

Administrative and Criminal Law in the Artificial Intelligence (AI) Era: A Bibliometric Review

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Abstract

This paper explores the potential application of AI in administrative law and criminal law. Based on 290 articles retrieved from the Web of Science database, we sort the main tendencies, most important papers, key journals, most prolific authors and most active countries in this field. Since 2014, relevance of articles has been on the rise especially for literature review articles published from 2016-2019. This indicates an rising need to synthesise information and give comprehensive viewpoints on this emerging topic. This research has a multidisciplinary nature, with the most cited publications focusing on enhancing the governance of AI, transparency, and algorithmic decision making. The Computer Law Security Review and the International Journal of Law and Psychiatry sway the arguments in the legal and ethical debates adjacent AI. It indicates that the authors of USA and UK are the top cited, indicating that this topic is focused on Anglophone authors. To identify theme clusters, term co-occurrence and trend topic analysis techniques were used. These clusters involve legal and ethical issues of AI, crime prevention, administrative regulatory frameworks, and algorithmic bias and fairness. Navigating AI governance and legal significance with academics, policy, and practitioners.

Keywords: Artificial Intelligence; Ethical Implications; Algorithmic Bias; Governance; Crime Prevention; Legal Frameworks; Bibliometrics

1. Introduction

With the emergence of artificial intelligence (AI), it has revolutionized and transformed the landscape of many sectors such as the legal and governance field (Liu et al., 2020; Chiu & Lim, 2021). Particularly, the use of AI technologies has had a significant influence on administrative law and criminal law (Coglianese & Lehr, 2016). Since AI systems are becoming more common in these legal areas, an in-depth analysis of the scholarship on this intersection is essential (Gupta, 2024; Brayne, 2020).

Administrative law is one of the fundamental elements in guaranteeing the accountability, transparency and legality of governmental actions and consequently of democracy (Shkabatur, 2012; Harlow, 2006). AI's use in administration has also brought legal and policy issues that have initiated the interest of scholars and policy makers in studying the implications of these developments (Dwivedi et al., 2021, Kuziemski & Misuraca, 2020). In administrative functions, AI-powered tools like chatbots, predictive analytics, and automated decision-making are becoming more commonplace in areas like regulatory compliance, public services, adjudication, and policy-making (Coglianese & Dor, 2020). However, the application of AI in decision-making in administration creates complex problems regarding the procedural fairness, accountability and the shield of individual rights (Kuziemski & Misuraca, 2020).

AI is not just impacting the criminal justice sector, but it is also manipulating the criminal justice system. Police are using predictive policing technologies that use crime data to predict crime patterns and give resources more optimally (Brayne, 2020; Ferguson, 2017). In the same way, AI algorithms can be used for risk assessment to

support judicial decisions on bail, sentencing, and parole, based on predicted rates of recidivism (McKay, 2020). These applications can develop criminal justice practices with regard to efficiency and objectivity (Ferguson, 2017; Malek, 2022). They, however, also advance issues of privacy, bias, and the potential of AI to exacerbate systemic inequalities (Završnik, 2019). A criticism of predictive policing is that it may lead to disproportionate policing in disadvantaged communities, which can further social disparities (Alikhademi et al., 2022). In addition, the application of risk assessment tools in judicial decision-making raises questions of fairness and reliability of these AI systems, particularly if the decision-making process is not entirely transparent and easy to understand by human actors (Bagaric et al., 2022; Chiao, 2019).

Based on the analysis of scholarly literature, this paper not only flattens the research themes but also depicts the research method implemented by the scholars in the field of administrative law and criminal law in the AI era. It will introduce topics such as laws and regulations on AI in public administration and criminal justice, ethical concerns in criminal justice AI, and transparency and accountability of AI in public administration. Further, the geographical distribution of research, preferred publication outlets among researchers and research collaboration between researchers and institutions will be explored. This bibliometric review seeks to integrate current research findings and discern new trends to provide meaningful insights for both legal scholars and policy and practice experts who face complex legal and ethical questions raised by AI technologies in administrative and criminal law.

The final dataset was then administered using VOSviewer and the R-package Bibliometrix tool, which are the most commonly used software to perform accurate and objective bibliometric analysis based on various indicators (Abu Huson et al., 2024; Abu Orabi et al., 2024). In particular, VOSviewer enabled a performance analysis to give an overview of the most influential authors, articles, journals, and countries for the research field. Science mapping was done using Bibliometrix using various bibliometric methods including keyword co-occurrence and trend topics analysis (Al-Qudah et al., 2022). Manual content analysis of the most influential articles supplemented the use of the bibliometric tools, and the main insights from the most relevant clusters which characterize value relevance research in administrative and criminal law in the AI era, and the emerging research directions, were discussed. Hence, the following research questions were stated specifically in this paper:

- a) What are the relevant themes characterizing value relevance research in administrative law in the artificial intelligence era fields, and how are they characterized?
- b) What are the emerging research directions of value relevance research in administrative law in the artificial intelligence era fields?

This is the first systematic attempt (to the best of the author's knowledge) to compile the academic literature on value relevance, which in contrast to a systematic literature review, has a more quantifiable and rigorous nature, and in contrast to a bibliometric analysis, has a more qualitative and focused nature. Moreover, this research provides a detailed, objective picture of the research within each of the research streams in value relevance research. This study has a different approach from previous studies: it is not imperfect to specific areas of value relevance or specific sub-areas like administrative law or criminal law, but merges administrative law in the AI era and thereby synthesizes the past, the present and potential future trajectory of value relevance research in all its aspects.

2. Methodology

This study applies a hybrid approach which combines bibliometric analysis and the systematic literature review (SLR) practices of several scholars (Momani et al., 2023). This decision was made because the researchers wanted to addition a deeper understanding of value relevance by conducting a comprehensive analysis that would combine both the quantitative and qualitative aspects of these two methodologies (Albalawee et al., 2024). The combined methods are intended to reduce any bias effects and amend the scientific validity of the results (Abu Orabi et al., 2024).

The study started with a systematic literature review (SLR) methodology, using the protocol established by ALShanti et al. (2024), This way the research process resulted in a strong and replicable process, consistent with the ideas of Petticrew and Roberts (2008, p. 44). The research protocol was complete, and included a clear and valid research question and a detailed description of the methodology planned. It also delved into the methods for

identifying, assessing and combining various types of studies and bordered a plan for the forthcoming reconnaissance.

The first phase comprised a series of steps, taken based on the known Systematic Literature Review (SLR) methodologies (Momani et al., 2023):

- 1) This step comprised clearly outlining the specific area of investigation and the research questions driving the study.
- 2) This involved selecting appropriate academic databases and identifying relevant keywords to effectively search for pertinent literature.
- 3) To refine the search results, papers were filtered based on specific criteria, such as subject area, document type, publication stage, source type, and language.
- 4) Completely, a rigorous screening process was conducted to assess each paper's eligibility for inclusion in the final review sample, ensuring adherence to the defined criteria.

