

Intersections between Law and Artificial Intelligence

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Abstract

The paper provides a concise overview of the interplay between law and artificial intelligence. Based on the analysis of legal resources, it identifies key topics, organizes them in a systematic manner and describes them in general, essentially regardless of specificities of individual jurisdictions. The paper depicts how artificial intelligence is applied in law, how law regulates artificial intelligence, and what are some theoretical legal questions that have been raised with regard to the developments in artificial intelligence.

Keywords: artificial intelligence; algorithmic decision-making; human-computer interaction; intellectual property; law; legal reasoning; liability; machine learning; overview; privacy; robotics; society.

1. Introduction

In computer science the term “artificial intelligence” is widely recognized to be used for the first time in August 1955 in a proposal of a research project authored by John McCarthy, Marvin L. Minsky, Nathaniel Rochester, and Claude Shannon [1]. The same expression was used in legal science already in 1848 by an unknown author in an article complaining about inefficiency of the jury system [2]. However, in this article the term “artificial intelligence” did not refer to intelligence and problem-solving capacities of machines but rather to fabricated intelligence of some jurors that should be avoided when deciding a case. Artificial intelligence (AI) within the meaning attributed to this term by computer science is being explored by legal science since 1960s. The first documents foresee utilization of AI for converting trial transcripts into a computer-readable form for more efficient information processing [3], for processing information provided by a client to an attorney and determining the probability of winning a case, for determining the probable amount of damages if they would be awarded, for analysis of statutory legislation, or for processing evidentiary material as well as case law [4: 163]. According to search results in the legal research database HeinOnline.org the interest of legal science in AI significantly increased in 1980s, dropped in 2000 and rapidly increased again in 2010s.

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A considerable amount of research has been conducted until now in order to describe various aspects of the relationship between artificial intelligence and law. However, the knowledge on AI and law is fragmented in various papers, specialized books, reports, opinions, notes, comments etc. Mostly only individual aspects or problems are being tackled. The overall description providing a bigger picture of the discipline in a succinct paper is missing.

The aim of this paper is to provide a concise overview of the interplay between the two fields in a systematic manner. The paper will focus on the approach of legal scholars to artificial intelligence rather than the technical approach of computer scientists to law. It is based on contents analysis of legal resources available through the database HeinOnline.org, a sound database of legal resources used worldwide for legal research. Currently, it contains nearly 5,000 resources specifically related to artificial intelligence. Relevant search results have been analyzed in order to identify common topics and organized in a systematic and logical manner. Although preliminary research was conducted as to book resources about law and artificial intelligence, this study is based only on professional articles from the database HeinOnline.org. This is mainly due to its availability. The vast majority of books focuses only on individual aspects of the relationship between the law and artificial intelligence. A few existing general books are at least partly outdated.

The paper does not include resources outside the database, therefore, some problems already identified elsewhere may not be mentioned. Individual topics are described generally and in essence regardless of specificities of particular jurisdictions. In a few cases the paper refers to specific laws for illustrative purposes. The paper works only with resources written in English. The paper, therefore, does not explain differences of national approaches to the individual topics that may vary from country to country. Merely general ideas and problems are pointed out as a guideline for further examination under national laws.

In the following sections the paper describes how artificial intelligence is applied in law, how law regulates artificial intelligence, and what are some theoretical legal questions that have been raised with regard to the developments in artificial intelligence.

2. Application of AI by Law

Artificial intelligence represents a very useful tool for law and legal science. In AI there is a subfield corresponding to what this section aims to describe. The subfield called “artificial intelligence and law” aims to apply knowledge in AI to solve or at least facilitate solution of some legal problems. At the same time tools and techniques developed in order to solve specific problems in law are further utilized by AI in general [5].

Legal science recognizes usefulness of AI especially for the purposes of legal reasoning. Legal reasoning is a general concept that refers to a process of forming and providing a justifiable answer to a particular legal question, such as what decision should be reached at the end of a trial, or whether and to what extent a person needs to pay a certain tax. AI applications can assist in legal reasoning for example by searching databases of legal texts and identifying which cases are relevant to the respective ongoing judicial proceedings. This tool significantly simplifies legal research as it is able to filter out irrelevant information [6]. Furthermore, some

