ARTIFICIAL INTELLIGENCE AND INEQUALITY IN EUROPEAN UNION

Mihail CARADAICĂ[1], PhD
Department of International Relations and European Integration, SNSPA
Bucharest/Romania

Abstract
The paper aims to explore the roots of inequality in the European Union by focusing on the potential of Artificial Intelligence (AI) to enlarge the actual digital divide. Each time a new technology is broadly implemented in society, it generates economic and social gaps. There are many similar examples in history when a new invention brought poverty for significant categories of people, who faced unemployment due to new industrial machines or found themselves unable to operate or afford new devices. Therefore, the research question that I will try to answer in this paper is: "does artificial intelligence have the potential to create more inequality in the European Union?". To answer this question, I will firstly address the issue of AI's state of the art and I will research how this new technology is industrially implemented, aiming to see to what extent it represents a threat to our jobs or our way of life. Secondly, I will search for social mechanisms that generate inequality by using the concept of digital divide. This theoretical approach focuses on the possibility of people impoverishing due to the lack of basic skills and the impossibility to afford new available technologies.

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Thirdly, I will develop a case study, a comparative approach on EU's member states strategies in the field of AI.

Keywords: artificial intelligence; digital divide; European Union; inequality; machine learning

1.INTRODUCTION

"AI is likely to be the best or worst thing to happen to humanity".
—STEPHEN HAWKING

The crossing point between the evolution of technology and society has always been a delicate issue in human history, as it always modified the economic structure of the society, the social habits or political organization. It generated both wealth and poverty, wars and peace, or illnesses and health. It was not technology itself that positively or negatively impacted the human societies, but the way people were prepare to accept changes and to adapt to them. In the 21st century researchers and engineers have produced technologies that might deeply change our way of life. There is Blockchain which could revolutionise the financial sector and the trust between people during financial transactions, Internet of Things that will allow machines to communicate with each other in real time, and Artificial Intelligence that assigns machines with the ability to "think" and empowers them to make decisions by themselves.

When most of the ordinary people hear about artificial intelligence, they associate the term with robots, especially with robots that become aware of their condition and start to see human race as a threat. But this conception is far from being true. At least for the moment. AI is no more than machines or programmes able to make decisions for themselves, without the assistance or guidance of a human mind. If humanity will ever create machines that are aware of themselves, that have different goals and morality, it is still an open debate and not a subject for this paper. But even without a super intelligent computer, the current achievements in the AI field do represent, to some extent, a threat to ordinary people. This new and powerful technology has this ability to change

society, economy or politics if it is not properly implemented or regulated. Consequently, my paper will focus on how artificial intelligence can create inequality in the European Union (EU), and I will demonstrate this by analysing the national strategies on AI of its member states.

2.WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial Intelligence is a concept that is starting to be broadly used at all society levels: by politicians who are promising digitalization and economic growth, by media which often addresses its impact on society, by the scientific community that constantly marks new achievements in the field of AI, and so on. There are also AI enthusiasts who believe that this technology is going to change our society for the better, enhancing the lives of human beings or even the humans themselves by combining human intelligence with artificial intelligence, while there are also skeptics who think that AI is going to be the end of human kind. Therefore, I believe that a more accurate perspective on how AI could generate social inequality could be achieved only after an analysis of its present development. "What are the technical limits of AI?", "What tasks is AI able to perform today and how can it develop in the near future?" or "Is AI going to take our jobs?" are questions that need to be addressed before I will discuss how this technology could create more digital divide.

Enhancing the intelligence of machines is not a new idea, but it has been on the minds of several researchers since the 18th century. However, one of the most important figures in this filed is Alan Turing, a mathematician and World War II code breaker, who did important research on this issue even when the term "artificial intelligence" was not yet used. He was wondering if it is possible to teach a machine how to think and, in 1952, "he published a paper about a set of equations that attempted to explain the patterns of nature, from a leopard's spots to a zebra's stripes to a plant's leaves. Even before the field had a name, one of its founding visionaries was taking cues from biology and from nature that would inform his ground-breaking ideas about machines that could think"

(Coleman 2019, chapter 2). How was it possible to imagine an intelligent machine, even before electronic computers were invented? Flynn Coleman thinks that Turing's interest in many disciplines and scientific areas, allowed him to tackle this issue so accurately (Coleman 2019, chapter 2).

