THE INTEGRATION OF AI IN DOCTORAL-LEVEL RESEARCH

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Abstract

In today's digital era, AI has emerged as a vital resource, particularly in academic research, offering innovative approaches to handle and interpret complex datasets. This influence is especially noticeable in intellectual property research, where AI is reshaping both theoretical understanding and practical applications. This study explores how AI affects doctoral research, with particular attention to its methodological and analytical contributions – ranging from automated legal text analysis to sophisticated document handling and pattern recognition using natural language tools.

However, the growing use of generative AI raises important concerns about originality, authorship and the legal status of AI-generated content. These issues are especially pressing in a discipline where clear boundaries around intellectual creation are fundamental. The research calls for clear guidelines to separate human creativity from machine input, especially in the context of academic writing.

The study also examines the broader ethical and legal dimensions of using AI in doctoral work, focusing on key principles like transparency, fairness, and the ability to explain AI-driven decisions. By combining theoretical insights with practical analysis, this work offers a well-rounded look at both the possibilities and challenges that AI brings to legal scholarship, while emphasizing the need to preserve core values in intellectual property law.

Keywords: *intellectual property, AI, doctoral research, artificial intelligence, law, machine learning.*

1. Introduction

In an ever-changing academic and social context, marked by accelerated technological advances and the massive digitization of knowledge, the need to understand how these phenomena influence traditionally well-defined fields such as law is becoming increasingly clear. This article aims to analyse the impact of AI on legal research, with a particular focus on how emerging technologies influence methodology, originality and argumentative structure in doctoral dissertations in intellectual property law. This is not merely a theoretical foray into a topical subject, but a thorough exploration of how these new tools shape, consciously or unconsciously, contemporary legal discourse.

The importance of this research derives precisely from the ambivalent character of AI in the academic space: on the one hand, it provides undeniable support in the process of analysing, synthesizing and organizing information; on the other hand, it raises essential questions about authorship, intellectual integrity and the boundaries between human and algorithmic contribution. In the field of law, where the subtlety of interpretation and logical construction are fundamental, such technological intervention cannot be viewed superficially. This gives rise to ethical and legal dilemmas, as well as a pressing need to reconsider concepts that, until recently, were regarded as immutable.

In this article, I propose to approach this issue from a twofold perspective: first, through a critical analysis of the way in which AI is already integrated into doctoral research in law and second by referring to the fundamental concepts of intellectual property law in order to identify possible tensions or contradictions that may arise between the use of technology and existing rules. The methodology used involves both a rigorous documentation of the literature and an applied reflection on relevant case studies, highlighting the practical implications of the topic analysed.

This study is part of a constant dialogue with the specialized literature, without, however, aiming at a simple reiteration of the ideas already conveyed. On the contrary, it attempts to fill an increasingly acutely felt gap in contemporary legal research, that of a critical and balanced approach to the use of technology in the academic space. While some of the literature is enthusiastic about the potential of AI, attempting to demonstrate new possibilities for analysis and study through the involvement of this technology, other studies are sounding alarm bells about the risks involved. This article assumes the intermediate position of a cautious

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but open-minded analysis that emphasizes nuances, the responsibility of the researcher and the need for regulation adapted to current realities.

2. Definition and evolution of AI in a legal context

AI refers to computer systems capable of performing tasks that require human intelligence, such as learning, reasoning and self-correction. AI also refers to a complex branch of computer science that aims to create and develop computer systems capable of performing tasks that mimic or exceed human cognitive abilities

In the general legal context, AI is commonly used for automating legal processes and actions, analyzing large volumes of legal data and for possible anticipation of litigation outcomes[1]. In the academic sphere, research on AI or involving AI and AI processes has highlighted the significant transformations that it brings to the way legal systems operate, including in the research area

The term informatics, according to Professor Ioan Craiovan, is a *„neologism introduced in 1962 by Phillipe Dreyfus and constructed by combining the words information and automatique it designates all scientific, technical and socio-economic disciplines that are suitable for information processing and automation"*[1]. The explanatory dictionary of the Romanian language defines *„**research**"* as an investigation, which is characterized by originality, carried out with the aim of acquiring new scientific or technological knowledge[2].

The particularity of the approach related to the use of AI systems in the field of doctoral research is that it will directly lead to the acquisition of new scientific and technological knowledge, the result of the research being useful for both directions of development (theoretical and practical).