The second phase of the study was a bibliometric study, which is a study that uses mathematical tools to explore and analyse the published research in a specific area (Santos et al., 2017). The process of this method is different from other research review methods because it allows the researchers to process the data that has been obtained in a more objective and automatic manner by using expressive statistical techniques and similarity measurement techniques (Momani et al., 2023). This enables the identification of key publications, journals and scholars in the field. Moreover, bibliometric analysis can help develop the "science maps," which represent the intellectual structure and evolution of any research field both visually and graphically and enhance the complete scientific rigor, replicability, and robustness of the study (Santos et al., 2017).

The second phase of the study comprises using different kinds of bibliometric analysis, which is done in a sequence of steps as described in Aladayleh et al. (2023). These analyses delve into the quantitative aspects of the literature related to the research topic.

- 1) This step provides a quantitative overview of the research field, such as the number of publications, citations, and authorship patterns.
- 2) This step identifies frequently used keywords and their relationships, revealing the key themes and emerging trends within the field.
- 3) This step pinpoints evolving research topics and areas of growing interest over time, offering insights into the future direction of the research field.

Phase One: Systematic Literature Review (SLR)

In line with the established research protocol, the initial stage of this phase involved formulating specific research questions:

- 1) What are the key themes that characterise value-relevant research in the field of administrative and criminal law pertaining to artificial intelligence (AI), and how are these themes distinguished from one another?
- 2) How are research trends evolving within the domain of value-relevant research in administrative and criminal law as it relates to artificial intelligence (AI)?

The papers were thoroughly selected from the Web of Science (WOS) database, in order to make the dataset as complete and representative as potential. WOS is one of the most beneficial databases over other databases such as Scopus because of the extensive coverage it provides, which can be useful in conducting a wide literature search (Momani et al., 2023). This will allow a broader search and data collection, organisation and further analysis. To get significant studies we used "Boolean operator: AND-OR" in the strategic search sequence: ("Administrative law" OR "Criminal law") AND ("Artificial intelligence" OR "Machine learning"). We do this on purpose in order to include a variety of perspectives regarding the relationship of law and technology to our research area.

The search process included some filters applied to the dataset in the Web of Science (WOS) database to make the data relevant and focused. The filters contained a list of subjects such as Automated Decision-making, and Criminal Law, document types (article), publication stages (final), source types (journal), and language (English) (ALShanti et al., 2024). The search was limited to peer-reviewed English language journal articles from 2014 (when the search first became possible on WOS to show the related AI with Administrative and Criminal Law) to 2023, of which the data collection was showed in early February 2024. To avoid bias, publications from 2024 were excluded. Initially, 1211 articles were found. This was followed by a two-stage screening process which involved first screening of the titles and abstracts and then a second screening of the full text paper (if applicable) by each of the authors, based on relevance to the study purposes (Lamboglia et al., 2021; Tranfield et al., 2003). There were frequent communications between the authors when there were any disagreements or uncertainties. Of these 329 articles irrelevant to the field and 521 not in the scope of the review were excluded by careful screening. In addition, there were 21 book chapters, 27 duplicates, and 23 articles that lacked an abstract. After this careful process a final set of 290 journal articles was reached as discovered in Table 1.

Table 1. Data formation.

Sample	Art.
A sample search for keywords Web of Science (WOS)	1211
Contributions related to different areas	-329
Contributions beyond the specified scope	-521
Chapter in book Extraction mistake	-21
Replication	-27
Concluding sample	-23
Sample	290

Phase Tow: Bibliometric Analysis

The first step, called a performance analysis, is the basis of the bibliometric studies and is crucial (Donthu et al., 2021, p. 287). This widely recognised and essential first step lays the foundation for subsequent analyses (Donthu et al., 2021). It is put to measure the performance of different elements in the research field including authors, countries, and journals. To do this, performance analysis relies on various indicators, mainly based on bibliographic citations, for producing descriptive statistics (Alqudah et al., 2023). This holistic overview would be beneficial to understand the research production and influence of the field.

The distribution of articles over time was studied and over a citation analysis and citations per year (CP) analysis to understand the impact of value-relevant research development in the area of administrative and criminal law in relation to artificial intelligence (AI) (Massaro et al., 2016). Citation analysis is a frequently applied bibliometric method that is used to construct lists of the most cited papers and authors to give an idea about research prominence and productivity (Aljawarneh et al., 2023). This is based on the assumption that scholars usually refer to the influential works that are relevant to their research (Aladayleh et al., 2023).

Based on this methodology, the research has been carried out to recognize the highly influential journals, authors and their associated countries (Lamboglia et al., 2021). This was done via the software program VOSviewer (Van Eck and Waltman, 2010, 2011, 2013, 2017; Waltman et al., 2010). Well known for the use in bibliometric analysis, VOSviewer made it possible to objectively and easily visualize the most important publications, authors, journals, research groups and countries in the field (van Eck and Waltman, 2010, 2011, 2013, 2017, Waltman et al., 2010).

The heart of the bibliometric analysis, or the so called science mapping, used first and second-generation relational indicators to explore the structure and organization of the research on administrative and criminal law in the AI field (Massaro et al., 2016). This included two main techniques, keyword co-occurrence and trend topic analyses. If not, content analysis of the keywords in the articles was used to explore the field's conceptual landscape, which is known as Keyword co-occurrence analysis. It discovered the important thematic clusters by computing the co-occurrence of specific terms in the same articles. The principle behind this is that higher co-occurrence means there is a closer relationship, and a greater chance that articles have the same research theme (Afeltra et al., 2022; Lamboglia et al., 2021). This approach wrangles from other bibliometric methods that connect documents via citations or co-authors; it is based on the paper's content to define a similarity measure and group into thematic clusters (ALShanti et al., 2024).

Trend topic analysis was conducted to identify new or future research directions by analysing the number of times authors use the keywords over time. This enabled the identification of periods where certain keywords were used to authority the scientific debate in the field, and differentiate common keywords in the recent years from those common in the past (Abbas et al., 2022). These analyses were carried out through the R packages Bibliometrix. Bibliometrix enables researchers to arrange various elements as sources, authors, records, and conceptual, social and intellectual structures, which allows for a comprehensive bibliometric study (ALShanti et al., 2024). It can employ clustering techniques such as “walktrap” and “leading eigenvalues” to build network graphs to visualize co-occurrence of bibliographic metadata (Aria & Cuccurullo, 2017). In the case of co-occurrence analysis of the keywords, the top eigenvalues algorithm was used by Bibliometrix to draw a co-occurrence network map of the keywords. This was an easy-to-use graph that showed clusters of keywords linked to specific research themes with different colours (Aria & Cuccurullo, 2017). The same tool was used for trend topic analysis, which developed in a scatter plot of trend topic axis (time) vs. occurrence axis (topics) and allowed the identification of the year of reference for the trend topic (based on the median of the distribution of occurrences along the trend period; Gerged et al., 2023; Aria & Cuccurullo, 2017).