applications can reason and provide specific answers by themselves. These applications are commonly known as expert or knowledge-based systems. According to Susskind, there are five classes of legal expert systems: *diagnostic systems* that provide specific solutions, *planning systems* that offer recommendations on by which conduct a desired goal is best achieved, *procedural guides* assisting in following complex legal procedures, *intelligent checklists* that serve for assessing compliance with requirements set out by law, and *document modelling systems* that automatically create documents out of predefined templates based on users instructions [7: 106-107]. Document modelling systems are also called “document assembly systems”. There are, however, two kinds of document assembly systems: procedural systems and expert systems. Procedural systems cannot be considered as AI application as in these systems a user follows a guided process with predefined steps resulting in a limited number of possible outcomes. Expert systems, on the other hand, search rules in their knowledge databases and apply them in a way that they create own decision tree in order to come up with required solutions [8]. These systems are, thus, able to provide solutions to unanticipated questions asked in natural language. Legal reasoning is tightly connected with representation of legal knowledge and its assessments. Unfortunately, in the area of law, this has been proven as extremely difficult. The law is not a closed system or a scientific field with immutable rules. It contains relative values and often requires balancing interests [9]. Moreover, specific tools needed to be developed in order to face the challenge of dealing with ambiguities contained in natural language. Scientists also had to come up with solutions on how to represent causality with regard to the legal notions of “proximate cause” and “remote cause”, how to represent internal psychological states of humans (emotions, goals, intentions, etc.) as well as their interpersonal relationships, or how to represent time (events and intervals) and determine its impact on other variables [10]. Despite all of the complications that AI faces when dealing with law, its applications are used in numerous contexts. Legal reasoning is used for example to formalize legislation in order identify ambiguities in the legal text and support drafting of legislation [11] or to model legal precedents [12]. There is a number of technologies that assist lawyers in their tasks, such as in identifying problematic clauses in contracts or planning a winning strategy in intellectual property lawsuits [13]. AI has already been deployed for the purposes of automatic online dispute resolution in order to solve disagreements between parties that entered into a contract for instance via eBay [13:33]. In the future, algorithmic decision-making is presumed not only to assist judges but to replace them in certain types of cases. However, this raises questions about transparency of these proceedings as algorithms operate in a concealed manner and, therefore, prevent public oversight. Dynamically evolving algorithms could be checked for possible biases for instance by examining them with help of test cases [14]. Although algorithms themselves lack transparency, paradoxically they can be used in order to improve transparency in society through improved data analysis [15]. The ability of AI to analyze vast amounts of data is used for example also in digital forensics [16]. Apart from examining large amounts of evidentiary data to reduce their number or find inconspicuous relationships among them, AI is also used for predictions, such as for determining “*which [crime] scenes will offer the best opportunity of recovering a forensic sample*” [17:321]. Furthermore, it is presumed that AI will assist in law enforcement in the form of autonomous robots that might one day become part of police forces [18].

3. Regulation of AI by Law

The problem of regulating artificial intelligence or creating a specialized legal framework for it lies in the very

nature of AI. There exists a number of definitions of AI but none of them is universally pertinent while being truly unequivocal at the same time. This is mainly due to the ambiguities pertaining to defining the very concept of intelligence. In general, *“an AI system includes both hardware and software components. It thus may refer to a robot, a program running on a single computer, a program run on networked computers, or any other set of components that hosts an AI”* [19:362].

From a legal perspective, AI is most often considered as work resulting from creative activity and is, therefore, protected by intellectual property as software through copyright [20]. Under certain conditions it can also be protected by a software patent. AI software patents are, however, questionable regarding the level of protection. They might be infringed in a specific manner due to the continuous development and a possibility of being manipulated by a user [21].

AI systems in a form of software [22] as well as AI systems inseparably incorporated into physical devices such as robots (cyberphysical systems) are considered as products. In general, every product should meet certain safety and quality standards as well as reasonable expectations of an ordinary customer. If a product is defective, for instance when it does not properly operate or causes damage, its manufacturer can be held liable. An injured party can potentially sue for product liability, service liability, malpractice or negligence. A result of each case depends on many factors. Not only manufacturers of AI systems but also their users must take reasonable care to avoid mistakes and causing harm [23]. Complications in determining a liable person could occur in case of custom-made AI systems combining knowledge of a manufacturer with client's specifications. Moreover, specificities in product liability can be identified in various application domains, such as in automated driving [24]. A standard of strict liability (i.e. legal responsibility attributed to a person regardless of her fault) is recommended to be applied to systems that are *“intended for use in a hazardous activity and/or [are] mass-marketed”* [25:268]. The standard of strict liability provides clear rules on who is accountable for actions of an AI system. This is especially relevant in the sphere of autonomous weapons systems that act to a certain degree independently. Their actions are intended to have fatal consequences. For these systems it is recommended that *“human control is always present at a significant level”* [26:126]. Nevertheless, even if such systems act without control, supervising commanders are supposed to be accountable [27]. This conclusion was made based on the concept of an actor and a tool and is specific for military environment. However, due to the rising level of autonomy, AI systems are evolving from mere tools into agents [28]. As long as these agents act on behalf of natural or legal persons, the existing legal system will be able to utilize the concept of product liability to determine who will compensate damages [29]. The same is true for validity and enforcement of legal transactions entered into by intelligent software agents on behalf of their users. In this case the software agents are considered as mere communication tools despite their certain level of autonomy. When, on the other hand, an AI system will start to act on behalf of no-one and supposedly on own behalf, the law will need to change [29].

