




Ethical and regulatory challenges amid artificial intelligence development: an outline of the issue

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Abstract

Motivation: The Fourth Industrial Revolution brings with it numerous challenges for society, business and government. Its nature and pace is dictated by the increasing use of artificial intelligence (AI) technologies. The acquisition, collection, analysis, processing and informed use of data, as well as the continued development of artificial intelligence algorithms, are becoming the basis for the development of modern economies. However, its implementation is associated with a number of opportunities as well as threats. The way and extent to which artificial intelligence-based technologies are used requires constant attention, the basis of which is an appropriate regulatory system.

Aim: The purpose of the paper is indicating and discussing selected challenges facing people and institutions responsible for creating regulations regarding the use and implementation of artificial intelligence. The regulators should, therefore, find a proper balance between innovation and credibility.

Results: The analysis of the available literature allows to indicate at least 3 important challenges facing regulators: these are providing a precise definition of AI, ethical threats and competition in terms of creating suitable regulations regarding AI. The European Union has developed regulations on artificial intelligence with respect for freedom and human rights. This is a different approach from other regions of the world, including regulations established in the US or China.

Keywords: *Artificial Intelligence (AI); AI regulations; AI ethics; regulatory competition*

JEL: A12; K20; O30; O38; L50

1. Introduction

The process of digital transformation of the society and the economy involving algorithms are the great development challenges of the 21st century. Over the past years information has become one of the most important production factors. Gaining, gathering, analysing, processing and consciously using data and the constant development of AI algorithms are becoming a fundamental competence of economies and states. This competence conditions their place in the global delivery chain and the added value connected to processing data in the area of AI usage. Technologies employing artificial intelligence are perceived as driving forces of the, so called, fourth industrial revolution.

However, apart from the benefits offered by the AI technologies, it is worth considering a number of threats which result from implementing and using this technology. Among those, it is worth mentioning, e.g. discrimination and bias, disinformation and manipulating opinions, omnipresent surveillance, or negative results on the job market. This leads to the necessity of legal regulations of artificial intelligence's usage and implementing. As it turns out, both the governments of particular countries as well as international organizations find it difficult to create suitable procedures regarding AI.

The purpose of the paper is indicating and discussing selected challenges facing people and institutions responsible for creating regulations regarding the use and implementation of artificial intelligence. The regulators should, therefore, find a proper balance between innovation and credibility, which means the regulatory framework (legal and ethical) concerning AI should be "flexible enough to promote innovation, but at the same time should provide population with a high level of security and safety" (Stuurman & Lachaud, 2022, p.2). The analysis of the available literature allows to indicate at least 3 important challenges facing regulators: these are providing a precise definition of AI, ethical threats and competition in terms of creating suitable regulations regarding AI.

To achieve the above aim, the paper adapted the following structure. In the second part, to emphasize the importance and validity of the issue, the significance and benefits of using AI were described. The next part includes the description of the research methods used. The part referring to the results includes the analysis of the literature to indicate the problems with defining and interpreting AI, points to the selected ethical problems which were possible to identify on the basis of the previous experiences of using AI, and explains the meaning of regulatory competition in the case of formulating regulations concerning artificial intelligence. The summary includes the conclusions resulting from those considerations and examples of recommendations aiming at solving the discussed problems.

2. Literature review: the importance of artificial intelligence

Technologies based on algorithms, such as artificial intelligence (AI), permeate different spheres of our lives more and more often. Artificial intelligence is widely used both in the private as well as the public sector. The use of AI may be noted in educational sector, in healthcare, in environment conservation, in executing law or in transport. State administration may use AI technology in order to improve the quality of provided services, to increase citizens' trust and to increase productivity and efficiency in providing services. AI enables to achieve greater efficiency of institutions and of the decision making. Thanks to the techniques of machine learning and deep neural networks, algorithms are able to learn and effectively solve more complicated tasks than ever before (Buhmann & Fieseler, 2021, pp.1–7).