The first approaches to the utilization of AI processes in the legal domain began in 1977 with the TAXMAN project, developed by Thorne McCarty in 1976 at Rutgers University, which consisted in an attempt to use AI to model/alter the legal reasoning process in a systematic and automated way. TAXMAN focused specifically on legal problems in the US tax area, with the aim of analyzing tax rules and provisions and applying them to complex legal cases. The system paved the way for further research in rule-based reasoning used in analyzing legal cases. Of course, the legal system in which TAXMAN has been developed is different from the Romanian one, TAXMAN performing the logical analysis both on the rule of law and on the comparative analysis of previous similar cases[3].

Clearly, the introduction of these technologies into the legal field, including academic legal research, is not without its challenges and risks. One of the most important issues discussed in the field of the application of AI concerns issues of ethics and transparency. Logical algorithms can reach conclusions without providing data to explain the reasoning[4], a phenomenon known as *„black box"*[5]. Lack of clarity can raise doubts about the correctness and rigour of conclusions that address a working hypothesis or academic research. Applying these aspects to the legal field or academic research, these risks can be amplified by the specificity of the field, characterized also by an often ambiguous and nuanced legal language, drafted according to the typology of the field in which the rules are applied, which can generate significant confusion in automatic interpretation, leading to possible errors.

To combat these risks, which lead to erroneous conclusions, recent research focuses on the development of Explainable AI (Explainable AI – XAI) systems[6], capable of providing clear justifications for decisions made, explanations and legal reasoning in detail. These development directions envisage milestones aimed at

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[1] I. Craiovan, *Tratat de teoria generală a dreptului*, Universul Juridic Publishing House, Bucharest, 2007, p. 291.

[2] *Dicționarul explicativ al Limbii române*, Univers Enciclopedic Publishing House, Bucharest, 2016.

[3] Reflexion on TAXMAN: An Experiment in Artificial Intelligence and Legal Reasoning – original version of the text January 1976 Harward Law Review.

[4] This lack of transparency may raise questions about respect for fundamental rights, in particular those laid down in the Charter of Fundamental Rights of the European Union, such as the right to data protection and to a fair trial – art. 8 and art. 47 of Charter of Fundamental Rights of the European Union (2000/C 364/01).

[5] N. Sfetcu, *Riscuri și provocări în inteligența artificială: Cutii negre și actorii de amenințare*, IT&C, vol. 2, no. 1, March 2023, *https://www.researchgate.net/publication/379012225_Riscuri_si_provocari_in_inteligenta_artificiala_Cutii_negre_si_actorii_de_amenint are_Risks_and_Challenges_in_Artificial_Intelligence_Black_Boxes_and_Threat_Actors*, last consulted on 05.02.2024.

[6] G. Pearce, *Explainable Artificial Intelligence (XAI): Useful But Not Uncontested*, 06.04.2022, *https://www.isaca.org/resources/news-and-trends/newsletters/atisaca/2022/volume-14/explainable-artificial-intelligence-useful-but-not-uncontested?gad_source=1&gclid= CjwKCAiAwaG9BhAREiwAdhv6Y6MonqLcKYJ433LYiqn2bZBrHARj4ATHrj7aeVa0b2AjzXRfjgijthoCO-sQAvD_BwE*, last consulted on 01.02.2024.

integrating AI with block chain and generating ethical algorithms that can determine conclusions that avoid errors and provide solutions that simulate human decisions in order to clarify certain aspects of law.[7]

Adoption of Regulation no. 1689/2024 laying down harmonized rules on AI and amending Regulations (EC) no. 300/2008, (EU) no. 167/2013, (EU) no. 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (the **AI Regulation**)[8] has the essential aim of ensuring the functioning of the internal market by establishing a uniform legal framework, in particular for the development, placing on the market, putting into service and use of AI systems (AI systems) in the Union, in line with the Union's values, to promote the uptake of trusted and human-centered AI (AI) while ensuring a high level of protection of health, safety, fundamental rights enshrined in the Charter of Fundamental Rights of the European Union (hereinafter „the Charter"), including democracy, the rule of law and the environment, to protect against harmful effects of AI systems in the Union, and to support innovation.