The legal theory started to explore the possibility of creating a specific legal status for AI way earlier before the above-mentioned conclusion was made. Solum analyzed two options – a status of a trustee and a status of a constitutional personhood [30]. Granting AI with the trustee status (entrusting AI with administration of certain affairs) should be conditioned by having appropriate capacity and responsibility. The status of a

constitutional personhood (equality of AI with a human), on the other hand, should depend on other concepts such as consciousness, intentionality, or emotion [30:1281]. This status considers emergence of general artificial intelligence with abilities comparable to humans. Currently, the law is trying to find some balance in attributing liability to persons who are involved with some kind of an autonomous AI system. Rather detailed rules have been proposed for autonomous vehicles. These rules take in account various modes of driving and divide liability mainly between a manufacturer and a driver [31]. Nevertheless, the idea of specific personhood for AI has not been forgotten and is currently being considered in the European Union as a viable option. In January 2017 the European Parliament issued a report that recommends to set up a status of “electronic person” for highly sophisticated and autonomous robots [32]. The nature of this status is yet unclear and presumed to be determined in the future. Recommendations to set up personhood for AI as an alternative to corporate personhood are voiced also in the U. S. [19]. Many questions remain as to whether this approach would not disrupt functioning of the society and up to which degree it could be exploitable by various subjects to avoid own liability.

Regardless of what the exact nature of the personhood would be, this new status might help to solve problems related to intellectual property created by artificial intelligence. AI is currently capable of producing artistic, musical, as well as literary works. AI can even program and create own software. However, copyright law worldwide recognizes only natural persons to be authors. Therefore, creations of AI usually end up in public domain and are not protected by copyright [33]. This practice has a negative impact on motivation of companies and programmers to develop creative AI. To promote innovation in this field, copyright should be assigned either to the software developer, the person who specified the problem for AI, or the computer owner [34]. It is justifiable to consider assigning copyright also to the user of AI who provides it with specifically selected input. Law in this regard could be changed in more ways, such as by stipulating that also a non-human entity can be an author and assigning copyright to the creator of this entity or by reinterpreting the term “employee” to include also AI systems. A person having control over the AI system would be considered as an employer and possess the copyright [33]. A similar problem raises in patent law. AI is not only capable of scientific discoveries. These systems are also capable of producing inventions, some of which have already been patented. Rights from these patents, however, belong to humans. It is presumed that with the rising trend of computer inventions, the patent law will need to react and address questions of ownership, replacement of human inventors as well as consumer protection [35].

Speaking of protection, humans need to be efficiently protected also with regard to their privacy. AI poses threats caused by automatic surveillance as well as by automatic decision-making. Due to the capacities of AI, surveillance can reach a previously unprecedented level. For instance, with help of voice recognition AI can monitor thousands of phone calls simultaneously as opposed to the past when one person was needed per one call. Combined with pattern recognition capabilities, that for example enable identification of change in behavior and alert authorities, such practice could “*underpin ubiquitous surveillance*” [36:168-169]. This threat is yet empowered by ever increasing presence of social robots and applications. These applications can communicate with users (possibly even without them knowing that they are talking to a robot), store the communication including related metadata, and analyze users’ behavior. Moreover, such applications are capable of deriving new information from the collected data [36]. This is especially true for processing big data.

Moreover, data can be analyzed with predictive algorithms in order to determine whether a person will for instance repay her loan on time and thus whether such loan is not a risky transaction for a bank. In many cases, AI decides about people after it analyzes them and ranks them [37]. As an algorithm can make a mistake and miscategorize an individual, the person should have an opportunity to have this decision revised [37]. In the European Union, citizens have the right not to be subject to an automated decision, although this right is limited in certain cases. Moreover, processing of personal data resulting in an automated decision must be performed in a transparent manner and legal interests of affected persons must be safeguarded [38, 39]. Without these measures the utilization of predictive algorithms could lead to discrimination, stigmatization, and unjust social stratification. Rights of European citizens related to automated individual decision-making are ensured also in the area of prevention, investigation, detection or prosecution of criminal offences [40].

