and decentralized dispute resolution systems. Kleros is an example of a decentralized platform that uses blockchain and artificial intelligence to provide automated dispute resolution [53]. Kleros uses crowdsourced and global participants as jurors to come to a legal determination, while relying on a decentralized process for the jurors and the evidence submitted. The entire process occurs on the blockchain, and

automated AI algorithms are also used to weigh evidence and predict outcome. Decentralized governance represents a radical shift in how legal determinations can take place.

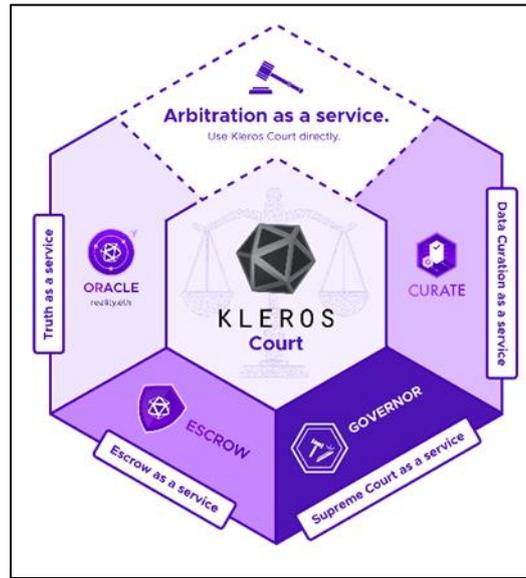


Figure 3 Kleros Court; Kleros not only illustrates the potential for automated legal determinations through decentralized protocols and smart contracts, but it also goes beyond and replaces the involvement of human judges and assigned reasoning to determinations.

5.3. AI-Driven Flexibility in Legal Systems

One of the main advantages of the application of AI in legal reform is the flexibility and responsiveness that AI inherently brings. Unlike precedential systems that bind future abbreviations to earlier ones, AI-based platforms can assess and respond to legal questions on a one-off basis and in real time with no reliance on any determinations. Flexibility allows the law to be applied nimbly in a manner that is based only upon present data and societal factors. Algorithms can make decisions extremely quickly based upon eligible data sources that are outside the constraints of proof and authority of traditional sources within a contract. The use of AI platforms is a way to provide rapid review of contracts that benefits the parties and the attorney’s client. Furthermore, the shifting digital process of reviewing contracts will remove or diminish the horizontal chance of people making errors or decisions based on the human cognizant biases of reading the often-written complex language, and overly complex legalities usually couched by para-legal support. The overall objective of this product is to provide a faster review of contracts with greater accuracy compared to the traditional review of contracts.

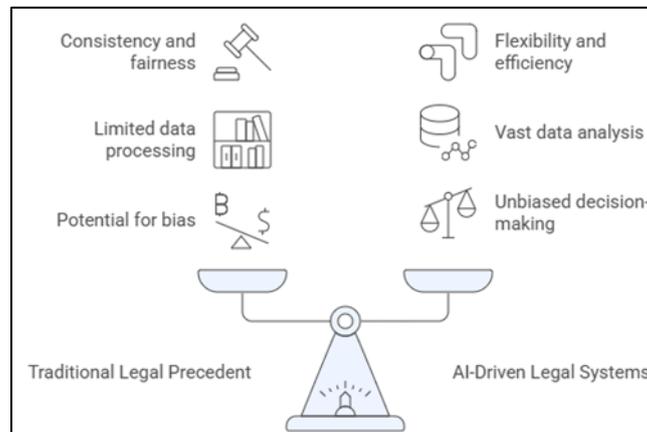


Figure 4 The equilibrium between traditional legal systems and those created with AI. In it, factors involving consistency, fairness, flexibility, data processing, and biases can all be compared.