Before performing science mapping analyses, the raw keywords were standardised and a thesaurus was used to remove duplicates, correct spelling, and merge synonyms. Thematic clustering of articles with a given probability level was also achieved by using Bibliometrix. Articles whose probability was above 0.8 were determined as highly likely articles for the specific cluster and between 0.4 to 0.8 were determined as likely. This automatic classification was then complemented with manual content analysis to guarantee reliability. Articles whose probability was lower than 0.8 were separation between the authors for independent reading, analysis of titles, abstracts and keywords. Panel meetings and discussions took place to discuss disagreements and uncertainties to ensure proper cluster attribution. A meeting was convened at the end to discuss and agree on the final cluster. Given the step-by-step agreement obtained, formal reliability checking was not measured necessary, but a critical review of the most relevant works in each cluster was made to discuss the key points, complement the results of the bibliometric analysis and indicate the emergence of research directions and/or opportunities for future research.

3. Results

Descriptive Analysis

The preliminary results of the bibliometric analysis on performance evaluation are shown in this section. It examines the development of value relevant literature and names, relevant papers, journals, authors and countries which have published the most relevant articles.

Articles

As seen in Figure 1, the number of publications on the topic of value relevance has been steadily increasing since 2014. Although the number of articles was fairly low in the first year (less than 20), there was a marked (and nonlinear) rise beginning in 2015. It is partly due to the publication of some important works about administrative and criminal law of artificial intelligence in 2014, including the works of Hildebrandt (2014) and Alzou'bi et al. (2014). These works reignited the debate and prompted many scholars to delve into the significance and relevance of

administrative and criminal law for artificial intelligence (e.g., Talesh, 2015; Kruisbergen et al., 2019; Watson, 2019).

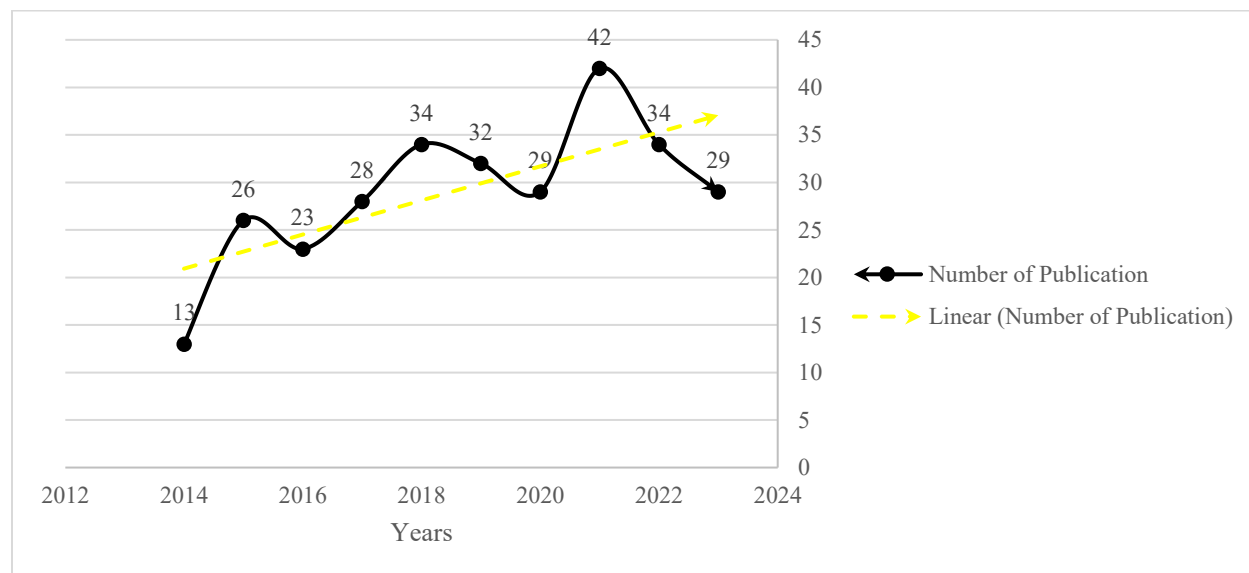


Figure 1. Number of Publication.

Table 2 presents the top ten most cited articles on value relevance from Web of Science (WOS) Database as of Feb 1st 2023. These articles point to important developments in the field, including those of Series (2015) and Tanasescu (2020). Interestingly, eight out of the ten are literature reviews published within a four-year window (2016–2019) by Alvarez-Garcia et al. (2016), NeJaime (2016–2017), Wheatley (2017), Talesh (2018), Sanders (2018), Clark et al. (2019), and Coglianese and Lehr (2019). The mushrooming of literature reviews in this study is an indication that there is still a need for a comprehensive and up-to-date study that synthesises all the available knowledge and affords diversity of views on value relevance even after a decade in the 21st century.

Table 2. The ten articles with the most citations on Web of Science (WOS) as of 1 February 2023.

No.	Ref.	Art.	Ct.
1	Series, (2015)	Relationships, autonomy and legal capacity: mental capacity and support paradigms	83
2	NeJaime, (2016)	Marriage equality and the new parenthood	67
3	Coglianese, and Lehr, (2019)	Transparency and algorithmic governance	65
4	Nejaime, (2017)	The nature of parenthood	64
5	Tanasescu, (2020)	Rights of nature, legal personality, and indigenous philosophies	54
6	Wheatley, (2017)	Spectral legal personality in interwar international law: on new ways of not being a state	52
7	Clark, et al. (2019)	Can you hear the rivers sing? Legal personhood, ontology, and the nitty-gritty of governance	49
8	Sanders, (2018)	'Beyond human ownership'? Property, power and legal personality for nature in Aotearoa New Zealand	47
9	Alvarez-Garcia, et al. (2016)	Validity and reliability of the cyber-aggression questionnaire for adolescents (CYBA)	45
10	Talesh, (2018)	Data breach, privacy, and cyber insurance: how insurance companies act as compliance managers for businesses	42

However, the average number of citations per year (CY) allows for a more balanced picture than total citations, since earlier publications have a head start and this also can be confusing (Royle et al., 2013; Bornmann & Mutz, 2015). Table 3 shows the results as of 1st February 2023, based on WoS data. Interestingly, nine articles (Coglianese & Lehr, 2019; Tanasescu, 2020; Series, 2015; Nejaime, 2017; Clark et al., 2019; NeJaime, 2016; Sanders, 2018; Wheatley, 2017; Talesh, 2018) appear in both tables, strengthening the fundamental role of these

articles in value relevance research. This along with the fact that older studies are still relevant (as seen in Figure 1) implies that despite the surge of research in recent years, there are studies that are still relevant. Just one of the top ten by CY is from the last three years (Cohen et al., 2023), further highlighting the enduring influence of the preceding work.

Table 3. The ten articles with the most citations annually (CY) as of February 1, 2023.

