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Selected Ethical Issues in Artificial Intelligence, Autonomous System Development and Large Data Set Processing

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Abstract:
Due to information technology development and its industrial adaptation, the dilemmas so far specific to philosophical speculations and science-fiction literature and films have become the real problems of the contemporary world. On one hand, these issues are related to an unprecedented scale on which computational algorithms are currently used as well as a level of complexity of mutual connections; on the other hand, these are linked to their autonomous behavior. States, industry, and users themselves demand formulation of understandable ethical categories and determination of transparency standards and legal norms for these algorithms' functioning in the near future.
Keywords: artificial intelligence, ethics, industry, autonomous systems, algorithms.

1. Scale

The world has been expanding its network of connections used to exchange information and this expansion not only consists of building new data transmission paths. The Internet architecture has been already steady and settled; however, its scale and, most of all, computing power are increasing. The scale of infrastructure and the scale of impact that IT technologies have on the lives of the people of the world today are now higher than ever before. It is precisely this scale that brought humanity closer to the point at which the existing legal solutions and philosophical ideas, in particular, ethical and human relation to non-humanity, turn out to be unreliable. First and foremost, the scale enabled the emergence of well-functioning artificial intelligence based on *deep learning* algorithms because the latter requires the availability of *big data*. Finally, it is also due to the scale of autonomous devices becoming so accessible that they require new legislation, and the social consequences of the technological revolution become so significant that they raise massive concerns not only about privacy but also about keeping jobs and even a complete change of political and economic order in the world.

What is this scale? According to one of the reports [48], the cloud data storage market suppliers will earn 120 billion dollars in 2020, and the sector's annual growth rate has been estimated to be 38.4%. It has been noticed that IaaS leaders experience even faster growth

compared to the rest of the market segment – 67.8% annually. According to other data [12] until 2021, the cloud computing market will double in relation to 2016, thus in the next five years. The perspectives of computing power development and its scale may be indirectly visible in sale predictions concerning backup power systems. According to the report [13], this market is growing faster than linearly and this trend is going to last at least until 2020. The scale of the undertakings is also visible in a physical area covered by the data centers – from 40.000 to over 100.000 square meters [47] while the unquestionable leader in this scope is Chinese Range International Information Group using the infrastructure of the area of almost 630.000 square meters [31]. End users who store their data on these companies' servers often do not pay for it at all or at least that is the impression. Making your data accessible to the companies as Facebook, Google, Microsoft or Apple is partly free and the companies make a profit thanks to the possibility of data processing. On a scale of billions of users sending as many queries to databases [19], large corporations have enormous amounts of information, among others, personal information as sensitive data concerning political views, sexual preferences or health records. Photos, films, metadata associated with voice communication, electronic mail patterns, emotional reaction patterns revealed in comments to articles in social networks as well as website opening sequence patterns or geolocation tracking are only some of the numerous pieces of information provided by every person connected to the common network as a "payment" to private companies and governments which are not necessarily their national governments. When algorithms are fed with big data and learn new skills as well as acquire the ability to recognize new patterns (*machine learning*), the problem occurs described by Daniel Tunkelang as "privatizing our past" [52].

So society is not only a beneficiary of "universally accessible and useful" [26] services but also, and perhaps above all, a living resource, fuel, by which all modern computer machinery can operate at all. For this reason, infrastructure impetus translates directly into legal, ethical and social issues. An example here can be a scandal caused by revealing a sociological experiment carried out by Facebook social network. The website, which currently has 1.86 billion active users [51], five years ago, that is in 2012, was used to analyze its clients' behavior on a sample of 689.003 people. The experiment of which the participants were not informed, consisted in showing, in most part, negative contents to the selected group of users while the other group was shown positive content mostly. Here, the fact that Facebook does not display all the information from pages liked by the users but only those which are recognized to be best adjusted algorithmically is worth mentioning. The algorithm itself is obviously a secret. After a week of manipulation, they investigated the users' reaction being the result of the supposedly induced mental state. As it turned out after the test was completed, the group, which was exposed to negative information, showed the much worse frame of mind compared to the one which had access to positive message [28]. The experiment stirred up emotions and ethical controversies. The political milieu even asked the question whether the CIA can trigger a revolution in some country by manipulating the mood of the public [5]? The questions concerning the idea proved to be logically valid taking the controversies related to United States presidential election in 2016 [1] and future 2017 election in Germany [41] into consideration. In the latter case, German authorities have their sights set on, among others, the aforementioned world's largest social network [50].

Large-scale ethical issues related to the processing of data from huge resources can be divided into two groups. One discusses the use of directly acquired data, a way of their processing and the fact that personal stories and traces left by each one of us are used as natural resources extracted by both private industry and governments in order to obtain particular benefits and the users are not necessarily the beneficiaries. The other group of moral issues is related to a dilemma regarding the way the obtained data are used towards the receivers who are often also the data providers. The aforementioned manipulation is just one of the examples but the class of objections can be expanded, also towards data processing and establishing decision thresholds. For instance, there is a system operating in Austria registering patient information, their medical appointments, picked up prescriptions and diagnoses and other detailed information including geolocation [39], and it is an example of a complex network that can be subject to a multidimensional analysis [23].