6. Empowering Judicial Discretion with AI

6.1. Redefining Judicial Discretion in the Age of AI

Judicial discretion refers to the practice of judges exercising their judgment about how to decide, based on their interpretation of law, as well as on their experiences and perspectives [54]. The flexibility inherent in judicial discretion affords judges the opportunity to consider the unique circumstances present in each case, which could potentially include consideration of intent, societal implications, and, occasionally, considerations about the overarching implications of a legal rule. Each of these factors represents a consideration that judges consider based on the values they hold or develop as legal officials, for information developed or gained personally would need to be disclosed and transparent to the parties and public. However, as more legal components of the law are incorporating AI applications, the meaning of what discretion is could begin to be fundamentally transformed. Judicial processes to decide within a purposive legislative framework could be facilitated by AI predictive modeling decision support systems with the reliance on algorithms and data analytics. AI can transform massive amounts of legal data to predict outcomes based on historical patterns observed in case law and even provide predictive data-supported options to parties during a case or process. This provokes a critical question whether data-supported, algorithm-driven dispositions of judicial discretion are possible or started to integrate with the discretion of the human judge to make decisions. AI offers possibilities to enhance judicial discretion by providing data-driven insights to support or complement it, not necessarily determine or dictate it. For example, an AI will provide judges with information about a case that would present patterns from adopted case law decisions, principles based on the statutory purposes a case law development, a summary of legal precedents datasets of decisions related to the case outcome [55].

6.2. AI as a Superior Decision-Maker: A Shift in Decision Making to Data-Based Decisions.

One argument that supports AI in legal decision making is that AI can work with large datasets and detect patterns that judges might miss. AI systems, particularly machine learning, could analyze datasets of previously decided cases, principled legal reasoning, and anticipate possible legal outcomes [56]. Moving away from subjective orientations to an empirical approach could allow for greater speed and consistency when reaching legal judgment. AI systems are good at making judgments based solely on objective measures, compared to human judges, who can be subject to emotional and cognitive biases, and inconsistent application of the law. For example, in sentencing decisions, AI systems could integrate and consider numerous factors concerning the offender and provide recommendations that reflect standardized legal principles with precedent from prior cases [57]. There is potential for AI systems to provide legal judgment that are consistent, explainable, and equitable, which would promote a fairer and more equitable system of justice. However, the appeal of AI systems in legal contexts brings into question their limitations with respect to subjective or ethical decision-making.

6.3. How AI Outperforms Human Judges in Certain Legal Domains

AI applications are increasingly existing in legal contexts where data can be analyzed objectively, and predictability is desired. This is important in family law for making child custody decisions. When the evaluator considers both past decisions and the potential for predicting future outcomes are important, an AI system can assist by considering vast amounts of prior decisions made and patterns, as well as options for supervised visitation. In China, for example, AI applications are being used in family courts to assist with making decisions about child custody [58]. AI systems gather information based on case data, assessments of parent and child psychological reports, and reports from experts to generate predictions of "the best interest of the child" [59]. The algorithm identifies patterns based on the data and provides judge with a set of predicted custody options. AI-facilitated decision-making enhances the potential for quicker and more efficient decision-making, while minimizing bias. AI systems are adept in aiding with pattern recognition and recommending a resolve based on analyzing the data. However, human values and social norms that do not transfer in the same way a human judge can transfer to a decision-making process. In family law, AI works most effectively when it is knowledgeable of a human judgment process that allows for human ethics and emotions to become part of the ultimate decision-making function.

6.4. Enhancing Consistency and Reducing Bias with AI

One of the benefits of AI in helping judges, lawyers, and other legal decision makers is its capacity to enhance consistency and reduce bias in legal decisions. Bias related to race, gender, or socio-economic status has always plagued the legal system. AI has the potential to help reduce bias by relying on data and algorithms that are standardized. For example, in criminal law, AI can be used to look at past sentencing data and identify historical trends of bias related to race in judicial decision-making. It is important to note that AI systems such as predictive sentencing tools have been implemented in various jurisdictions to reduce racial or socio-economic bias in sentencing. AI systems and algorithms

can account for several variables, such as criminal history, recidivism risk, demographic information, and provide recommendations that produce results that are consistent with the law and free from bias or discriminatory thinking [60]. When well designed and well utilized, AI can help judges make fairer legal decisions through a fair and data-driven recommendation which will lead to a fairer justice system. There is, however, still a considerable risk of bias being held in the algorithms if the data that is used to train the AI systems holds bias. Zeng & Ross made a crucial point to carefully consider the training data before using an AI tool for legal decision-making [61].

6.5. AI as a Supportive Tool for Judges, not a Replacement

AI should be viewed as an adjunct to human judges, supplying tools and technology that enhance the productivity for and quality of the court process. AI is used in the court process to enhance human judgment, assisting judges in making more informed decisions while judges maintain the final discretion over all cases involving the application of the law. Many jurisdictions have begun to adopt AI systems to support judges by providing legally informed options, predictions, and suggestions, which in turn form appropriate conclusions regarding decisions to be made on the issues and applicable law. For instance, ROSS Intelligence, an AI legal research tool, provides judges with an extremely efficient model that speeds up the identifying relevant case law, statutes, and precedents to allow judges to spend less time researching the law so they are able to focus on the respective situations of the litigants involved in the legal process [62]. These tools add, but do not replace, the judgment of a judge, however coming equipped with a completely legally informed context and concluding opinions based on the respective claims will lessen a judge's decision time and enliven prudence. Another example is LawGeex, which is a step further in the AI platform. This platform allows attorneys to review contracts and identify issues, which demonstrates the support AI can provide to legal practitioners. While some roles can be supported by AI technologies, the human element or human touch is always an important consideration when using AI in litigation because the final decision in a legal dispute will be made by a judge considering ethical reasons and the human ability to contextualize and fix the situation to reach a decision.