But Alan Turing did not stop there. He also came up with a test, known as the Turing Test, which could check if a machine developed awareness. Peggy Thomas describes the test as is follows: "An interrogator or judge sits in front of two computer terminals. One terminal is connected to a person in another room; the other terminal to a computer in a third room. The interrogator types questions on both terminals to try to figure out which terminal is controlled by a human and which is controlled by a machine. If the interrogator cannot decide which contestant is human, or chooses incorrectly, then the computer would be judged intelligent" (Thomas 2005, 21). Until now, there is no machine that successfully passes the Turing Test, a fact that shows us that until present day, there is no AI device that became aware of its existence.

It must be said that the term "artificial intelligence" was used for the first time during the Dartmouth College workshop in 1956, organized by the computer scientist John McCarthy who was going to become a professor at Stanford University. The concept was coined by DeepMind, a British AI company acquired by Google in 2014, that was created by three scientists, two of which met while working at University College London. In 2015, DeepMind developed the Alpha-Go software that managed to be the first computer Go programme to defeat a human professional Go player (Kaplan and Haenlein 2019, 20).

Because AI research field developed many branches since 1956, it is quite impossible to identify a single definition commonly accepted by the entire scientific community. According to Peggy Thomas, "AI is the study and creation of machines that can perform tasks that would require intelligence if a human were to do the same job" (Thomas 2005, 13). Thereby, this new field requires knowledge from other areas such as programming, robotics engineering, mathematics, neurology, psychology or even philosophy. While addressing the subject of philosophy, Flynn Coleman considers that "the study of intelligent technology is actually a philosophical study of the fundamental nature of our existence, reality, and knowledge that will be mirrored in our machines"

(Coleman 2019, chapter 2). This approach requires a deeper exploration of our humanity, because only by understanding our nature we might be able to replicate its features. Finally, Stuart Russell states that "The goal of AI research has been to understand the principles underlying intelligent behavior and to build those principles into machines that can then exhibit such behavior" (Russell 2019, Chapter 3). According to Russell, intelligence is the core element that needs to be understood, defined and replicated in order to create machines that can think.

What we can certainly know about intelligence is that it represents more than the sum of facts a person knows and it derives from what a person experiences and how a person perceives the world around (Thomas 2005, 28). But what is curious about intelligence is that people could easily identify it, but they have a hard time when they should define it. This is happening because "thinking covers a broad range of different cognitive abilities that most humans take for granted. These include the ability to understand logic, learn, have self-awareness, have emotional intelligence, think abstractly, and solve problems" (Wilkins 2019, chapter 1). The fact that we did not manage to create an autonomous artificial intelligence that can pass the Turing Test, might be related to the absence of an universally accepted definition of human intelligence. "Just as we don't fully comprehend how AI works, we also do not fully understand how our own brains function, nor do we have a definitive grasp of what consciousness is, nor who, or possibly what, is conscious" (Coleman 2019, chapter 2). Besides the problem that we cannot replicate what we do not fully understand, computers intelligence should be constructed using math language.

AI is very different from human intelligence because it is designed in a mathematical sense. Human brains use neurons to function, while a computer is having a CPU (central processing unit) that performs all calculations. "The smallest unit of a CPU is a transistor, an electronic component that makes up logic gates. These are the equivalent of neurons for computers, but they don't do very much. They can switch the flow of electricity, amplify it and that's pretty much it. Logic gates form the basis for computer programs, which are just a series of ones and zeros" (Wilkins 2019, chapter 1). Thus, the electricity can be transformed in intelligence using software, meaning how a programme makes

decisions based on inputs. For example, a website is asking for your birthday to check if you are 18 years old, and then is deciding if you get access or not.
According to Anca Dragan, "At the core of artificial intelligence is our mathematical definition of what an AI agent (a robot) is" (Dragan 2019, Chapter 13). To support her argument, she uses the example of a robot which is defined by states, actions and rewards. A delivery robot for instance uses states as locations in the world, the actions are in fact the motion necessary to move from one point to another, and the reward function is mostly related to its intelligence. "To enable the robot to decide on which actions to take, we define a reward function—a mapping from states and actions to scores indicating how good that action was in that state—and have the robot choose actions that accumulate the most reward" (Dragan 2019, Chapter 13). When the robot reaches destination, it is rewarded; when the robot finds a shorter way, it is rewarded; When it gets to the destination as quick as possible, again, gets rewarded. Thereby, a machine can make decisions, but the conditions of its decisions are already set up by programmers.

3.CATEGORIES AND IMPLEMENTATION OF AI

For each computer to perform an action, it requires to be programmed. The difference between AI and other regular programmes, following Flynn Coleman, is that in artificial intelligence "the algorithms themselves are designed to let the computers learn on their own" (Coleman 2019, chapter 2). A good example for this feature is Google AI, which tries to learn about you, about what you are looking for when you use the search engine, and prioritize the search results based on what they think you would like to find.
Therefore, artificial intelligence faces two different areas:

- building software – the most common way through AI is developed nowadays;
- building hardware – the field of robotics (Coleman 2019, chapter 2).