Based on Regulation no. 1689/2024 the AI system is defined as a machine-based system which is designed to operate with varying levels of autonomy and which can exhibit adaptability after deployment, and which, following explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations or decisions that can influence physical or virtual environments.

3. Application of AI in doctoral research

3.1. Scientific research. Automation of the research process

According to the GO no. 57/2002 on scientific research and technological development, research activity includes *„scientific research, experimental development and innovation based on scientific research and experimental development. Scientific research comprises fundamental research and applied research"*. This normative act defines scientific research as comprising both basic and applied research.[9]

Scientific research, experimental development and innovation are essential for the transformation of law through technology, through the adoption of technological tools, in particular through the integration of AI systems. In legal doctoral research, these three components form the foundation for the discovery of new solutions, from the theoretical level to their practical application in solving complex legal problems.

Scientific research involves two main strands that together lead to innovative solutions – **basic research and applied research**.

Thus, **fundamental research** endeavors to explore theoretical concepts and to propose new models for understanding legal rules, for interpreting existing rules both in the light of an updating of the legislator's will to modern needs and in the light of new legislative trends at European level. For example, a doctoral programme can study ways of logically representing articles, texts and even normative acts as a whole or of automatically interpreting the legal text (on the basis of certain general principles or starting from certain working hypotheses), laying the foundations for future practical applications.

Applied research, on the other hand, aims to use this knowledge to solve real problems, such as creating algorithms that analyze documents, opinions or contracts, and suggest legal solutions, amendments or issue warnings. Of course, it is not impossible that through applied research, logical algorithms could be developed or there could be a concrete contribution to the realization of such algorithms that could predict court decisions – based on similar case-law.

As we show in the introduction, AI is an advanced technology that allows computer systems to simulate human cognitive processes such as learning, reasoning or decision making and to improve these processes based on the experience gained from data. In the context of doctoral research in law, it can become an essential tool, offering vast possibilities for automating and optimizing legal analysis processes in multiple research directions.

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[7] A. Koshiyama, E. Kazim, Ph. Treleaven, P. Rai, L. Szpruch, G. Pavey, G. Ahamat, F. Leutner *et al.*, *Towards algorithm auditing: managing legal, ethical and technological risks of AI, ML and associated algorithms*, 2024, at *https://royalsocietypublishing.org/doi/10.1098/rsos.230859*, last consulted on *accessed on 7 February 2025, see also https://www.internetmobile.ro/riscuri-si-provocari-in-inteligenta-artificiala-cutii-negre-si-actorii-de-amenintare/*

[8] Regulation no. 1689/2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) no. 300/2008, (EU) no. 167/2013, (EU) no. 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (OJ 12.07.2024).

[9] E.E. Ștefan, *Etică și integritate academică*, 3rd ed., revised and added, Pro Universitaria Publishing House, Bucharest, 2023, p. 55.

For example, a doctoral study analyzing the evolution of case-law in cases of infringement of exclusive trademark rights might have difficulties in managing the huge volume of legal documents available, including court decisions, doctrinal opinions and national or European regulations. The use of AI, through natural language processing algorithms, would allow the process of analyzing complex legal texts to be automated, the essential elements or arguments to be quickly identified and compared with existing legal standards.

Moreover, artificial neural networks can help to detect hidden patterns in judicial decisions and foreshadow potential solutions in similar litigation based on previous cases. This approach would not only save the lawyer-researcher time but also provide an innovative perspective on the evolving legal interpretation of the notion of privacy, in the sense that this term is constantly expanding its scope of application, given the dynamic nature of law in the digital age.

AI can also be applied to bibliographical study by identifying the most relevant doctrinal works in a particular subfield of law, analysing citations and relationships between scientific articles. This process assisted by AI models helps the doctoral student to quickly access the most influential theories and coherently integrate different legal opinions into his/her doctoral research, as well as to ground his/her studies on a multitude of opinions collected and correlated from diverse scientific works.

However, the use of AI in law-specific doctoral research requires a balanced approach and a clear awareness of the ethical implications. For example, if the PhD student is using algorithms to analyse court judgments, they need to be mindful of the risks of misinterpretation or absolute reliance on automatically generated results. So far, AI models have not been able to fully and definitively replace human legal reasoning and cover what is generically referred to as the *spirit of the law,* which is the main reason for erroneous results or conclusions of doubtful usefulness. In this sense, AI becomes rather a complementary tool, aimed at supporting critical analysis and enriching the PhD student's interpretations, providing access to insights and information that would be difficult to obtain through traditional methods.