The concepts of liability, agency, intellectual property, and privacy that regulate AI in general are accompanied by specific regulations related to individual uses of AI systems. Distinct rules that can be applied to AI can be found for instance in the areas of autonomous weapons (international law), transportation and automotive industry, telecommunications, information society services, cybersecurity, crime, stock trading, banking and investment, healthcare, etc.

4. Theoretical Legal Questions Related to AI

There is a number of theoretical questions posed by the AI that might sooner or later become reality and, therefore, also affect law. The first problem is tightly connected with AI's level of intelligence and its ability to communicate with humans in a natural language. At a certain moment AI starts to produce original contents by itself. The questions related to intellectual property protection of such creations were discussed in the section above. However, a rather interesting question remains – could expressions of AI be protected by free speech doctrine [41]? As the freedom of speech is a fundamental human right, it feels kind of unnatural to grant it to artificial subjects and it may pose specific risks. It has been documented that some speech products have already caused harm such as “*deception, manipulation, coercion, inaccuracy, and discrimination*” [41:1189]. If granted freedom of speech, AI could be also privileged over human speakers in case of harmful speech, as it would be much harder to prove intentionality of such harm. On the other hand, public could be deprived of valuable information if AI would not be granted the free speech right. It is, therefore, necessary to reexamine the current approach and consider possible models of regulation that would ensure that the public will get valuable information while being protected from harmful speech at the same time [42].

The freedom of expression or free speech results from freedom of thought and, respectively, from freedom of belief. This reflection raises another provocative question – should AI be free in believing and practicing religion? As the social AI is learning from interactions among humans, it will need to understand the concept of religion. In order to accommodate some users, it might start to shown signs of a believer. When this happens, supposedly many public debates will be initiated and their results are currently uncertain. The only certainty is that these debates will force us to clarify which values the society needs to protect [43].

Some debates about freedom of expression as well as freedom of thought and religion will be shaped by the fact

that people tend to anthropomorphize AI. People accept, like and trust AI more if it is incorporated in a human-like robotic body. People not only attribute mental, emotional, and social characteristics to such robots [18:885-887] but they *“are already forming deep and meaningful relationships with their artificial friends, and indeed many humans are becoming intrigued by the possibility, and increasing reality, of human-robot romance”* [44:138-139]. Researchers started to ask whether one day a human should be able to marry a robot [44]. They presume that if robots were legally able to enter into contracts, they could theoretically enter into marriage. However, this possibility should not be understood as a right of a robot, but according to professor Gary Marchant rather *“the right of a human to choose to marry a robot”* [44:175]. Given the existence of sex robots, marriage could be consummated as well. However, this brings up a question whether a robot could be abused. Marriage with a robot probably could not be considered as marriage of two equal persons, as this would imply equality with people in other areas as well. According to some researchers, robots should be controllable at all times and, therefore, be considered as slaves (hopefully without consciousness), not persons [45]. Consequently, it is questionable if considering robots as slaves in marriage could not lead to the shift in perception of marriage between humans, respectively in the approach of some individuals to their interpersonal relationships.

All of the mentioned theoretical questions point out to ambiguities about the legal status of artificial intelligence in the society. They all relate to rights and freedoms that AI might be granted one day. Granting a right to someone must, however, be balanced by imposing liability as well. Its most severe form is criminal liability. Just as with the issue of free speech, there pertain questions as to the intentionality of acts of AI. Nevertheless, feasibility of attributing criminal liability to AI was illustrated by criminal liability imposed on corporations [46]. How to construct appropriate punishments for AI, however, remains a question.

5. Conclusion

Artificial intelligence and law intersect on many levels. AI influences not only legal practice by making lawyers more efficient in their job or by automating some legal services but also the law itself. AI challenges traditional legal concepts, so the law needs to adapt. This adaptation will have to continue and correspond to new developments in AI. Concurrently, the law will be shaping developments in AI as well by setting up new standards, guidelines, as well as limitations on developments in various AI application domains. An extensive legal research will need to be conducted in order to determine social implications of implementing AI and robots in our everyday lives. For instance, an assessment of whether AI and cyberphysical systems should be regulated differently, as well as an analysis of how law should react in case AI will cause massive unemployment, will soon be needed.

6. Recommendations

As the development of artificial intelligence is a global phenomenon that has worldwide social and economic effects, new international laws should be adopted. These laws need to be established with regard to specific approaches to the interplay between the law and artificial intelligence in individual national jurisdictions. Therefore, further research in comparative law should be conducted in order to identify general values to be protected by law as well as various national solutions that might secure protection of these values.

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