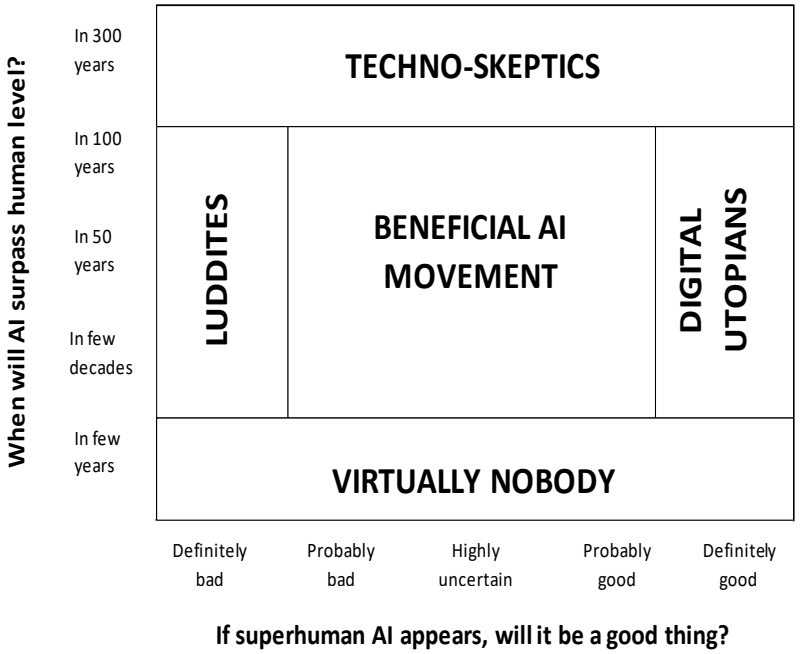
Focusing mainly on software, means that people do not have physical contact with AI, and perhaps, most of the time they do not know they have interacted with an AI programme. When we talk of robotics, situation is quite different. Robots, especially those with human forms, might appear as a threat to many people. It is a general fear among us that robots are going to replace us by taking our jobs, by getting involved in our private lives, and, finally, by achieving political control. But are those fears based on a scientific ground? To see this, I will further analyse the categories of AI and I will give concrete examples of how it is used in daily life.

Generally, as Neil Wilkins (2019, chapter 1) also states, artificial intelligence has two different meanings when used in daily life:

- Narrow AI – that allows computer to perform complex tasks or to make decisions based on how they were programmed;
- Artificial General Intelligence (AGI) – that allows computers to think as humans do.

Artificial General Intelligence is, as I already hint until this point of the paper, not discovered. A machine that can think to a comparable level with a human being is, as Wilkins (2019, chapter 1) points, the "holy grail" of AI research. But is it technically possible for AGI to be created? This question splits researchers and scholars that work in this field. As I show in Figure 1, there are various technical communities with different visions: We have Digital Utopians who think that superhuman AI may possibly emerge in few decades or in, at maximum, 100 years, and it will be constitute a positive support for humanity. On the other hand, there are Techno-Skeptics, who believe that we will never have AGI or that it could emerge in the long future, between 100 and 300 years, or Luddites – the nowadays followers of the 19th century English textile workers organization that used to destroy textile machinery as a form of protest against technology replacing human labour – who think AGI could emerge in between a few decades and 100 years, but it will be destructive for humanity. What is also interesting to mention is that virtually nobody thinks that AGI can be achieved in the next few years.

Figure 1 (Tegmark 2017, chapter 1)



Therefore, as AGI is more of an academic pursuit, most of the time when people use the term artificial intelligence, they refer to the Narrow AI. This category embeds all the achievements in the field until today, and it is split in other subcategories:

1. Clever programming;
2. Machine learning.

Clever programming refers to the building of a programme that can achieve intelligent behaviour. The most common use of clever programming is in the field of video games through the non-player characters (NPCs) that are controlled by computer. "NPC respond to user input in such a way that may

pose a challenging gaming experience. This is done by switching through "states" and defining program behavior at each state. If a player is running away, the computer AI may switch into the chase state and follow in pursuit" (Wilkins 2019, chapter 1). A relevant example could be the soldiers from military video games: they are designed to "think" based on the movements of the human player and the context of the environment around him.