In doctoral research in the field of law, AI thus opens up new horizons but also new challenges. Used correctly, it can transform the way law is interpreted and applied, while supporting the development of innovative and academically and practically relevant theses.

3.2. Logical reasoning

In doctoral research involving the use of AI models, the choice of reasoning type depends on the specifics of the research, but each of the three types, namely **deductive, inductive and transductive[10]**, can play an important role in the development of logical algorithms. However, depending on how AI is used, inductive reasoning is the most common and appropriate, and in certain contexts, it may be complemented by deductive reasoning.

Where machine learning or AI training models are used to analyze large datasets and discover relevant patterns or relationships, the inductive model is the most used. Terminologically*, induction* means drawing general conclusions (principles/theories/logical flows) from concrete examples. A good example of this is when studying court judgements on copyright infringement, where AI models can be used to identify recurring patterns in court decisions and to formulate a general theory of how they interpret certain legal provisions.

Transduction, on the other hand, is different from induction in that it does not attempt to generalize the patterns discovered, but uses them to make specific predictions or classifications. Using this type of reasoning, AI can analyze the data already available to predict how a new case might be solved, without the need to formulate a general theory.

In doctoral research, these two types of reasoning – induction and transduction – are often combined, and by exploiting AI models, general patterns can be discovered from existing data (*induction*) or applied to obtain precisely predictable solutions or to classify new cases (*transduction*), and theoretical results can be further verified or refined by deductive reasoning[11].

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[10] I. Craiovan, *Tratat de teoria generală a dreptului, op. cit.*, p. 249, *apud* E.E. Ștefan, *Metodologia elaborării lucrărilor științifice Curs universitar*, Pro Universitaria Publishing House, Bucharest, 2019, p. 38.
[11] *Ibidem*.

3.3. Obtaining primary information and the use of artificial neural networks in the PhD research process

Advanced research data analytics and artificial neural networks are two key technological concepts which, when linked, can contribute significantly to the relevant theoretical results of doctoral research in law. Advanced data analysis refers to the process that the doctoral student goes through with respect to extracting valuable patterns and information from large unstructured or semi-structured datasets or scientific papers and materials available to him/her in the research process. Artificial neural networks, on the other hand, are computational models inspired by the structure of the human brain, capable of learning and recognising complex patterns and generating conclusions and reasoning similar to human reasoning.

In doctoral research, linking the two technologies can transform raw data into meaningful theoretical results. For example, the PhD student analysing case-law or legislative texts may have to process thousands of legal documents and court decisions or other texts relevant to his research. Advanced data analysis is used to extract relevant information, such as the type of case, the court that rendered the judgement, the articles of law invoked and the final conclusions, providing a quantitative basis i.e. a set of raw information without any further interpretation or relationship between these data or between these data and others. Interestingly, in advanced data analysis, data can be collected from multiple sources, such as data from legal texts, decisions of national courts or other jurisdictions as well as data from the literature[12].

This is where artificial neural networks come in, which can learn from the patterns discovered in the initial process and recognise the subtle connections between different legal elements. The network can identify whether court decisions on copyright protection have been consistently influenced by particular articles of law or legal interpretations. Based on these connections, the network can generate predictions or theoretical models, which can help the PhD student to formulate new hypotheses or test existing ones.

Another benefit of this correlation is that neural networks can evaluate cases and outcomes with a high degree of complexity, taking into account several factors simultaneously, such as the existence of EU-wide provisions. In research analysing the impact of new EU regulations on judicial decisions, neural networks can detect subtle changes in the interpretation of certain legal concepts before they become traditionally obvious. In this way, the network can propose a theoretical result that legislative changes in a given period lead to gradual changes in subsequent court decisions.

Advanced data analysis thus determines as a source of raw information an essential set of information or data, which neural networks process and interpret to derive theoretical results, which can subsequently lead to the discovery of innovative theories, to the verification of the correctness of doctoral hypotheses or even to the proposal of new research paradigms, the development of useful applications, all based on a solid empirical foundation

3.4. Theoretical results

In scientific research, by exploring fundamental concepts, formulating hypotheses, critically analyzing all (or most) of the available data and constructing abstract models that explain or formalize the legal processes under study, the theoretical results generated by the research process will be obtained.