7. Rethinking Regulatory Governance in the Age of Blockchain and AI

Regulatory governance systems follow traditional or conventional approaches which rely on centralized authorities to promote conformity to laws and regulations. With advancements in Blockchain and AI technologies, there is potential for automating and decentralizing regulatory governance systems. These modern technologies can provide improvements to governance systems with respect to, but not limited to, efficiency, transparency, and fairness, while also addressing challenges of traditional regulatory governance systems. AI can transform regulatory governance through its automated capacity to enforce rules, make decisions, and enhance oversight [63]. Because of its capabilities to collect and analyze large volumes of data, recognize patterns, and predict future behavior, AI has the potential to be a powerful means of identifying violations and monitoring compliance in many different capacities. AI can effectively and efficiently collect evidence of fraud while also investigating compliance adherence and predicting future behavior with a historical basis of violations. The Financial Industry Regulatory Authority (FINRA) is already using AI to identify patterns of trading-related fraud and misconduct by analyzing large volumes of trading data in the capital markets. AI tools can identify concerning patterns across markets and facilitate reviews for compliance violations [64]. FINRA also uses machine-learning algorithms in their surveillance of manipulative trades and other types of fraud. The use of AI systems to monitor and identify unusual trading behavior in real time has increased the efficiency of market surveillance. In sum, AI tools are capable of quickly analyzing data and determining potential violations to facilitate quicker analysis and response time, and the ongoing process of real-time analysis may improve regulatory bodies' abilities to instigate timely investigations or enforcement action.

7.1. AI-Powered Governance in Blockchain and Legal Systems

In addition to automating regulatory processes, AI and blockchain can complement each other in developing a decentralized and transparent regulatory system. The characteristics of blockchain are decentralized and immutable, which provide a transparent audit of all transactions and actions taken in the regulatory system [65]. AI can also automate procedural decisions along with providing data-driven insights and can replace a traditional centralized regulator for a centralized blockchain governance system. The blockchain will create an immutable audit of all regulatory decisions, smart contracts, and legal agreements while AI executes the contracts, disputes, and compliance checks [66]. The merger of blockchain and AI has the potential to reduce human error, improve efficiencies, and comply in real time, but overall will provide better governance systems.

7.2. AI in Financial Regulatory Oversight

The U.S. Securities and Exchange Commission (SEC) has incorporated AI technology into its market surveillance systems to enhance their monitoring abilities of financial markets, along with the potential for fraud [67]. They use AI tools to

review trading behavior patterns to identify insider trading and to find unusual activity that may indicate fraud or manipulation in the market. With AI-enabled surveillance tools, the SEC has the capacity to comb through larger amounts of data exponentially faster than human regulators. AI-enabled surveillance tools provide SEC surveillance tools with the capability to identify suspicious patterns in real-time across global markets. Using machine learning, AI-enabled surveillance tools improve their ability to identify potentially fraudulent activity in the marketplace with constantly changing market conditions. The application of AI with financial regulatory oversight provides an example of how AI-enabled governance can provide increased transparency, accuracy, and speed of compliance oversight, while also mitigating the risk of human error or bias in decision-making [68].

7.3. Blockchain and AI for Global Regulatory Compliance

The integration of AI and blockchain technologies also plays a key role in achieving global regulatory compliance, for key areas such as data privacy and cross-border financial transactions. The principal advantages of utilizing blockchain technology are to verify and immutably store transactions, as well as data exchanges. AI enables compliance monitoring and reporting through automation that continuously audits compliance with regulations. For example, the General Data Protection Regulation (GDPR) in the European Union (EU) has been a leader in compliance automation using AI and blockchain technologies [69]. Organizations that understand GDPR rules know they must ensure personally identifiable information is securely stored, accessible only by authorized individuals, and that all their activities remain in compliance with GDPR regulations [70]. AI technology can audit data, establish a rules violation, and create compliance documentation without a human and administrative burden; and Blockchain can support GDPR compliance in that it allows one to create an immutable record of all transactions regarding the data in a distributed ledger, promoting transparency and accountability to stakeholders. As a result, a combination of AI and Blockchain can ensure a principle-based approach to global regulatory compliance and provide organizations access to a fast, best practice, approach to conduct business in protected markets, without restriction of authority or regulated business. In addition, the use of AI and blockchain technologies will provide a more efficient approach to global regulatory compliance from the reduction of time, efficiencies, transparency, the sum process of improved efficiencies, and global regulatory compliance.