Machine learning (ML) is basically a process where algorithms can "learn" from large amounts of data[1]. "Machine learning falls under narrow AI because it can learn how to do one thing very well but usually can't generalize it to other problems. Some might take this further and say that machine learning is a subfield of computer science and is completely different from AI research" (Wilkins 2019, chapter 1). The remarkable achievements in the ML field are driverless cars, recommender systems, facial recognition, or understanding human language. The limitation here, as Wilkins points, is that an AI driverless car can only drive, and not understand your language or recognizing your face. But as narrow as the AI is in this area, it has, however, "the potential to replace human labor where a narrow skill set is employed, like in manufacturing" (Wilkins 2019, chapter 1), proving that some fears and remarks claimed by the techno-skeptics or luddites have a real base.

An interesting research direction of the machine learning is deep learning, the confluence point of AI with neuroscience. The main goal of the deep learning field is to create AI based on the human brain model. However, present achievements in this area show that the emerging AI is more human, rather than less. "The skills they bring to learning are not <<better than>> but <<complementary to>> human learning: Computer learning systems can identify patterns that humans cannot—and vice versa" (Lloyd 2019, chapter 1).

[1] Here is the point where AI is mixing with another new field of research. States and corporations are collecting so much data, that it cannot be process by human brains. This is where machine learning programmes are getting involved to provide us accurate information in the shortest time possible. As Etherm Alpaydin put it, "each of us is not only a generator but also a consumer of data. We want to have products and services specialized for us. We want our needs to be understood and interests to be predicted" (Alpaydin 2014, 1).

We can say that it is not a computer winning a game against a human player, but in fact humans working together with computers.
To conclude this chapter, I must say that Artificial Intelligence is something that just started to transform our society and our way of life. As Pedro Domingos said, "the Industrial Revolution automated manual work and the Information Revolution did the same for mental work, but machine learning automates automation itself" (Domingos 2015, 9-10). And who are the most vulnerable people to be affected by these changes? According to Carl Benedikt Frey, "many medium and low-skilled workers have seen their incomes stagnate. Or, succinctly put, computer technologies contributed to shrink the size of the middle class, put downward pressure on unskilled workers wages, and reduced labor's share of income across many Western countries" (Frey 2019). As most of technological changes in history have generated, a broad implementation of AI can create new social and economic gaps among people. Thereby, in the next chapter I am going to explore the nature of these gaps using the concept of digital divide.

4.DIGITAL DIVIDE AND ARTIFICIAL INTELLIGENCE

While new technologies are deeply changing the way we live, "a large section of society is still on the wrong side of the digital divide, unable to fully enjoy the benefits of the revolutionary changes taking place" (Datta, Bhatia, Noll, and Dixit 2019, 70). As a consequence, digital divide could be simply defined as the inequality generated by the diffusion of a new technology in society. In fact, is not technology itself that creates inequality, it is the global capitalism. As Thomas Piketty argues, there is a continuous increasement of inequality in both national and global level (Piketty 2014), that is not related to technology, but to the very nature of the capitalist system. Any technology that possesses the ability to boost various economic sectors, could generate also massive inequality between people and societies in the absence of specific regulatory policies.

Thereby, following the pattern of inequality, digital divide also has two dimensions: national and global level.

The national level

The digital divide between individuals is highly visible in societies where traditional patterns of inequality encounter new technological changes and amplify existing gaps. "If there is a revolution underway, then it is controlled by a small minority of well-placed people, even if it affects us all. Initial hopes that the invention of the PC or the Internet would lead to a more equal or democratised society quickly faded" (O'Hara and Stevens 2006, 69-70). Usually, the big business is in charge of spreading new technology, while their own profit is the law behind the distribution process. It turns out that marginalized classes could be the most affected, as they massively lack financial resources.

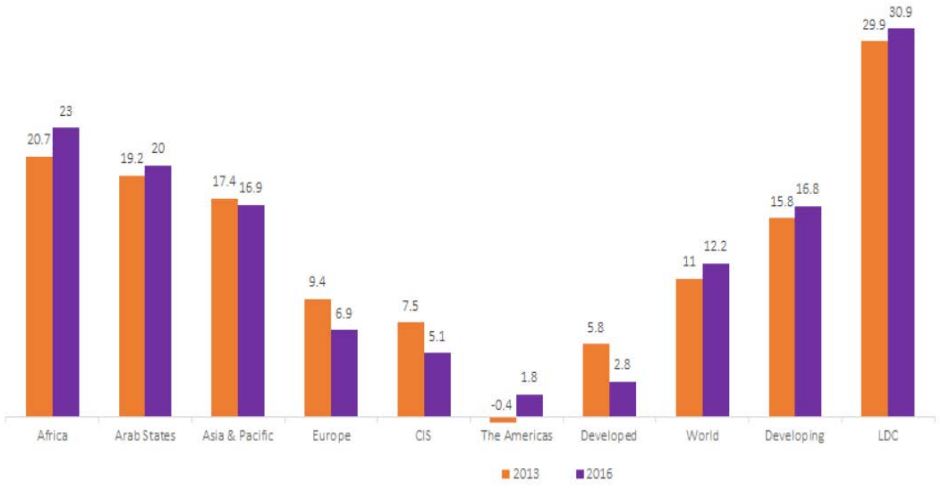
Antonio Hidalgoa, Samuel Gabalyb, Gustavo Morales-Alonsoa and Alberto Urueñaa managed to identify two important dimensions of the digital divide that could emerge among individuals and were also generated when the internet was firstly implemented:

- Connectivity – the access to the ICT (Information and Communication Technology) infrastructure and the possibility to afford it;
- Digital skills – acquiring abilities required to use ICT (Hidalgo, et all. 2020, 1).

These two dimensions could be both applied in the field of artificial intelligence. On the one hand we have the connectivity, which should be interpreted as having access to AI technology – the capacity to afford AI devices or software, and on the other hand, we have the digital skills – the ability to understand and use every device of software based on AI.

But the overall picture of the digital divide hides another problem: the gender digital divide. Technology in general and the internet in particular can be an extremely important tool for women's empowerment, but the lack of opportunities or low digital skills inhibit many of them from tackling this field. The achievement of gender equality becomes impossible without ensuring equal access to technology. As Figure 2 shows, there is a large increasing gap at the global level, while the situation in the EU is improving. However, there is still a threat that AI might reverse the trend if proper policies will not be applied.

Figure 2 – The use of the mobile internet and the gender gap (Sorgner, Mayne, Mariscal and Aneja 2018)



The global level

The trend of global capitalism that was emphasised by Thomas Piketty in his research on inequality, was also pointed by Manuel Castells in 2001, when analysing the global impact of digital divide. He observed that the global economic, social and political arrangements are "simultaneously increasing wealth and poverty, productivity and social exclusion, with its effects being differentially distributed in various areas of the world and in various social groups. And because the Internet is at the heart of the new sociotechnical pattern of organization, this global process of uneven development is perhaps the most dramatic expression of the digital divide" (Castells 2001, 265). And this seems to be a one-way road because, "it is unlikely that societies around the world would engage freely in non-technological forms of development-among other reasons, because the interests and ideology of their elites are deeply rooted in the current model of development" (Castells 2001, 270). The internet example seems to be similar with current evolution of the artificial intelligence which

created, along with the implementation of 5G network, a global race for supremacy.

But to have a clear picture of the global digital divide, it is necessary to see how the spread of technology occurred in the last decades and what is the current situation. The use of technology "has expanded worldwide over the past two decades, with China and India in the lead, starting in the mid-2000s in total volume of usage. In per capita mobile phone use, the rising economies of South Korea and Brazil lead the way, while in regards to internet users per capita, Korea, Japan, and the U.S. are the leaders. In 2013, an estimated 2.7 billion people worldwide used the Internet. However, 4.4 billion people have not yet made use of it" (Pick and Sarkar 2015, 83-84), a situation that might reflect how the gap can furtherly increase during the AI implementation: people that never utilized it, or are just starting to, would find it almost impossible to understand and benefit from the usage of machine learning.

In 2013 there were 4.4 billion people without internet access, and the situation did not change substantially as "3.6 billion people, remain unconnected from the Internet – despite 96% of the global population living within reach of a mobile signal. Most of the world's unconnected people reside in Least Developed Countries, where 80% of the population is offline" (ITU Digital Inclusion Division 2019). With a 53% of the global population online it is almost impossible to imagine a uniform implementation of AI on a global scale (ITU Digital Inclusion Division 2019).

Shifting the discussion from individuals to nation states, the situation is quite similar. "The United States and China create the vast majority of wealth in the digital economy, the study reveals, and the two countries account for 75% of all patents related to blockchain technologies, 50% of global spending on the "Internet of Things" (IoT), more than 75% of the cloud computing market, and as much as 90% per cent of the market capitalization value of the world's 70 largest digital platform companies" (Zahri 2019). As can be observed from this statistic, the capital related to innovation and new technologies is not equally distributed around the world, but it is in fact concentrated in some specific areas where it receives strong support and substantial investments in research. In this context, European states must act quickly if they want to be a global player in

the field of technology in general, and artificial intelligence in particular. In the next chapter I will analyse European and national strategies regarding artificial intelligence to see how EU and European member states are trying to become a global player in the field and if there is any concern regarding the problem of digital divide.