Once the theoretical results are obtained, they are tested in the experimental development stage, which consists in creating and evaluating prototypes. For example, in the framework of doctoral research, the doctoral candidate may develop a system capable of automatically identifying potentially risky clauses in a contract and determining whether they comply with the law in force or develop an algorithm capable of identifying in several databases significant elements, expressions or concepts (keywords) relevant to the interpretation of legal texts. By testing this prototype, it can be verified whether the algorithm is efficient and accurate or whether it requires further fine-tuning or substantial alterations to the logical scheme. At this stage, collaboration between legal specialists and programmers or software architects, generically referred to as technology specialists, is essential in order to ensure that the prototype meets the real needs of the professional activity.

Innovation occurs when solutions tested in the experimental phase are transformed into technologies applicable in the real world. In law, this innovation can mean creating digital platforms for automatic drafting of

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[12] These models may include personal data in their analysis, which requires compliance with the provisions of Regulation (EU) 2016/679 (GDPR), in particular regarding the lawfulness of processing and the principle of data minimization.

legal documents, implementing blockchain-based smart contracts or using natural language processing algorithms to quickly analyse case files, to name but a few examples

For example, the outcome of the doctoral research could contribute to the development of a system to assist lawyers by automatically generating legal recommendations based on case-law or even to support them in drafting applications to the courts.

3.5. Applied results

The link between research, development and innovation is essential for creation in general, the basis of progress, including in the legal field. Specifically, creative endeavour „*means any intellectual creation, including scientific and technical works*"[13]. On the basis of creative acts, resulting from theoretical research, problems are identified and explained, and experimental development tests possible concrete solutions, innovation transforming them into practical applications. In this way, the study of algorithms for interpreting legal texts can create a support system for analyzing complex legal texts or, why not, court judgments, which is tested, refined and finally proposed for use by legal practitioners.

However, **the use of AI in law also comes with challenges, risks and limitations.** The limitations are mainly caused by the state of the art and the legal language, which is often complex, and algorithms may misinterpret specific terms (such as *good faith* or *reasonable diligence*). Logical algorithms need to analyze the language by „*systematizing knowledge in close cooperation with the specific language of the branch sciences*"[14] so that the concrete result is not erroneous. In addition, automatic decisions may raise ethical issues, especially if they do not contain the logical-legal explanations or arguments to support them or even generate discriminatory results. For this reason, it is important that research should also focus on creating explainable and transparent systems that provide clear justifications for their decisions and respect ethical principles and fundamental principles of fairness.

3.6. The iterative process of research methodology

In order to develop a research methodology based on the two main strands of scientific research – fundamental and applied - a well-structured approach is needed, allowing a gradual transition from theory to practice. The start is represented by the delineation of a solid theoretical framework, based on the key concepts – the basis of the doctoral research, as well as the AI models to be exploited in this endeavour. At this point, the focus falls on exploring the basic concepts, working hypotheses and formulating questions to guide the whole process.

The methodology of scientific research „*as a discipline of study can contribute to the development of the scientific spirit including the critical spirit as well as other intellectual dimensions such as rigour, respect for the ideas of others, intellectual probity, the cult of proof, the power to renounce everything that proves to be without foundation*"[15]. From this perspective, the methodology of scientific research encompasses not only one's own ideas, but also a certain level of ideas at a certain historical point, the ideas of others, and is a tool that imposes a discipline of its own on the doctoral student to renounce ideas and in general everything that has no foundation or basis or that cannot lead to a concrete applicable result.

The doctoral research will analyze how legal rules can be logically represented (in mathematical concepts), which models can capture the relationships between obligations and exceptions, or how the ambiguities inherent in legal language can be overcome. This stage also entails a rigorous review of the literature in order to identify the solutions already proposed and to establish their limits.

Methodology, terminologically, can be conceptually defined as a method of knowledge with maximum generality[16]. As early as 1967, at a colloquium organized in Belgrade, on the methodology of legal science, it was

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[13] V. Roș, D. Bogdan, O. Spineanu-Matei, *Dreptul de autor și drepturile conexe, Tratat*, All Beck Publishing House, Bucharest, 2005, p. 33.