Most studies emphasize that AI will have a major influence on economy. In the research conducted by PwC (2018), it is estimated that the global GDP may increase even by 14% (equal to USD 15. billion) by 2030 as a result of the faster development and the AI use. McKinsey Global Institute (2018) estimates that AI may contribute to the additional production rise amounting to about USD 13 billion by 2030, increasing the global GDP by about 1.2% yearly. Moreover, McKinsey Global Institute (2018) predicts that around 70% of companies will have adapted at least one type of AI technology by 2030, whereas less than half of big companies will implement the whole range. According to Eurostat (2022) data, in 2021, 8% of EU enterprises and 28% of large EU enterprises used artificial intelligence technologies. The highest share of enterprises using AI was recorded in Denmark (24%), followed by Portugal (17%) and Finland (16%). PwC (2018) expects that thanks to AI all sectors of the economy will see a gain of at least 10% by 2030. The report says that the services industry is to gain the most (21%), with retail and wholesale trade as well as accommodation and food services also expected to see a large boost (15%).

AI's positive influence on economy results from at least three reasons. Firstly, it is believed that AI use will lead to a major increase in work productivity (even by 40%) due to the innovative technologies allowing more efficient time management with regards to the workforce. Secondly, AI will create new virtual workforce — described as “intelligent automation” — capable of solving problems and self-learning. Finally, economy will also benefit from innovation diffusion, which will influence different sectors and will create new income sources (Szczepański, 2019, pp.1–8).

Huge interest in AI technology results to a large degree from the technical development in IT. It should be noted that its first use took place in the middle of the 20th century, while its rapid development has only been observed in the last decade. This development results from two key phenomena (Schiff et al., 2022, pp. 121–143): (1) the increased computing power which enabled the use of algorithms and (2) the rising availability of big data, including data from online shopping, browsing or social media. AI, just like the earlier in-

formation technology (IT), computers or electricity is becoming a widely accepted technology of common use (Goldfarb et al., 2020, pp. 400–404). This leads to the mass investment of companies and governments in AI (Lee et al., 2022, pp. 1–2). This result in, among others, the increase of AI patents all over the world (see Chart 1). The average annual increase in the years 2010–2015 amounted to 6%, which is more than the annual increase in the case of other patents. The leading countries as regards the research in that period were Japan, South Korea and the USA. South Korea, China and Chinese Taipei noted a huge increase in the number of AI patents in comparison with their earlier results. The EU member states had a 12% share in the total number of inventions connected to AI in the years 2010–2015 (OECD, 2017).

The increase in the importance of the AI technology is also reflected in the growing number of studies and analyses concerned with defining AI's influence on economy (Acemoglu et al., 2021, pp. 1–53; Brynjolfsson et al., 2019, pp. 23–57; 2021, pp. 333–372; Chalmers et al., 2020, pp. 1028–1053; Farboodi et al., 2019, pp. 29–43). The analyses of data bases containing academic publications (e.g. Scopus) conducted by Bickley et al. (2022, pp. 2055–2084) indicate that AI in economy follows the same direction as the AI area itself: some activity in the 70s, a slowdown in the 80s and the rise in interest in recent years. Economic papers are most often concerned with the issues connected with AI's influence on job market, economic development and growth, innovation, technological changes or legal-economic analyses resulting from the regulatory challenges brought about by the growing importance of AI (Calvano et al., 2020, pp. 1040–1042; Hardyns & Rummens, 2018, pp. 201–218; Leib et al., 2021, pp. 1–16).

3. Methods

The main method used in the research is the desk research method. The emphasis on artificial intelligence's importance in social, economic and political life was illustrated by presenting up-to-date, secondary statistical data obtained from Eurostat (2022) and OECD (2017) bases. The author also invoked the analyses and forecasts of well-known analytic companies, such as: McKinsey Global Institute (2018) or PwC (2018).

Considerations aiming at indicating challenges and problems of ethical and regulatory nature were based on the overview of the literature, previous research and legal acts. The analysis and overview of legal acts concerning AI established by the European Commission, the Chinese government and the US government enabled to indicate differences in the attitudes to the discussed issue.⁴