No.	Ref.	Art.	CP
1	Coglianesi, and Lehr, (2019)	Transparency and algorithmic governance	11
2	Tanasescu, (2020)	Rights of nature, legal personality, and indigenous philosophies	10.8
3	Series, (2015)	Relationships, autonomy and legal capacity: mental capacity and support paradigms	8.3
4	Clark, et al. (2019)	Can you hear the rivers sing? Legal personhood, ontology, and the nitty-gritty of governance	8.17
5	Nejaime, (2017)	The nature of parenthood	8
6	Cohen, et al. (2023)	The new abortion battleground	8
7	NeJaime, (2016)	Marriage equality and the new parenthood	7
8	Sanders, (2018)	'Beyond human ownership'? Property, power and legal personality for nature in Aotearoa New Zealand	6.71
9	Wheatley, (2017)	Spectral legal personality in interwar international law: on new ways of not being a state	6.5
10	Talesh, (2018)	Data breach, privacy, and cyber insurance: how insurance companies act as compliance managers for businesses	6

Journals

Table 4 provides information about journals that have greatly predisposed the research in the field of value relevance, the number of articles published in the journals, the average number of citations per article (ANG) and the reputable ABS ranking for business and management journals up to 2014. The most cited journals are the International Journal of Law and Psychiatry, Computer Law Security Review and the International Journal of Law Crime and Justice. However, a number of total citations (121) make the International Journal of Law and Psychiatry stand out, involving seminal works by Šttilis and Laurinaitis (2016), Eboibi (2017) and Broadhead (2018). This makes it the most cited journal in the field with almost one-third of all citations. Interestingly, its average number of citations (12.1) is nearly triple the second ranking journal, Computer Law Security Review (4.4).

Table 4. The ten most cited journals.

Sources	Ct.	Art.	ANG	ABS ranking
International Journal of Law and Psychiatry	121	10	12.1	Q1
Computer Law Security Review	101	23	4.4	Q1
International Journal of Law Crime and Justice	79	10	7.9	Q4
Journal of Crime & Justice	74	13	5.7	Q4
Columbia Law Review	50	6	8.3	Q1
International Environmental Agreements-Politics Law and Economics	45	9	5.0	Q2
European Journal of International Law	34	6	5.7	Q4
American Criminal Law Review	22	11	2.0	Q4
Journal of the American Academy of Psychiatry and the Law	16	6	2.7	Q1
European Business Organization Law Review	14	5	2.8	Q4

Authors and Countries

Table 5 presents key authors who are touching the field of value-relevant research in administrative and criminal law in the realm of AI. A total of 478 authors were found in our analysis and 290 articles. Three authors have significant numbers of citations as can be seen in the table: Arlen J. (44 citations), Huntington C. (50 citations), and Balgimbekova G. (44 citations) were the most cited authors. (11 citations). For instance, both Arlen J. and Kahan co-authored all four of their articles that were part of the analysis (Arlen, 2016; Arlen & Kahan, 2017; Arlen & Buell, 2020; Arlen & Kornhauser, 2023). Huntington C. is also a co-author in two articles (Huntington, 2018; Huntington & Scott, 2020). Furthermore, there are four authors with extraordinary citation number with almost all citations corresponding to a single document. For example, Series' article Relationships, autonomy, and legal capacity: Mental capacity and support paradigms has been cited 83 times.

Table 5. The ten authors who have been most frequently cited.

R	Aut.	Art.	Ct.
1	Arlen J	4	66
2	Huntington C	2	50
3	Balgimbekova G	2	11
4	De Hert P	2	9
5	Bu QX	3	5
6	Hardman J	2	5
7	Karagiannopoulos V	2	5
8	Acquisti A	2	4
9	Graves JT	2	4
10	Babin A	2	1

Finally, Table 6 shows the top ten countries from which the most-cited authors are from: USA, England, Australia, Belgium, China, Netherlands, Spain, Germany, Kazakhstan and Scotland. Interestingly, 40% of the high number of cited authors are from American universities (e.g., Arlen J, Huntington C, Acquisti A, Graves JT), and 30% are from British universities (e.g., De Hert P, Hardman J, Karagiannopoulos V). This distribution also shows that the majority of researchers studying value relevance in administrative and criminal law in the realm of artificial intelligence come from a North American context.

Table 6. The countries of the ten most cited authors.

R	Countries	Ct.	Art.
1	USA	886	121
2	England	253	43
3	Australia	218	21
4	Belgium	73	5
5	China	63	13
6	Netherlands	58	12
7	Spain	48	6
8	Germany	46	8
9	Kazakhstan	32	6
10	Scotland	22	9

Keyword Co-occurrence Analysis

The co-occurrence network map (Figure 2) provides an overview of the results of the keyword co-occurrence analysis. The dots represent keywords (nodes), and the lines between them indicate that these keywords appear together in the texts, according to the criteria of Lamboglia et al. (2021). The dot size represents its absolute relevance and is a measure of the frequency of occurrence of each keyword, as in the approach of Aria and Cuccurullo (2017). The width of the lines shows how strong of a relationship the co-occurrence frequency of the keywords has. Likewise, the distance between nodes reflects their affinity – the closer the nodes, the more related they are (Aria & Cuccurullo, 2017; Lamboglia et al., 2021). In addition, all nodes of the same colour are part of a thematic cluster, which in the visualization shows the interconnectedness of thematic areas in the value-relevant research landscape.

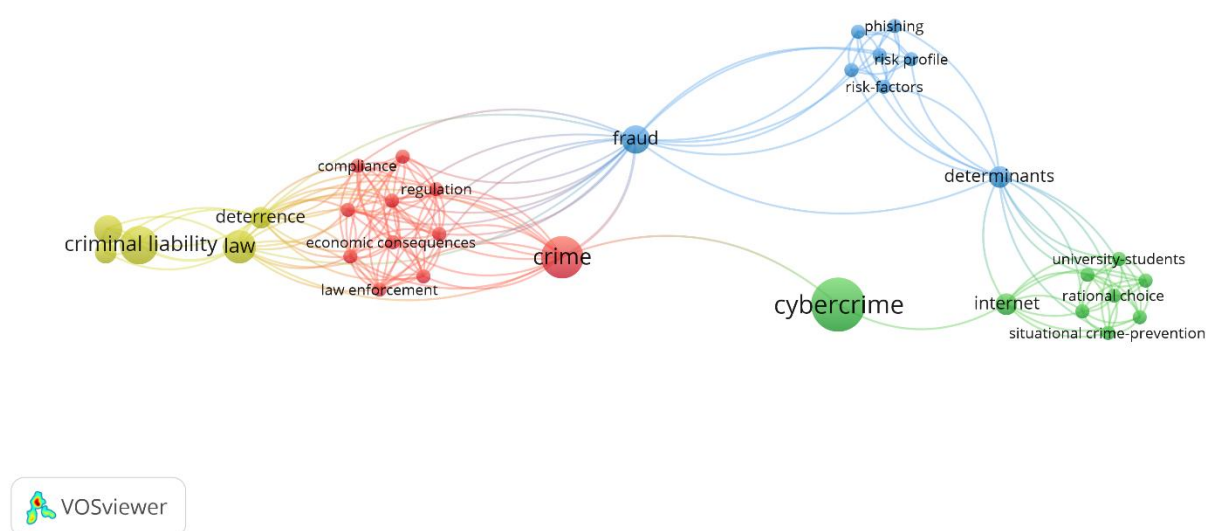


Figure 2. Co-occurrence network map for keyword co-occurrence analysis. Bibliographic information derived from the Web of Science (WOS) dataset.