To conclude, the digital divide generated by artificial intelligence can appear at both levels, national – between individuals, and global – between states. At the national level, the lack of skills, and the gender gap, could manifest themselves as in the case of internet or mobile phones. But the issue of connectivity might not follow the same pattern as there is no special infrastructure needed, just the access to ordinary technology such as internet, smartphones or computers. Thus, the problem is more of how to afford technology that uses AI, in the context I presented in the previous chapter, regarding the possibility of many low and medium skilled people to lose their job because of AI automation. At the global level, the analysis should focus on how a specific country supports its AI private companies or implement AI technology in its public administration. This could attract more capital from the global market and create a competitive advantage for that country.

5.ARTIFICIAL INTELLIGENCE IN EUROPEAN UNION. CASE STUDY: NATIONAL STRATEGIES ON AI AND THE DIGITAL DIVIDE

Artificial intelligence became, in the last few years, a focus point for the EU and its member states. European Commission, the institution in charge with the coordination of EU policies and strategies in this field, is defining artificial intelligence as "a generic term that refers to any machine or algorithm that is capable of observing its environment, learning, and based on the knowledge and experience gained, taking intelligent action or proposing decisions. There are many different technologies that fall under this broad AI definition. At the moment, ML techniques are the most widely used" (European Commission

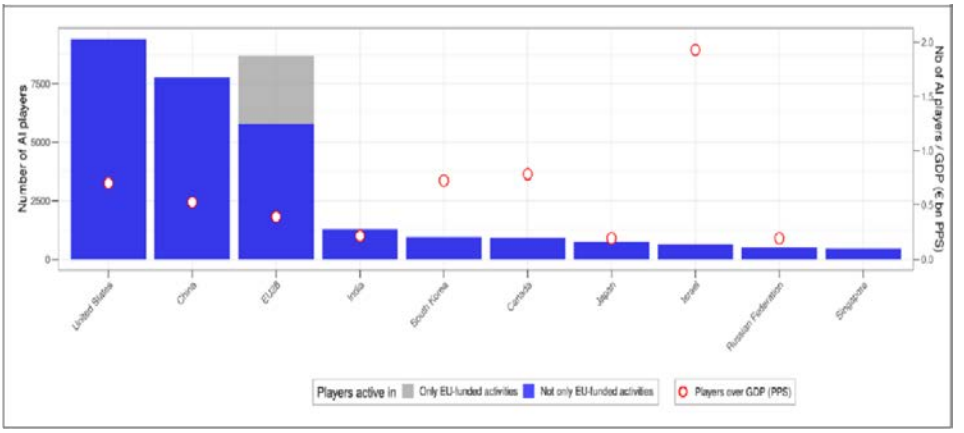
2018b, 18). There are no major differences between this paper's and the European approach, as the way I defined the main elements coincide with the Commission's definition of AI. Furthermore, AI is expected to generate an important wave of economic and social changes, already known as The Fourth Industrial Revolution, which determined Laura Delponte to consider "that the country that achieves the lead in AI is set for having a technological, economic and security advantage. To this end, China and US are competing to dominate Big Data, which is the raw material that makes AI work" (Delponte 2018, 9).

While taking into account this situation, EU needs to act as an umbrella, coordinating its member states to develop policies and strategies that can boost research and business in AI field. Thereby, in May 2017, European Commission published the mid-term review of the Digital Single Market strategy where it emphasised the importance for the EU "to be in a leading position in the development of AI technologies, platforms, and applications" (European Commission 2018a, 3). The Commission also stated that a common European initiative on AI should have the following objectives:

- Boost the EU's technological and industrial capacity and AI uptake across the economy, both by the private and public field;
- Prepare the societies for socio-economic changes generated by AI;
- Ensure an appropriate ethical and legal framework, based on the Union's values and in line with the EU's Charter of Fundamental Rights (European Commission 2018a P3).

On the global level, member states, individually analysed, cannot face the competition, while the EU as a whole is a very important player in AI industry. In Figure 3, "the number of AI players is illustrated by blue bars. To assess the impact that EU-funded projects (FP7 and H2020) have on the presence of EU28 players in the landscape, the number of AI players participating in AI activities exclusively because of their involvement in FP7 and H2020 projects is shown in grey. The US, China and the EU28 differ significantly compared to other worldwide areas (at least four times larger)" (Samoili, Righi, Cardona, López-Cobo, Vázquez-Prada Baillet and De Prato 2020, 13-14). The grey bar is actually an adequate indicator of how important the supranational action and coordination are, and what the real impact of the European funds is.