[14] N. Popa, *Considerații privind sistemul științelor juridice și rolul teoriei generale a dreptului*, in Revista de Științe Juridințe Juridice 1/2007, University of Craiova.

[15] M. Șt. Rădulescu, *Metodologia cercetării științifice. Elaborarea lucrărilor de licență, masterat, doctorat*, 2nd ed., Editura Didactică și Pedagogică, Bucharest, 2011, p. 13.

[16] *Dicționarul explicativ al Limbii române*, Univers Enciclopedic Publishing House, Bucharest, 2016.

pointed out „*the need for clarification in the process of defining the meaning of traditional methods and the appeal to explanation and interpretation of legal reality in a world characterized by a particular mobility of its component structures*"[17].

As society progresses, research naturally progresses as well and theoretical results allow the formulation of clear hypotheses and a precise purpose leading to a unified method of working. Theory suggests that legal rules can be codified efficiently by a set of logical rules, in which case applied research will focus on testing this hypothesis in practice. This leads to experimental development, where abstract concepts are transformed into prototypes or concrete applications and the PhD student can create an algorithm (or lay the foundations of an algorithm, together with specialists) capable of analyzing legal clauses in a set of documents and formulating interpretations or identifying possible risks or ambiguities in the context of practical situations.

In the case of legal methodology, its object „*is made up of the relationships, links, relations that are established between different methods, either before, during or after the finalization of the scientific research act*"[18]. Going through this definition of legal methodology, it cannot go unnoticed, the appearance of a logical, mathematical process, within this typology of methodology, describing the stages and links that are formed during the doctoral research in the legal field, with the applicability of the exploitation of AI in this process, a result of human imagination.

As part of the process of practical hypothesis-testing on real cases, the algorithm can be applied to real legal situations and its results compared with those obtained by specialists. It is important that the collected data is carefully analyzed to determine whether the proposed solution is viable or whether adjustments are necessary. The principle of data collection should be aimed at the extreme limits of Nothing-To-Tot, since „*nothing is known at the start, we have to start from nothing and so methods and results are created at the same time*"[19].

Although the effort of correctness is considerable, the PhD student may determine that the algorithm encounters difficulties in interpreting certain data, rules or complex texts (multiple theses), which would suggest a return to the theoretical stage to re-evaluate the way in which the rules and working hypotheses are formulated. At each stage of evaluation and analysis, within the logical process, deduction plays a crucial role. According to Professor Nicolae Popa, „*Law is an eminently deductive science*"[20], which brings it very close to the exact sciences, more specifically computer science.

3.7. Evaluation of results from the research process

After finalization of the tests, a **critical evaluation of the results** follows. At this point, the PhD student will analyze whether the working hypotheses have been confirmed, whether the accuracy of the solution is satisfactory and, above all, whether it can be generalized to other types of documents or legal domains.

At this point in the doctoral research, the doctoral student is to determine whether the application of AI modelling, based on working hypotheses, can lead to a concrete result that can lead to a useful solution or application.

In the case of positive results, the integrated conclusions will reflect both the theoretical contribution of the fundamental doctoral research and the practical applications validated from the experiments. The validation of the experiments demonstrates that the AI model(s) applied are useful for doctoral research and that the data and information processed by these AI models have generated valid conclusions or results that can be used in the process of developing a doctoral thesis or even in concrete situations, *i.e.* applications and technical solutions for legal practitioners.

Methodology becomes a continuous process of learning and refinement, where each step contributes to refining the proposed solutions. Methodology based on the application of AI models not only leads to quick and outstanding results, but can also develop the research methodology itself by bringing new milestones into the process carried out by the research lawyer, thereby speeding up the process. Moreover, the application of such AI models can lead directly to the updating of results by the application of fully automated processes inextricably

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[17] N. Popa, *Teoria generală a dreptului*, 5th ed., C.H. Beck Publishing House, Bucharest, 2014, p. 14; D. Mazilu, *Teoria generală a dreptului*, ALL Beck Publishing House, Bucharest, 1999, p. 5.

[18] N. Popa, I. Mihăilescu, M. Eremia, *Sociologie juridică*, University of Bucharest Publishing House, 1997, pp. 5.

[19] J. Guillaumaud, *Cibernetica și materialismul dialectic*, Științifică Publishing House, Bucharest, 1967, translated by Dan Răutu.