7.4. The Rise of Decentralized Autonomous Organizations (DAOs) in Governance

The development of Decentralized Autonomous Organizations (DAOs) marks a new type of governance being enabled exclusively through blockchain and AI [71]. DAOs are a form of organization that uses blockchain to allow a group of either token holders or protocols in an automatic fashion to make decisions, rather than those decisions being made by centralized organizations. DAOs utilize smart contracts to permit decision making and governance processes in the context of a democracy through governance systems that are transactional. DAOs are emerging in finance (decentralized finance or DeFi), charitable work, and other online communities. In Decentralized Autonomous Organizations DAOs, decisions are made through “code” in relation to rules delineated in a validated smart contract or similar contract stored on a blockchain network and are all likely using AI to govern decisions, predict future consequences, ensure compliance with the rules of governance, or act as intermediaries to mitigate centralization [72]. DAOs unite to provide governance structures that diverge from governance structures and organizational hierarchies based on events but still provide the capability to make consequential decisions just placed in the hands of those in a related committee or organization. DAOs take governance processes a step further by providing decentralized, algorithmic decision making based on consensus-based governance and data-informed decisions capable of being automated - this governance model has the capacity to transform governance structures and create efficiencies across sectors.

8. Conclusion

In summary, Blockchain and AI are disrupting traditional legal authority within legal systems, while simultaneously enhancing efficiency, transparency, and a drive toward decentralization [73]. Both Blockchain and AI impact core legal traditions constructed on heightened efficiency for legal functions and processes, including drafting documents, facilitating dispute resolution, decision-making, and ensuring regulatory compliance. The Blockchain serves as a secure and immutable vehicle for contracts and governance processes, in effect removing these from intermediaries, and helping to remove reliance for centralized authority. Decentralization is a concept that clearly pushes against the construct of a traditional legal system, which generally allocated decision-making, authority, and accountability to people, and situated this in a hierarchy around resolving social conflict [74]. Blockchain can also improve tensions between access and fairness. With the principles of data sovereignty and transactions able to operate within Blockchain, fraud is mitigated, and more importantly, trust increased in users in a transacting system. AI improves judicial discretion through a data-driven, predictive-analytical process. AI tools can support an analysis of law commentaries and pre-calculate case results while developing efficiencies in areas of legal research so legal practitioners can direct their energies in those areas of law that become see complex. AI decision-making will provide recommendations that are

descriptive and transparent in nature, as decisions will not be retained and provided within a structured framework for consistency in results - this is particularly important, if inappropriate, directed areas of reform like sentencing and family law are being measured for safety, validity, and purpose, around efficiency, equity and accuracy - but questions about AI persist.

The capability of AI to leverage regulation will be based on the reality that regulators will be able to compute and assess massive datasets in real-time through the pooling of blockchain and AI. DAOs can capture a shift in thinking from governance to peer-to-peer as well as tapping into the further development of AI and blockchain technology to democratize action and carve open decisions, agreements, and outcomes. The coding of AI, along with blockchain, layers on previous questions of legal governance related to data ownership and privacy, accountability, discretion, and bias. Regulatory frameworks such as the EU Digital Single Market legislation, can increase the acceptance and regulated use of technology to accommodate AI for legal service actions in a safe and responsible manner, but it creates contradictions when assessing AI as a social or human justice outcome of accountability, versus the derivative impact for civil or collective impacts[75]. The characteristic of legal governance authority to decide is most probably still a more hybridized process that includes human cognition, and some technology enabled reasoning, for the purpose of promoting fairness and justice. For example, blockchain technology can move legal governance and legal management to a much more decentralized, automated, data-driven to a shift toward whole new ecosystem! Blockchain adds a level of immutability to records in the ecosystem, while at the same time, AI enables predictability and will seek oversight and regulation. As one evidence example, in capital markets, AI-based systems are seeking to surveil potential fraud and market manipulation as the SEC and FINRA deploy AI technology.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflicts of interest.

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