4. Results

4.1. The AI term interpretation

The literature presents many different approach to interpreting the term artificial intelligence. This notion was introduced in the scientific discourse for the first time by one of the leading cyberneticists, McCarthy (1958, pp. 77–84, as cited in Collins et al., 2021, pp. 1–17; 2006) from Stanford University in mid 50s of the 20th century. He then defined artificial intelligence as “science and technology of creating intelligent machines”. Russel and Norvig (2020, p. 17) defined this fact as “the birth of artificial intelligence”. Bellman (1978) interprets artificial intelligence as a concept of automation of actions, connected to human thinking, which means actions such as: making decisions, solving problems and learning. According to Engelmores (1987, pp. 1–20) some researchers define symbolic computation as artificial intelligence, while others connect it with expert systems. On the other hand, Engelmores (1987, pp. 1–20) himself explains the notion of artificial intelligence through the term “the latest IT issues” (“cutting edge problems in computer science”). The latest definitions describe AI as the machine’s capability to perform cognitive functions, attributed to human mind. Those functions include: perception, reasoning, learning, interaction with environment, solving problems, making decisions, or even showing creativity (Rai et al., 2019, pp. 3–8) or as a process which enables a machine to show human intelligence, including the ability to perceive, reason, learn and interact (Russel & Norvig, 2020). A similar interpretation of AI may be also found in works of Polish authors. Nowakowski and Waliszewski (2022, p. 124) assume that artificial intelligence is the ability of machines to show human skills, such as reasoning, learning, planning and creativity. It is the use of technology which enables technical systems to perceive their surroundings, dealing with what they perceive and solving problems to achieve a particular aim. Collins et al. (2021) identified almost 30 different definitions of AI through a systemic overview of the subject literature. The analysis they conducted allowed to state that most definitions focus on AI systems’ functionality, rather than on explaining what AI really is. The common part of most descriptions and proposed definitions is the growing ability of machines to perform particular cognitive functions, roles and tasks performed currently by people. Therefore, the key element of AI definition is intelligence (Koniakou, 2022).

AI comprises a wide set of computational techniques capable of performing functions which would normally require the use of human intelligence. Those functions comprise the use of different technologies (see Table 1). Tasks performed due to the use of AI include, among others: chatbots text generating, recognizing objects and faces, driving vehicles autonomically. The feature that distinguishes AI from other technologies is the ability of self-improving its predictive power through constant practice and “learning”, which makes it pos-

sible to perform tasks on a high cognitive level. AI is not, therefore, a single and independent technology, but “a deeply technological family of cognitive technologies” (Kuziemski & Misuraca, 2020, p. 1), comprising different techniques, subdisciplines and uses (Gasser & Almeida, 2017, pp. 58–62), from machine learning and processing natural language to robotics and superintelligence systems (Raso et al., 2018; Stahl et al., 2021a, pp. 374–388; 2021b, pp. 23–37).

Apart from academic circles, formulating AI definition is the task of different organizations, government agencies and international institutions. According to European Commission (2021b, Article 3, p. 1), the AI system is defined as: “(...) software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with.” It should be noted that this is a very wide definition, comprising a wide range of uses, both dedicated, as well as modules (e.g. a safety component or a decision-making module), which are integrated with products or systems offering greater functionality (Stuurman & Lachaud, 2022). In particular, this definition emphasizes the following issues:

- Artificial intelligence is treated as software.
- AI should use one of the methods mentioned in Appendix I (while according to European Commission (2021b, Article 4), Commission is authorised to change its content).
- AI realizes a particular aim defined by a human.
- AI generates or may generate particular results (including recommendations or decisions).
- AI influences or may influence the environment it interacts with.

Undoubtedly, the AI definition is constantly changing. Previously, AI was associated with technology which allows a robot to win a game of chess. Nowadays, it is also the ability to solve different problems and to perform much more complicated reasoning and actions. According to European Commission (2021b, Article 12), the AI system’s definition should be neutral in terms of technology, which means that its changes are acceptable due to the current technological changes. There is also no clear and common definition of the term “artificial intelligence”, as this notion comprises a huge number of issues connected with various disciplines, from neurology, neurobiology or neurophysiology to information technology, mathematics, etc. (De Felice et al., 2022, pp. 1846–1856).

The lack of a homogeneous attitude towards artificial intelligence understanding in the technical area leads to uncertainty in the legal, social and moral-ethical spheres (Yaroshenko et al., 2022, p. 161). For instance, the use of different interpretations of AI in different countries may result in difficulties in comparing the level of investment or of progress in AI research. The lack of a homogeneous definition constitutes a serious problem for the governments which would like to grant enterprises developing or implementing AI with donations. Those regulatory institutions will need a clear definition of they understand as AI, otherwise they will risk attracting companies with no intention to help. If

the regulations were to impose obligations on subjects creating or implementing AI, the lack of a clear AI definition may provoke to evade such regulations, especially when not obliging with them may mean the risk of imposing sanctions (Smuha, 2021, pp. 57–84).