The co-occurrence network map was made according to the methodology of Lamboglia et al. (2021), which shows the relationships of the frequently occurring keywords. For clarity, keywords that did not have any connection with other keywords (isolated node) were eliminated and only keywords that had at least one connection (edges) were kept. This process led to the production of a map of the network with 33 keywords, that can be broken down into four thematic clusters all well defined.

To effectively convey main ideas and goals, and to identify key areas of interest, clusters need to generate names through keywords. A well-written title should convey the main ideas, the extent of the study, and its possible implications. For instance,

- (Red Cluster) Legal and Ethical Implications of AI
- (Green Cluster) AI and Crime Prevention
- (Blue Cluster) Administrative Regulatory Frameworks for AI
- (Yellow Cluster) Algorithmic Bias and Fairness in AI

Trend Topics Analysis

The results of the trend topic analysis are shown in Fig. 3, which included keywords that appeared at least five times (twice per year) from 2015 to 2023, and standardised by three keywords per year (using similar methodologies as (AlShanti et al., 2024)). This scatter plot displays the top 10 relevant keywords for this time period; each bubble represents a topic. Keyword occurrence frequency is represented by the size of the bubble and the grey bar represents the first and third quartiles of the distribution. The bigger bubbles represent more frequent keywords, and the longer bar represents a longer use period by scholars, stable with the suggestions of Aria and Cuccurullo (2017).

As seen from the figure, the term "criminal liability" has been progressively appearing in the field of value-related research in recent years. Thus, some keywords such as "criminal law" and "content analysis" have been introduced in recent years. In particular, the keyword 'legal personality' has been a trending keyword since 2019, while 'victimization' has been a trending keyword since 2020. Further, topics such as "traditional crime," "corporate criminal," "human rights," "separate legal," "cybercrime victimisation," and "financial cybercrime" have been receiving an important voice in the last decade, but some of these topics have recently been declining. Other words that have historically been important have, on the other hand, become less important, such as "article argues" and "corporate legal".

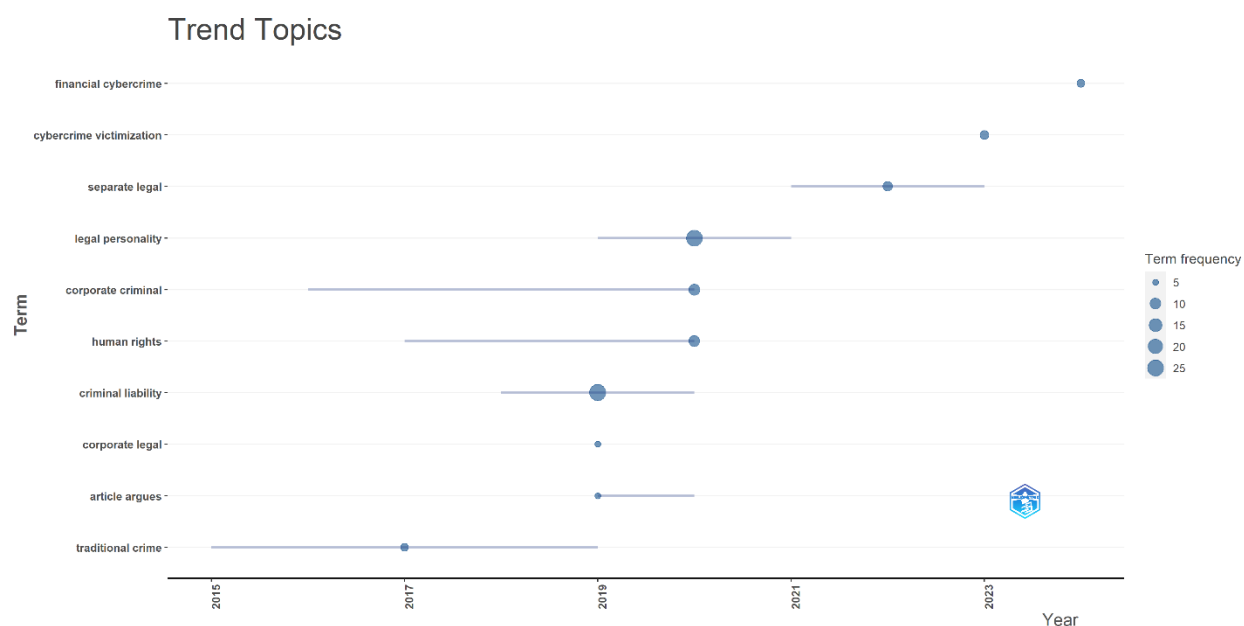


Figure 3. Analysis of trending topics: Bibliographic information derived from the Web of Science (WOS) dataset.

4. Discussion and Emerging Research Directions

This section is an extension of the results of the keyword co-occurrence and trend topic analyses. The most informative papers in every thematic cluster from the keyword co-occurrence analysis will be investigated by focusing on key insights gleaned from these papers. New directions of research and potential study topics for the future in each of the clusters will also be discussed by taking evidence from the trend topic analysis and a content analysis of the most relevant contributions.

(Red Cluster) Legal and Ethical Implications of AI

Cluster 1 (Red) is a discussion of the legal and moral aspects of AI. Amidst the fast-paced nature of criminal technologies, Artificial Intelligence (AI) has appeared as a valuable tool for tackling criminality, thereby improving community security and safety (King et al., 2020; Qudah et al., 2021; Madi & Kameel, 2019). The legal and ethical implications of AI are vast and will have wide-ranging influences on many facets of contemporary

society, requiring a reassessment of existing norms, values, and regulatory systems. With the rapid development of AI, stakeholders are confronted with heavy challenges associated to accountability, transparency, equity, privacy and socioeconomic fairness (Du & Xie, 2021).

Legal challenges are a new phenomenon with AI, and legal principles need to be changed (Gupta, 2024; Brayne, 2020; Kameel et al., 2023). One of the major challenges is related to accountability and liability, as the decisions of AI systems can have significant consequences, and they are made without the involvement of humans (Scherer, 2015). When AI systems become more complex and autonomous, the task of determining who is responsible for what becomes more complex (Abbass, 2019). Also, the responsibility of AI failures or harms can be very complex, especially the question of foreseeability and causation, especially when human and machine agency are intertwined in creating the AI. AI also poses additional issues for IP rights, for example, because of the confusing of lines between the creative and the inventive, between humans and machines (Buiten et al., 2023). AI innovations can also have complex patentability, copyrightability and trade secret protection issues, which need to be cracked to balance the incentive of innovation with an objective of competition and knowledge availability (Kop, 2019).