[20] N. Popa, *Teoria generală a dreptului, op. cit.*, p. 17.

linked to legislative changes and to scientific works that subsequently emerge and deal with the subject initially submitted for doctoral analysis or which deal with similar working hypotheses.

This type of approach offers legal PhD students the opportunity to develop innovative solutions, from complex theoretical ideas to practical applications that can have a real impact on the legal profession or the way litigation is handled. Everything is based on the ability to integrate theoretical knowledge with practical observations, providing a solid foundation for future research.

4. Concrete applications of AI models in doctoral research

4.1. Assisted literature review

AI-assisted bibliographic analysis is an advanced process by which the PhD student can explore the scientific literature in a fast and efficient way, extracting relevant information from a huge volume of works, including academic materials. This type of activity starts with the automatic collection of bibliographic data from databases, specialized journals or digital archives. As it can be seen, one of the essential requirements is that the entire database under analysis must exist in digital format, the existence of documents, books, materials, journals that are not in digital format will not be able to be analyzed by AI models until after a prior digitization process.

AI plays a key role even at this stage, filtering data, materials and articles and organising them on the basis of criteria such as authors, years of publication or, more interestingly, keywords or areas of interest. Of course, the use of complex AI models can lead to an output aimed at extracting certain information, data or even opinions from the texts under analysis, even on the basis of working hypotheses or theories. Such applications of AI in bibliographical analysis involve the concrete application of algorithms to simulate complex human legal reasoning so that the result is the intended one.

The digital approach is natural in today's age, as „*the world we live in is a world of information and communication*"[21], and most academic and research activities now rely on digital tools.

As the data is processed, natural language processing algorithms identify connections between different works and highlight citation patterns. In this way, a comprehensive literature map can be created, highlighting seminal works, the most influential authors and major research directions or theoretical conclusions. With AI, the researcher no longer has to go through each article manually, but can quickly see how the different publications are related to each other and which topics are gaps or controversial.

One of the most important advantages of using AI is its ability to detect not only direct citations, but also indirect influences between papers, which can lead to the discovery of unexpected or unexplored connections. AI models can suggest relevant articles even when they are not explicitly cited, and can handle similar concepts or complementary methods. Thus, assisted bibliographic analysis not only organizes existing information, but also opens up new research perspectives.

Along the way, the use of AI can generate detailed reports on citation frequency, author influence or the evolution of a topic over time, providing a clear and well-structured overview, helping the PhD student to formulate sound theoretical conclusions and to develop well-founded academic work.

4.2. Identifying plagiarism

Plagiarism remains one of the most acute moral problems in the academic community, both nationally and internationally. In Romania, the extent of the phenomenon has become evident in the case of accusations of plagiarism levelled against doctoral dissertations by various public figures. In fact, we are talking about a veritable „industry" of plagiarism, which includes simple copying techniques, but also sophisticated methods which can be difficult to detect, especially in doctoral theses or in certain volumes by established authors.

From a historical perspective, plagiarism was not always considered a moral or legal offence. It became problematic only with the institutionalization of the concept of *authorship* and the emergence of the academic system based on intensive specialization, continuous research and massive publication of articles and books.

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[21] I. Vaida, *Legistică formală. Introducere în tehnica și procedura legislativă*, 3rd ed., Lumina Lex Publishing House, Bucharest, 2006, p. 69.

The consolidation of reputation – transformed into a real „bargaining chip" for obtaining funding and attracting the best students – has intensified the struggle between universities, supporting the dictum „*publish or perish*![22]".

Currently, with the emergence of advanced digital verification tools, including AI engines, the process of identifying sources and assessing the originality of texts has become more efficient. AI models can compare documents from extensive databases, bringing to light similarities and copying patterns that are hard to spot in the classical way. However, the same technologies can also be used to generate synthesized or altered pre-existing content, further complicating the way in which attempts at plagiarism can be identified. In this context, universities, and educational institutions in general, have had to adjust their academic practices and monitoring tools to maintain standards of scholarly integrity[23].