4.2. Ethical threats

Apart from benefits offered, AI systems and algorithms also create a wide range of threats (Gerards, 2019; Radu, 2021; Taihagh, 2021) and ethical challenges (Stahl et al., 2021a, 2021b). The dynamic AI development renewed the discussions on role of automatization in replacing human work and on which economy sectors are most threatened by this (Frey & Osborne, 2017). Even though the AI proponents admit that some workplaces will be lost due to “the creative destruction”, they still maintain that the positive net benefits will emerge in terms of creating workplaces and economic growth (McKinsey Global Institute, 2018). Nevertheless, the issue of distribution of these effects on different social groups, or even countries remains.

In the context of the debate on ethical-legal implications, a crucial issue is the one of processing personal data. One of the examples is the app-related use during the COVID-19 pandemic crisis. An application was used to monitor infected people’s moves and contacts. Despite the fact that this kind of applications were created for “social” aims and to protect society, their installation was not obligatory. It is obvious that the progress and increased use of such apps will be possible with the growing awareness that confidentiality, integrity and availability of information and data are protected (De Felice et al., 2022).

Another example is the omnipresent surveillance. A face-recognition system is currently used more and more often, both by the states for political and safety purposes, as well as by the cities (so called, smart city), or companies (so called, smart factory). The ability to recognise faces and the possession of data enabling blanket surveillance exacerbate traditional fears regarding privacy and autonomy (Bennett & Raab, 2017), especially when the biometric recognition sector remains mostly unregulated. The aim of the regulators should, therefore, be the regulation and standardization of data use in order to guarantee employees’ and citizens’ legal rights (De Felice et al., 2022). Additionally, algorithms used to moderate online content were often accused of private censorship or influencing opinions (Gillespie, 2020; Gorwa et al., 2020). In this way, AI systems and algorithms may also contribute to repression and authoritarian practices (Feldstein, 2019).

Among ethical threats, there is also the ability of algorithms to reflect and replicate social biases, e.g. when making decisions about who should qualify for a bank loan, state donation or job offer. Using this AI function without the necessary transparency or public control highlights the dangers connected with letting the machines make more and more important decisions (Schiff et al., 2022). There are also views that such decisions influence or even interfere

with the wide range of human rights, such as freedom from discrimination, the right to work or the right to gain education (Latonero, 2018; Raso et al., 2018).

There are growing concerns that some decisions with profound legal implications may be left to AI (Scherer, 2016). Implementing AI algorithms also in the legal system in the form of Law Tech (Kennedy, 2021), or as mechanisms of prediction and risk assessment, raises concerns that they may influence or interfere with the right to equal justice under law, a fair trial, freedom from arbitrary arrest, detention or expulsion, or even the right to freedom and personal safety (Asaro, 2019; Završnik, 2020). In many sectors of human life, from AI in healthcare to independent vehicles, the dangers — which at this moment may not be fully predictable — should be balanced against the transformational potential of this powerful set of technology.

Cases of discrimination and bias, online disinformation and opinion manipulation, private censorship, omnipresent surveillance and negative results on the job market raise serious concerns. Therefore, it is a common belief that if such technologies “are designed or developed in a wrong way or wrongly used, they may be highly destructive both for individuals and the society” (Fukuda-Parr & Gibbons, 2021, pp. 32–44). On the other hand, the existing legal loopholes lead to ambiguity and provide an opportunity for individuals’ opportunism.

Due to the existing threats, which may result from the use of AI technology, governments, intergovernmental organizations, public entities, non-governmental organizations, scientists and stakeholders from the private sector present a number of recommendations regarding the formulated legal framework so that they would include ethical norms as well. An example of such a recommendation is a document prepared in April 2019 by High-Level Expert Group on Artificial Intelligence (AI HLEG, 2019) — an expert group appointed by the European Commission. Basing on core laws and ethical rules, the document mentions seven key criteria (so called, “Guidelines”), the AI systems should fulfil to be perceived as trustworthy. These criteria apply to various stakeholders taking part in the AI systems’ life cycle: their creators, implementers and final users, as well as the broader sections of society.

When issuing the legal act on AI, the European Commission aimed at “ensuring that the AI systems introduced on the (EU) market and their use were safe and in accordance with the binding law regarding basic laws and value of the EU”. In June 2019, G20 group formally validated a set of ethical rules for AI formulated by a group of experts appointed by the OECD. The OECD guidelines are based to a large degree on the “Trustworthy AI” concept developed by the European Commission.