Figure 3 (Samoili, Righi, Cardona, López-Cobo, Vázquez-Prada Baillet and De Prato 2020, 15)



"One reason for Europe's strong position in terms of research is the EU funding programme that has proven instrumental in pooling action, avoiding duplications, and leveraging public and private investments in the Member States" (European Commission 2020, 4). In the last three years, EU allocated €3.2 billion for research and innovation in AI field. This was a 70% increase, compared with the previous period, but still not enough set side by side with North America - €12.1 billion, or Asia - €6.5 billion. These numbers show that important steps were done, but there is room for improvements. Thereby, "in December 2018, the European Commission presented a Coordinated Plan on Artificial Intelligence. The Coordinated Plan aims at ensuring complementarity and synergies between national and EU level actions to maximise the impact and spread the benefits of AI across Europe" (Van Roy 2020, 5). An important part of this plan was that member states were encouraged to develop their own national strategies on AI by the end of 2019.

Thereby, to answer my research question on how AI can produce more inequality at the European level, I will analyse the member states' national

strategies[1] on AI through the digital divide indicators, focusing on two dimensions: national and global level. As I showed in the previous chapter, on the national level, connectivity, digital skills and gender gap are the main issues that define the digital divide. Thus, for my analysis, I will consider digital skills and the gender gap as part of the educational process, the issue of connectivity will be related with affordability and job access, and I will further search for a national mechanism that should monitor social changes generated by AI implementation. Consequently, for the Table 1, I propose the following indicators:

- Education: this will illustrate how member states are planning to address the issues of basic skills (mass education and awareness), advanced skills (technical education) and gender specific policies;
- Jobs: people need to have jobs in order to afford AI technology, and I want to observe how states are involved in creating alternative jobs and if there are any reskilling programmes for those who lost their jobs due to AI automation;

[1] Until April 2020, there were seven EU member states that did not manage to adopt their own strategy on artificial intelligence (Bulgaria, Croatia, Greece, Hungary, Ireland, Romania and Slovenia). Thereby, my analysis will be applied on the other twenty member states as it follows: Austria (Austrian Council on Robotics and Artificial Intelligence 2018), Belgium (De Croo and De Backer 2019), Cyprus (Ministry of Transport, Communications and Projects 2020), Czech Republic (Ministry of Industry and Trade 2019), Denmark (Ministry of Finance and Ministry of Industry, Business and Financial Affairs 2019), Estonia (Government of the Republic of Estonia 2019), Finland (Ministry of Economic Affairs and Employment 2017), France (Villani 2018), Germany (The Federal Government 2018), Italy (Ministry of Economic Development 2019), Latvia (Government of Latvia 2019), Lithuania (Lithuanian Government 2018), Luxembourg (The Government of the Grand Duchy of Luxembourg 2019), Malta (Office of the Prime Minister 2019), Netherlands (Government of Netherlands 2019), Poland (Government of Poland 2019), Portugal (Government of Portugal 2019), Slovakia (Government of Slovakia 2019), Spain (General Technical Secretariat of the Ministry of Science, Innovation and Universities 2019) and Sweden (Government Office of Sweden 2018).

- A monitoring tool: it is also very relevant if states have an institutional tool that is supervising the evolution of AI technology in order to be more flexible and adapt faster to the new changes.

Table 1

State	EDUCATION			JOBS		Monitoring tool
	Mass education	Technical education	Gender specific policy	Alternative jobs	Reskilling program	
Austria	✓	✓	✓	✗	✗	✓
Belgium	✓	✗	✗	✓	✓	✓
Bulgaria	-	-	-	-	-	-
Croatia	-	-	-	-	-	-
Cyprus	✓	✓	✗	✗	✗	✓
Czech Republic	✓	✗	✓	✓	✗	✓
Denmark	✓	✓	✗	✗	✗	✓
Estonia	✓	✓	✗	✗	✗	✗
Finland	✓	✓	✗	✗	✗	✗
France	✓	✓	✓	✗	✗	✗
Germany	✓	✓	✗	✗	✗	✓
Greece	-	-	-	-	-	-
Hungary	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	✓	✓	✗	✗	✗	✓
Latvia	✓	✗	✗	✗	✗	✗
Lithuania	✓	✗	✗	✗	✗	✗
Luxembourg	✓	✗	✗	✗	✗	✗
Malta	✓	✓	✓	✗	✓	✓
Netherlands	✓	✓	✗	✗	✗	✓
Poland	✓	✓	✗	✗	✗	✓
Portugal	✓	✓	✓	✗	✓	✗
Romania	-	-	-	-	-	-
Slovakia	✓	✓	✓	✗	✗	✓
Slovenia	-	-	-	-	-	-

Spain	✓	✓	✓	✗	✗	✗
Sweden	✓	✓	✗	✗	✗	✗

For the global level of analysing digital divide, I showed that a state should be able to be competitive and, in the field of AI, it should perform on innovation and implementation level. Thus, I propose a set of indicators related to how a state is supporting its private and public sector in the field of AI and how it perceives itself at a global level:

- Private sector: if there is any financial or non-financial aid coming from the state level in order to boost the activity of AI private companies;
- Public sector: this field could strengthen the state's position on global level by implementing AI technology in the public administration and also by using artificial intelligence to rethink the entire public services system;
- Global approach: this indicator will show if the state is willing, or not, to be a global key player in the field.