The ethical implications of AI are significant, with issues of fairmindedness, bias, and discrimination coming to the fore. If we're not careful, AI systems can exacerbate offered inequalities, and more particularly, reinforce and/or reinforce inequalities from the data they learn from, namely large amounts of data that reflect inequalities in society (Heinrichs, 2022; Kameel et al., 2024). To moderate algorithmic bias it is important to proactively work towards curating the data sets, designing the algorithms, and monitoring and intervening to detect and correct any unfair decisions. Additionally, transparency and explainability in the decision making process of AI systems are crucial to foster trust and accountability for the stakeholders (Nazer et al., 2023). But transparency in complex AI systems is still a difficult task to achieve, and there is a need for progress in interpretability techniques and standards for algorithmic accountability. In addition, the socio-economic impacts of the use of AI raise moral questions on the job loss, inequality and centralization of AI capabilities by large organizations of technology (Lu, 2020). Policymakers should think about ways to grant a fair transition for those whose jobs get automated by AI and another much bigger question of how to promise economic justice and social equity (Bloom & Bloom, 2020).

To undertake the legal and ethical issues immediate AI, cooperation and collaboration between countries and institutions are essential. With the international character of the development and deployment of AI, it is crucial to create harmonized regulatory frameworks, share good practices and encourage cross-border collaboration to facilitate responsible innovation of AI and diminution the risk of regulatory arbitrage and jurisdictional conflicts (Liu & Lin, 2020). In addition, public engagement and education are critical elements in influencing societal views on AI and sponsoring a culture of ethical responsibility and accountability (Robinson, 2020). In this way, a multi-faceted approach that considers the legal, ethical and societal implications enables various stakeholders to address the multifaceted challenges of AI governance and guide technological advancement towards a future where respect for the dignity of the human person, justice and human rights (Stahl et al., 2021) are upheld. In the future, it is essential to highlight the importance of developing and approving ethical guidelines and regulations for AI to ensure that these technologies are used in a responsible and beneficial manner, prioritizing the well-being of individual and society, and contributing to a more inclusive and sustainable future for all (Floridi et al., 2018).

(Green Cluster) AI and Crime Prevention

The synergies between AI and crime deterrence are taken into account in Cluster 2 (Green). The swift progress of artificial intelligence in recent times has mounted a plethora of legal and ethical dilemmas. Since more and more people and societies are being impacted by AI applications, it is also necessary to establish a comprehensive legal and ethical framework that regulates the use of AI applications (Wischmeyer & Rademacher, 2020). It is one of the important reasons that are responsible for raising the human rights and health of society. In the area of crime prevention, AI technologies provide law enforcement with a variety of advanced tools to help stop criminals, especially in a multi-pronged approach (Shah et al., 2021; Apostolakis et al., 2021).

AI's ability to forecast crimes is one of its main helps when it comes to misconduct prevention (Meijer & Wessels, 2019). The huge volume of data – such as historical crime data, demographic data, socioeconomic indicators or weather patterns – can be analyzed using AI algorithms and recognize the complex patterns and trends

that may hint at imaginable criminal activity (Feng et al., 2019). Predictive modeling can inform law enforcement of the most indicating areas and time to focus their resources on maximize the likelihood that criminal activity will occur (Kennedy et al., 2011; Al-Raggad et al., 2024). Furthermore, AI predictive technology can be used to target individuals who may be more susceptible to committing a crime and implement early intervention and tailored intervention measures such as social service programs and community outreach initiatives (Shah et al., 2021).

AI systems have revolutionized the way that the police monitor and recognise suspects, along with predictive analytics (Jarrett & Choo, 2021; Kameel et al., 2025). Sophisticated facial recognition systems mingled with behavioural analysis algorithms are able to track and identify people in public spaces in real-time, helping to quickly apprehend suspects and to prevent crimes in progress (Kreissl et al., 2014). Additionally, AI-based surveillance cameras can process a lot of footage from security cameras, identifying unusual behavior or patterns that might not be uncovered by human monitors (Kaloudi & Li, 2020). The onscreen surveillance enhances the effectiveness and efficiency of the police's function and reduces the human resources burden by freeing up police to focus on more critical tasks (Apostolakis et al., 2021).

In addition to this, the AI technologies have a great prompt in optimizing patrol routes and strategies for deployment through the use of predictive policing algorithms (Shah et al., 2021). AI can analyze data on historical crime trends and patterns to develop optimized policing schedules that direct officers to areas where crime risks are highest and discourage crimes, as well as increase response time to robberies or other crimes (Berk, 2021). The proactive policing has been successful in several jurisdictions to reduce crime rates and enhance public safety (Majmundar & Weisburd, 2018).

Moreover, AI is reshaping the landscape of Forensic analysis, by curtailing the workflow of handling and analyzing digital evidence (Jarrett & Choo, 2021). AI algorithms can handle repetitive tasks that are time-intensive, assist with investigations, and progress the accuracy of criminal identification, among other functions, whether it's DNA analysis, matching fingerprints, or facial recognition (Jain & Ross, 2015). This will help make the disposal of criminal cases faster as well as justice will be served timely and properly.

While the probable of AI in crime prevention is significant, there are also ethical and legal issues to consider, such as the risk of bias and discrimination in AI algorithms (King et al., 2020). Relates about privacy infringement, algorithmic bias, and the transparency of AI decision-making need to be addressed to sack potential harms and foster responsible and ethical use of AI technologies (Nassar & Kamal, 2021). In addition, concerns about the possibility of discrimination and the necessity of strong regulatory frameworks and oversight to uphold civil liberties and the rights of individuals when it comes to AI-driven surveillance systems have been raised.

The application of Artificial Intelligence in crime prevention is revolutionizing law enforcement by providing unprecedented tools for crime prediction, detection and prevention. Predictive analytics, the surveillance technology and forensic analytical tools can promotion law enforcement agencies in creating public safety, decreasing crime and making communities safer (Hayward & Maas 2021). But, as AI is implemented in crime prevention, there are also ethical, legal, and social concerns that must be taken into account (Greenstein, 2022; Shah et al., 2021).