However, due to the fact that the ethical issues and the issues of the improper use of AI resulted in the risk of slowing down of the AI development in the West, Chinese government and Chinese technological companies are taking steps to ensure that the concerns regarding ethics and other issues will not



hinder innovation in China. One of the ways is recognising the risk without articulating it. For instance, Jack Ma from Alibaba recognised the risk connected with AI, but Alibaba is not engaged in any national or international ethical groups and does not have an ethics department in its internal structures. This implies that the government may define ethics, but only when it is necessary (Lucero, 2019, p.102).

4.3. Regulatory competition

Nowadays, the AI technology race can be observed in the world. AI has gained a strategic importance for governments all over the world, it is considered to be one of the most transformative forces of our times. Its common status enables to generate a wide range of profits, which may contribute not only to the growth of the individual prosperity but also to the economic and social prosperity (Smuha, 2021, pp. 57–84). Competitiveness of the economies leading in creating technologically advanced solutions, including AI, correlates directly with their level of competitiveness. The world leaders as regards the amounts spent on AI solutions are the USA, China, France and Great Britain (Resolution No. 196, 2020, p.14). Many countries and regions takes parts in the race to design applications using AI, in order to enable faster and more successful use of this technology and to gain the benefits it provides.

High competitiveness in terms of creating and implementing the AI technology is motivated not only by the desire to ensure a high position on the global market, but it is sometimes presented as an almost existential necessity, invoking not only the classic arguments of national security, but also those of economic safety. In fact, not only the huge profits which may be the result of implementing AI, but also the huge losses in the case of not taking such a decision seem to strengthen the rhetoric of the existing competition.

Achieving good results regarding AI has become a matter of interest of many governments on the national and international level. In July 2017, the State Council of the People's Republic of China (2017) published a document titled *New Generation Artificial Intelligence Development Plan*, which presented national ambitions to become a leader of the global AI industry by 2030. This plan raised a lot of interest and became the basis of the concept that AI development is a huge geopolitical competition whose winner will control the future (Lucero, 2019, p.102). In 2018 the European Commission (2018) published the European strategy in terms of artificial intelligence. Their aims are to turn the EU into the world class AI centre and ensuring that AI is focused on the human being and trustworthy. The EU attitude towards artificial intelligence focuses on perfection and trust in order to stimulate research and industrial potential, but to also ensure security and basic rights. On the other hand, the act on artificial intelligence proposed in April 2021 (European Commission, 2021b) has been described as “The first in the world framework for AI”. On February 11, 2019, President Donald J. Trump launched the US national strategy regard-

ing maintaining American leadership concerning the AI field (Executive Office of the President, 2019). American attitude to AI focuses federal government's resources on supporting AI innovation, which will contribute to prosperity, greater national security and a better life quality.

Nowadays many countries, among the developed one, have their own strategies as regards artificial intelligence. It may be observed that each strategy emphasizes the strong points of developing AI solutions and this potential's growth factors (European Commission, 2021a). Moreover, all countries want to lead the AI race and all of them claim to already be the leaders at least in terms of some specific aspect — for instance, the AI talent, research, start-ups, applications, software and equipment, or investment (Smuha, 2021, p. 58).

Furthermore, due to the risks involved in using and implementing the AI technology, governments are called upon to adopt policies, which will not only stimulate beneficial investment in AI, but also protect people from the dangers connected to its use. The regulatory system, which may balance these needs and provide legal certainty to all interested parties, might not only ensure trust towards this technology, but also facilitate its adoption, and at the same time increase the competitive position of the states (Smuha, 2021, p. 59).

The benefits stemming from introducing appropriate regulatory framework regarding AI are even more important for those countries which are first to propose new solutions. They will then be able to achieve the, so called, “first mover advantage” (Smuha, 2021, p. 59). This leads to the emergence of the, so called, regulatory competition in the global economy. At best, this will force governments to find the most proper balance between protection and ensuring safety of the AI technology users, and stimulating innovation of enterprises and investment in AI technologies. Striving for such a balance, countries may compete with each other through regulations in order to attract those elements (factors) which will turn them in a competitive force on the global AI market. However, this might result in a situation where the regulatory competition regarding AI will lead to “a race to the bottom” instead of “a race to the top” which will affect the level of citizens' safety.