4.3. Analysis of case-law and legislation

Artificial intelligence is revolutionizing the way legal researchers analyze court decisions and legislation, simplifying what was once a laborious and time-consuming process. Thanks to its ability to process huge amounts of information quickly, AI enables the legal researcher to navigate complex databases and extract essential information quickly. Natural language processing algorithms are at the centre of this process, as they can understand and interpret legal texts in a way that is similar to human thinking, but much faster. Of course, this process of understanding natural language involves a process of training AI models continuously, but they are still subject to the risk of generating errors arising either from the way they understand or the way they interpret legal texts. The legal researcher is obliged, both in the process of loading the information, the working basis of the AI model, and in the process of interpreting the result, to be careful to avoid possible errors that could have consequences.

Logical algorithms analyze court decisions, identifying patterns and patterns that might ordinarily go unnoticed by a researcher skimming through manual documents. In this way, they can detect trends in how courts interpret concepts related to the interpretation of legal rules, or subtle changes in the application of certain rules over time can be highlighted. In this way, AI not only speeds up the process of analysis, but also provides insight into how the law is interpreted in practice.

For a doctoral student researching copyright law, this type of technology can open doors to innovative conclusions. Algorithms can highlight the most relevant cases, correlate similar decisions issued by different courts, and suggest interpretations that could be incorporated into academic arguments. From the perspective outlined above, it follows that AI not only provides access to a vast amount of information, but also transforms legal analysis into a more accurate and informed process, supporting researchers in formulating relevant and original conclusions in their dissertations.

5. Final aspects

Taking into consideration the aspects presented in the article, I believe that the use of AI can obviously represent a significant support for academic research activity. The different models of AI can help to facilitate research even within a specific field, such as the legal field, but they can never substitute the human vector in this equation.

However, the use of AI must meet the highest standards of academic quality, ethics and transparency in research. The legal framework applicable to AI does not currently allow for effective integration into research activity, particularly in the academic environment, where it is necessary to identify and individualise the considerations, arguments, contributions, working hypotheses and research hypotheses of the doctoral candidate.

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[22] E. Socaciu, C-tin Vică, E. Mihailov, T. Gibea, V. Mureşan, M. Constantinescu, *Etică și integritate academică*, 2nd ed, University of Bucharest Publishing House, 2022, p. 149.

[23] As contributions generated using AI raise questions of authorship and intellectual property rights, the legal framework provided by Directive 2001/29/EC on the harmonization of certain aspects of copyright in the information society should be taken into account. Ref. Directive 2001/29/EC of the European Parliament and of the Council of 22.05.2001 on the harmonization of certain aspects of copyright and related rights in the information society.

In this sense, the use of AI in academia presents specific rigours, which must be interpreted from the perspective of quality or ethical standards, the doctoral student having the obligation to be aware of the risks and limitations of using systems involving AI in research.

6. Conclusions

This research set out to explore the role of AI in doctoral research, with a specific focus on its implications within the domain of intellectual property law. Through a critical examination of existing practices, tools, and theoretical frameworks, the study has highlighted the transformative potential of AI technologies in enhancing the efficiency, depth, and scope of academic inquiry. Key outcomes include the identification of AI's capacity to automate and optimize complex legal analysis, support the management of extensive data sources, and reveal patterns in judicial reasoning that might otherwise go unnoticed. At the same time, the research has underscored the challenges posed by the use of generative AI, particularly with regard to authorship, originality, and the integrity of scholarly work.

The expected impact of these findings is twofold. First, they offer a clearer understanding for academic institutions and legal scholars regarding the responsible integration of AI into research methodologies. This may contribute to shaping institutional policies and ethical guidelines that balances innovation with academic rigor. Second, the study opens a path toward the modernization of legal scholarship, where technology not only assists in research tasks but also informs the very evolution of legal reasoning and doctrine in an increasingly digital society. Moreover, by engaging with the tension between human creativity and machine-generated content, this work contributes to the broader legal discourse on intellectual authorship and the boundaries of protection under current IP frameworks.

Given the rapidly evolving nature of AI technologies, further research is both necessary and inevitable. Future studies could investigate how specific AI tools perform in various legal subfields or compare the use of AI-assisted research across disciplines. It would also be valuable to examine how doctoral candidates perceive and engage with AI in their own research practices, potentially through qualitative interviews or longitudinal case studies. Additionally, legal scholars may find fertile ground in exploring how existing copyright and patent laws might be adapted to accommodate the unique challenges posed by AI-generated academic content. Such inquiries would deepen the understanding initiated by this study and ensure that the academic and legal communities remain both critical and adaptive in the face of technological change.

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