(Blue Cluster) Administrative Regulatory Frameworks for AI

Cluster 3 (Blue) is a vital piece of the governance of AI, and aims to prompt administrative regulatory frameworks for AI. AI technologies are promptly changing, posing the challenge for policymakers to find a balance between encouraging innovation and holding AI accountable. This is must to promote the development and use of AI system responsibly (Hagemann et al., 2018; Al-Faouri et al., 2024). These rules include various administrative measures aimed at grasping various legal, ethical and societal concerns of AI. Administrative regulation has one of its primary aims to guarantee transparency and accountability in the use of AI in the decision-making process (Kuziemski & Misuraca, 2020; Al-Raggad et al., 2024). This involves introducing mechanisms to make algorithms more transparent, for example via demanding AI builders to provide information about the data sets, training methods, and the rules used for the algorithms to make a decision (Felzmann et al., 2020; Kameel et al., 2026). Further, administrative rules could demand the creation of an oversight body or a regulatory agency to

supervise and ensure conformance with laws and standards on AI (de Almeida et al., 2021). The importance of these agencies is that they help tackle issues of safety, reliability, and ethical concerns surrounding AI systems, advising developers and users and investigating complaints or incidents related to AI-related harm (Stahl et al., 2022; Wong, 2020; Ehjelah & Al-Qawasmeh, 2026).

Furthermore, administrative regulatory regimes of AI may contain conditions that seek to foster non-discrimination and fairness (Wachter et al., 2021). Regulatory bodies might demand that AI developers perform comprehensive bias analysis and mitigation steps to prevent the reinforcement or worsening of inequalities in AI systems, considering that AI algorithms are inherently biased, and the data used to train them may have its own biases (Huson et al., 2024; de Almeida et al., 2021). In addition, standards or guidelines for the ethical design and use of AI systems might be wanted under administrative regulations, with a focus on human dignity (Wong, 2021), fairness, transparency, and accountability. These standards are intended as a guideline for the development of responsible AI and support the developers in making ethical decisions and enhance citizens' trust in AI technologies (Díaz-Rodríguez et al., 2023).

In addition to transparency, accountability, and fairness, administrative regulatory frameworks for AI also address concerns related to privacy and data protection (Abiteboul & Stoyanovich, 2019; Alqudah et al., 2024). AI systems can be applied to large volumes of personal data to learn algorithms or make predictions, resulting in issues of privacy regarding the collection, storage and use of personal data (Manheim & Kaplan, 2019). Administrative rules can be put in place to tackle these issues, including demanding that data be anonymized, consent acquired, and data minimized, meaning that AI systems can only access and use data that is strictly required for the intended purposes. Moreover, there could be requirements for data security and breach notifications, which would require AI developers to take comprehensive steps to ensure that their systems are secure and are required to notify the relevant authorities and exaggerated individuals in the case of a data breach (Park, 2019).

Further, administrative regulatory frameworks around AI reach to liability and accountability (O'Sullivan et al., 2019). Whereas AI systems are increasingly autonomous and have the ability to make intricate decisions, issues of liability come into play when AI systems cause errors, harms, or unethical conduct (Yazdanpanah et al., 2023). Administrative regulations can create laws on how to partake in the responsibility of AI developers, manufacturers, operators and users, and how the responsibilities of each of them should be attributed in AI related transactions (Wong, 2020; de Almeida et al., 2021). Further, regulatory bodies could establish guidelines for the ethical use of AI in sectors where it poses high risks, such as healthcare, criminal justice, and autonomous vehicles, providing principles for responsible AI development, deployment, and oversight (Taeihagh, 2021).

(Yellow Cluster) Algorithmic Bias and Fairness in AI

Cluster 4 (Yellow) explores the issues of algorithmic bias and fairness in AI. These are the main issues that are part of today's debates around technology and ethics. With the mounted use of AI in everyday life, there is a need for greater oversight of the ability of AI to amplify or exacerbate societal biases. This needs a full investigation (Tsamados et al., 2021).

Algorithmic bias is a systemic discrimination that can be built into AI systems, perhaps based on incomplete data used to train the algorithm, inaccurate algorithms or even societal prejudices. Such biases can be racial, gender, socioeconomic or geographic, resulting in a differential treatment of various population segments (Kordzadeh & Ghasemaghaei, 2022). For example, the facial recognition system has been found to be less correct for people with dark complexions because the training data used to program the algorithm is biased (Schuetz, 2021). In a similar fashion, worries concerning over-policing in marginalized communities have resulted in predictive policing algorithms improving disparities in law enforcement practices (Alikhademi et al., 2022).

However, cracking the challenge of algorithmic bias and promoting fairness for AI technologies requires a comprehensive strategy that includes technical solutions, ethical principles, and regulatory frameworks (Ehjelah et al., 2026; Konda, 2022). Technically, counteracting bias can be overcome by using powerful data preprocessing methods to detect and correct biases in the training data, which include data augmentation, bias correction, or fairness-aware algorithms (Siddique et al., 2023).

Ethically, the notions of transparency, accountability, and inclusivity should be promoted in the AI development process. Transparent AI systems that explain how decisions are taken can allow stakeholders to better understand and contest prejudiced decisions and varied and inclusive development teams could help identify and mitigate blind spots and biases (Varona & Suárez, 2022).

Additionally, the function of regulatory bodies and industry requirements in guaranteeing equity and accountability for AI is of great significance, as they set regulations and necessities for the moral creation and use of AI. These can range from algorithmic impact assessments, to bias audits and other forms of algorithmic accountability, to model documentation and outside audits (de Almeida et al., 2021). However, these risks can be mitigated and with the goal of developing and maintaining AI fairly, AI can help build a more equal and fair society (Singh, 2021; Tsamados et al., 2021).

However, more research and interdisciplinary collaboration is commanded to improve the understanding of algorithmic bias and to develop efficient algorithmic bias management strategies (de Almeida et al., 2021). Meanwhile, this must include interdisciplinary research across computer science, ethics, sociology and other areas to grasp where bias can come from, and how to best detect, mitigate and prevent it (Mehrabi et al., 2021). Overall, this can be achieved as a community by mounting up the positive effects of AI technologies while addressing the contest of algorithmic bias to ensure that AI can continue to be a positive force in creating a more inclusive, equitable and just world for all (Yu, 2020; Schuetz, 2021).

5. Conclusion

A study using the bibliometric methodology and systematic literature review, was made an force to know everything about value relevance in administrative and criminal law within the scope of artificial intelligence (AI). The combined method was used to cut potential bias and to ensure scientific rigor and credibility of the findings to offer a full-fledged assessment of the field. The SLR was performed with a specific set of research questions and complied to in detail. This followed in a final data set of 290 journal articles on which further analysis was based. A bibliometric study was then conducted to examine the quantitative features of the literature and synthesize information about the amount of research, impact and trends in the field.

Moreover, science mapping was used as a method to identify influential publications, authors, journals and thematic clusters in the research field, and bibliometric analysis was implemented. The study highlighted the use of keyword co-occurrence and topic analysis of trends to uncover the conceptual map of the field and the changes in the field's research trends over the years. The study also ensured accurate and reliable cluster attribution, as the processes were electronic, and manually content analysed. This risen in a detailed perspective on the intellectual matrix and on the development of value appropriate research in administrative and criminal law on the topic of AI.