5. Conclusion

Considerations included in this article have shown the growing importance of AI in the development of modern economy. Despite the fact that AI has existed since the middle of the 20th century, only recently did it start to be used on a wide scale, due to, among others, the increased computer performance and huge databases available. Regulatory authorities all over the world have placed AI at the top of their strategic programmes, aiming to make it a source of benefits for their economies and societies. However, it is worth emphasizing that apart from the benefits resulting from the wider use of this technology, it is also connected with a number of risks. Therefore, the article presumes that it is necessary to regulate the area of creating, implementing and using artificial



intelligence in a proper way. Those regulations should, on one hand, promote innovation and encourage it, but on the other — they should ensure a high level of security and protection of citizens' basic rights.

However, as the article proves, regulating the AI field is connected with a number of challenges, resulting from, among others, the lack of homogeneous interpretation of the AI notion, numerous ethical threats and regulatory competition. The lack of the homogeneous attitude to the notion of artificial intelligence in the technical sphere results in uncertainty in the legal, social and moral-ethical spheres and gives way to many opportunistic behaviours. Because of the existence of the number of ethical threats regarding the use of AI, it is necessary to conduct an open and integrative debate involving representatives of different communities and countries, focusing on the proper use of these new technologies, on respecting basic rights such as privacy, freedom, security and non-discrimination. It is crucial to ascertain the anthropocentric principle according to which AI should serve people, and not the other way round. Finally, the benefits resulting from the AI use cause an increased global competition in terms of its acquisition and implementation. Such a competition is connected with the risk of countries creating regulations which would only aim at promoting innovation, i.e. gaining economic benefits, without proper consideration for citizens' rights and freedom. Therefore, regulatory authorities should adopt a holistic attitude in terms of formulating regulations regarding AI, taking into consideration interactions between different branches of law.

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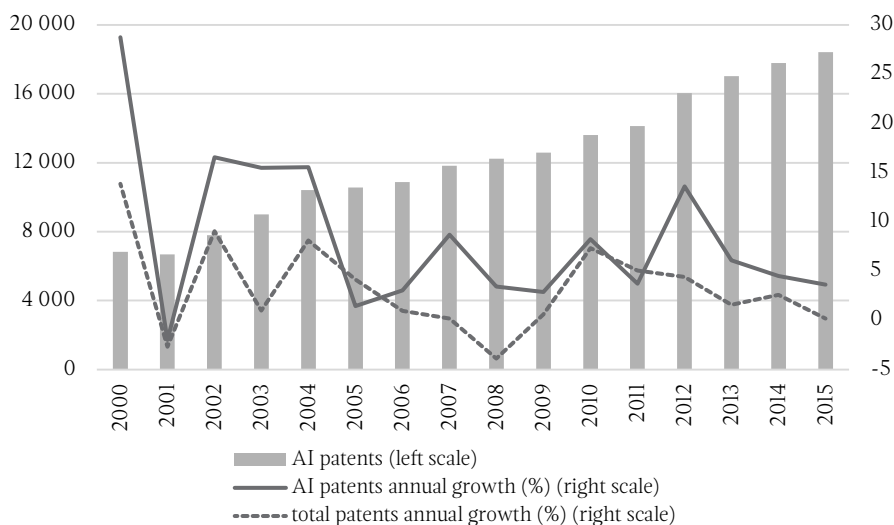
Appendix

Table 1.
AI Functions

Technology	Description	Example
Expert System (ES)	Designed to simulate the problem-solving behaviour of a human.	DENDRAL: Expert system used for chemical analysis to predict molecular structure.
Machine Learning (ML)	Automatically refines its methods and improve its results as it gets more data.	Many of the more advanced recommendation systems i.e., Google, YouTube etc.
Robotics	Concerned with the generation of computer-controlled motions of physical objects in a wide variety of settings.	service robots
Natural Language Processing (NLP)	Designed to understand and analyse language as used by humans. NLP is the base for the AI-powered Speech Recognition.	intelligent agents i.e., Apples Siri, Amazons Alexa
Machine Vision (MV)	The analysis of images using algorithmic inspection.	The computer vision used to help drive autonomous vehicles.
Speech Recognition	Can be understood as an approach that deals with the translation of spoken words into the text.	Google Dictate uses speech recognition to convert spoken words into text.

Source: Collins et al. (2021, p. 3).

Chart 1.
AI patents worldwide, 2000–2015



Source: OECD (2017).