Table 2

State	Private sector		Public Sector		Global approach
	Financial aid	Non-financial aid	AI implementation	Rethinking public sector	
Austria	✗	✓	✗	✗	✓
Belgium	✓	✓	✓	✓	✗
Bulgaria	-	-	-	-	-
Croatia	-	-	-	-	-
Cyprus	✓	✓	✓	✓	✗
Czech Republic	✓	✓	✓	✗	✓
Denmark	✓	✓	✓	✗	✓
Estonia	✓	✓	✓	✗	✗
Finland	✓	✓	✓	✗	✓
France	✗	✓	✓	✗	✓

Germany	✓	✓	✓	✗	✓
Greece	-	-	-	-	-
Hungary	-	-	-	-	-
Ireland	-	-	-	-	-
Italy	✗	✓	✓	✗	✓
Latvia	✗	✓	✓	✗	✓
Lithuania	✓	✓	✓	✗	✓
Luxembourg	✗	✓	✓	✗	✓
Malta	✓	✓	✓	✓	✓
Netherlands	✓	✓	✓	✗	✓
Poland	✓	✓	✓	✗	✓
Portugal	✗	✓	✓	✓	✓
Romania	-	-	-	-	-
Slovakia	✗	✓	✓	✓	✓
Slovenia	-	-	-	-	-
Spain	✗	✓	✓	✗	✓
Sweden	✗	✓	✓	✗	✓

After analysing the AI strategies of twenty member states I found the following potential sources of inequality:

1. Education: All countries have different strategies to massively educate people with low skills in terms of artificial intelligence. This could allow ordinary people to understand what AI means and what are its benefits for the economy and for daily life. However, five strategies do not give enough attention to advanced skills, and do not propose specific policies for higher education in the field. In terms of gender digital divide, there are only seven European strategies that focused on this issue.
2. Jobs: Regarding this aspect, market seems to be the tool that member states are planning to use when dealing with the job problem. There are only two countries (Belgium and Czech Republic) that propose themselves to be actively involved in the process of creating new jobs,

and only three that want to develop reskilling strategies for the people who lost their jobs due to AI implementation.

3. Monitoring tool: Eleven member states, just over a half of those that have published a strategy until April 2020, want to develop a monitoring instrument for supervising the AI implementation and the social changes that occur.
4. Private sector. While all the countries plan to support their own AI private companies in different ways (e.g. by reducing legal constrains), only eleven of them would provide financial aid. But still, these are promising numbers which show high interest for the business sector.
5. Public sector. The stronger the administrative apparatus is, the more dynamic the state is in the international arena. Excepting Austria, nineteen countries are mentioning different plans to implement artificial intelligence in the public administration, but only five of them realize the AI potential and consider to rethink the entire public system.
6. Global approach: when it comes to the way countries perceive themselves, most of them have a global ambition and aim to be the key player at international level.

6.CONCLUSIONS

In this paper I was mainly focused on the narrow AI (and its application in the machine learning field), rather than on Artificial General Intelligence which still generates an active debate in regards to the possibility of its functioning. Machine learning field is evolving fast and many low and medium skilled jobs could disappear in the next few years, deepening the actual digital divide. Thus, I considered that a further analysis should be made in order to see how AI, apart from other new technologies, could generate more social and economic inequality. To accomplish this objective, I separately tackled the national and international dimension of the digital divide, developing indicators related to education, jobs and support for private and public sector.

In order to be a global player in the field of artificial intelligence, EU, besides many other initiatives, asked member states to design their own national AI strategy. But these strategies are very diverse and, as I stated in the previous chapter, if they are applied, some might have the potential to actually increase the digital divide, generating more social and economic inequalities.
All the national AI strategies that I have analysed show vulnerable areas regarding gender gap, job creation and reskilling unemployed people. Therefore, it seems that most of the countries are more interested in competing at a global scale, rather than reducing internal gaps. My conclusions might not represent a mirror for the European societies, but it could function as a window for the near future. Without a critical view, transforming general strategies in public policies has the potential to create new inequalities and amplify the current digital divide.

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