As for the descriptive analysis of the bibliometric data, it reveals an remarkable trend in the significance of research in the field of administrative and criminal law as it relates to the use of artificial intelligence (AI) over the years. The importance and the hob of this interdisciplinary field is seen in an amassed publication trend from 2014 onwards. This resurgence is due in part to seminal works which sparked a new interest in research. While there are pre-existing literature reviews; there is a substantial rise in literature reviews in the recent years. But there remains a need for making sense of the existing knowledge, and for having holistic visions on value relevance. The most cited articles and journals that are retrieved from the bibliometric analysis can be used as a standard to rate the impact of research and guide further research. Some of the works are still suitable although they have been published years ago as a strange thing. Also, the authors' country of origin and institutional affiliation show a degree of the predominance of North American and British institutions in contributing to the discourse, which glittered the world-wide distribution of the scholarly activities in this field.

The keyword co-occurrence analysis and trend topic analysis take the extra mile to pose an in-depth exploration of the thematic landscape and emerging trends in valuable research. Multi-dimensionality is seen in clusters of the study that have been done in this area, including "administrative regulatory frameworks for AI," "algorithmic bias and fairness in AI," "AI and crime prevention" and "legal and ethical implications of AI. The study of the trending topics throughout the years may provide some clues on the evolution of academic activity. In

particular, criminal liability, victimisation, new aspects of cybercrime as well as the legal personality have been in the spotlight. These conclusions have stimulated the awareness of the literature presented on this subject and have provided some direction for the future research. The analysis highlights the continued importance of issues such as algorithmic bias and fairness, and presents novel fields of research on law-AI interaction, such as criminal liability and AI victimisation.

The thematic clusters gotten by the keyword co-occurrence analysis shed light on key areas of research where the intersection of law and artificial intelligence (AI) is particularly relevant. These groups signify vital concerns that involve our consideration at a time when AI technologies are experiencing swift changes. The red group focuses on the legal and ethical aspects of AI and the importance of addressing the many facets of issues related to accountability, transparency, fairness and socio-economic equity. Complete regulatory frameworks and codes of conduct including the participation of civil society should be industrialized in consultation with policymakers, researchers and practitioners, and with the confirmation of respect for human rights, social welfare, and minimization of possible harms. New research fields may include research on new problems like decision-making algorithms in AI systems, privacy rights of individuals in the era of AI, and the ethics of AI surveillance technologies. It is important to have cooperation and collaboration between legal scholars, ethicists, technologists and policy makers. Overall, this strategy for AI governance will help ensure that AI systems are both innovative and responsible, with a focus on ethical considerations.

The green cluster examines into AI and crime prevention. More studies are necessary to understand the advantages and disadvantages of AI for law enforcement and ethical and legal issues. Predictive analytics, surveillance and forensic techniques may be useful, but face questions of civil liberty, algorithmic bias, and privacy. Given the complexity of the application of AI in crime prevention, research priorities need to focus on developing responsible and rights-based approaches to AI, and social impact assessment and effectiveness measures of AI technologies. The interdisciplinary conversation between criminologists, legal scholars, data scientists, and civil rights groups can prove to be a turning point and can result in in-depth and creative solutions for a pilot project on the hybrid nature of the relationship between AI and criminal justice.

The blue cluster delves into administrative regulatory issues of AI. Future research needs to address the question of how to design and how to implement efficient governance mechanisms that will, concurrently, deliberate innovation and accountability here. The focus of the regulatory actions should be on the transparency, fairness, privacy and accountability of algorithms. This assists to ensure that AI systems are not harmful or dangerous, and uphold the public interest. Here are potential areas for research: impact of AI regulations on AI technological innovation and competitiveness, challenges in implementing AI regulations, and the roles of regulators in developing and deployment of AI systems. Comparative studies of the regulatory strategies that have been allowed in various jurisdictions could help identify best practices and inform policy lessons in order to address the various facets of AI regulation.

The yellow cluster is dedicated to algorithmic bias and fairness of AI. Further studies should aim to investigate interdisciplinary solutions to comprehend and tackle the original drivers of bias within AI systems. Besides the technical solutions (like bias detection algorithms and fairness aware machine learning techniques), there are ethical, regulatory and public engagement solutions that need to be taken into consideration. The research might be focused on inclusive approaches to designing and implementing AI, the enclosure of diversity in AI development teams or effective stakeholder collaboration for the use of AI to impact positive change for all of society. The longitudinal studies of AI systems that change over time can be cooperative in the understanding of the success of bias mitigation techniques, and how much bias bodies in algorithmic decisions. A cooperative tool for raising awareness and understanding about algorithmic bias and fairness, and for developing more equitable and fair futures with technology, can be interdisciplinary research and collaboration among academics, industry and civil society.

A need for in-depth research into interdisciplinary nature of the field of AI and law. If the lawyers, the ethicists, the computer scientists, the sociologists and so the policy makers could all be synergic, perhaps there would be a better acceptance of the legal and ethical consequences of the AI technologies. Furthermore, an analysis of how these regulatory frameworks have been adopted and evolved over time in different jurisdictions could

provide inputs on the effectiveness of multiple regulatory models for governing AI. Qualitative research methods, such as interviews with stakeholders and case studies, can provide a deeper understanding of the challenges and opportunities associated with AI in the legal field. Parents might be concerned in a number of research projects and interdisciplinary research to help shape evidence-informed policies and practices for the responsible and ethical application of AI in society.

There is a job for governments, and the legal framework, to do in further. Advisory panels or interdisciplinary task forces are suggested for the affirmation of a primary governance structure for AI. All these schemes need to be oriented towards transparency, accountability and fairness and towards innovation and competitiveness of the economy. Additionally, governments should ask themselves how to finance capacity building activities to increase technical capacity of institutions overseeing and regulating the use of AI technologies, including regulatory and law enforcement bodies. Fulfilling consultation and engaging with the public can help ensure policy decisions are made, taking into account the gains and opinions of a broad spectrum of stakeholders. These are civil society groups, industry and marginalised groups representatives. International cooperation and coordination also plays an important role to harmonise regulatory frameworks and resolve issues related to cross-border challenges with AI regulation. AI can have trust-building and innovation-enhancing guidelines that aim to protect the rights and well-being of their citizens in the AI world.

It's important to acknowledge the potential limitations and challenges of regulating AI technologies, though. A major limitation is the fast rate at which technology is modifying, and regulatory structures and ethical guidelines haven't caught up. This may have regulatory implications, as laws and regulations may not be swiftly adjusted to the changing landscape of AI applications, leading to issues of oversight and accountability. Achieving regulatory compliance and enforcement might be more intriguing because of the opacity and complexity of the algorithms employed in AI, especially in the cases of opaque or not easily understood decision making processes. Additionally, with the international scope of AI development and usage, aligning regulatory frameworks with other countries can be challenging, potentially resulting in regulatory inconsistencies and conflicts regarding AI governance models. Finally, there is an industry bias in the decision making process: industry's regulatory capture of the public interest.

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