The system's designers expected that the citizens equipped with smart cards and 12.000 physicians would provide detailed data on an ongoing basis which would be further processed [15]. However, the system has raised serious ethical objections. Among others, there are questions of patient's right to decide what is done with their body, transparency and international medical data transfer [34]. An analysis of a great amount of information enables one to draw useful conclusions. Among others, through comparing a certain illness history and previous treatment profile for this and other diseases with similar cases, one may, with great probability, determine how the illness will develop in a particular human being in the future [49]. The ability to predict the further development of a disease and its transformation into a number of new disease entities may result in offering suitable preventive treatment to a patient as it is much cheaper to an insurer than later treatment of many possible future diseases. But what if the algorithm finds that the expected cost is too high? Will the patient be qualified for treatment or even informed of a threat when the predicted expense is too high to the system? What if the case lies below the threshold used to make a preventive treatment decision? Is there a place for empathy in this kind of algorithmic system at all or is it only governed by statistics and economic calculations? This is the example where automatic data processing resulting in data set classification implies the questions of the moral character of division and control over the result. Not only private companies but also states and international organizations operating for the "public good" are currently under pressure of determining the context of their actions, providing proper transparency and public participation in implementation and control of the tasks executed by algorithms [30].

2. Artificial Intelligence and Autonomous Devices

The ethics of artificial intelligence has only recently been discussed, mainly within the frameworks of philosophical discussions based on visions created in science fiction. The previous questions have been focused mainly on fear of humanoid robots taking over the world or even destroying the humanity in its biological form. The visions presented in the series of the Terminator movies starring Arnold Schwarzenegger have become in the popular culture the symbol of social fear of superior intelligence form. Also, the "Matrix" trilogy, a masterpiece of filmmaking from a dozen years ago, frightens the viewers with the humanity apocalypse brought about by ruthless machines using a biological component as their power source.

Already in 1942, similar analyses concerning a possible result of human and machine interaction led Isaac Asimov to formulate the three laws of robotics which he presented in one of his stories [2]. According to these laws (1) A robot may not injure a human being or, through inaction, allow a human being to come to harm, (2) A robot must obey the orders given it by human beings except where such orders would conflict with the First Law, and (3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws. In his text from 1985 [3], the author added one more law to precede the others, which sounds exactly like the First Law except a "human being" phrase was replaced with a "humanity" word.

If one discusses a real class of problems related to artificial intelligence application, Asimov's laws seem to be too general and impracticable, for instance, with regard to the perspective of using an autonomous weapon. What is more, the notion of "harm" itself is ambiguous and dependent on both situational and cultural contexts. Does an automaton treating a patient and inflicting temporary pain on him in the dentist's office but eventually relieving the ailment do harm to a human being or not? Is an autonomous car in the situation of an unavoidable accident supposed to safe passengers at the expense of passers-by or the other way round [20]? In many cultures, the good of the society is ranked higher than the good of an individual. However, the degree to which individual's rights are protected, even within the specific culture group, depends on the context. For instance, according to Article 3 of the Universal Declaration of Human Rights, everyone has the right to life and liberty [53], and that does not prevent states from imprisoning people and sentencing them to death in the particular situations. This happens in the name of "public welfare" that is the situation where the expected benefit of the group is ranked higher than

individual well-being. When introducing his zeroth law, Asimov must have been aware of this dualism; however, his rules are still too general to be something more than possible guidelines for a practical code of ethics for machines.

The discourse on the law, ethics, economic and social consequences of development in the area of artificial intelligence and autonomous devices has already gone beyond the fictitious space and has become a real problem in the face of technology developing more with every year [10] [18]. This has happened because of accessibility of great computing power which has enabled one to make complex calculations in a short time (or even in a real time), accessibility of large data sets which are indispensable for training and testing algorithms as well as developing mathematical methods used to execute the tasks of artificial intelligence. Within the ethical issues worth discussing here there are three areas requiring a detailed analysis: (1) determining acceptable goals that can be pursued by an autonomous algorithm or a device using this algorithm, (2) understanding the decisions made by artificial intelligence objects and (3) making supervision over their actions possible.

The first area (re. 1) is related to two classes of questions: (1a) which human actions are supported or taken over by artificial intelligence and (1b) what is the overall objective it is supposed to pursue? Additionally, in relation to these two classes, the primary question is what is the general purpose of these algorithms? The silent assumption that autonomous devices or programs are to "help with something" or "replace somebody in doing something" is often *a priori* used in discussions from the anthropocentric position; however, one may ask the questions whether animal or climate protection is equally important or more important than well-being of one, selected *homo sapiens* species, or a specific individual? After all, it is possible that a being much more intelligent than a human will come to the conclusion that he is the one standing in its way to achieve a seemingly ethical goal? Therefore, should one consider the question of human relations with the environment from the perspective of human ethics or a broader one that includes ecology in general? There can be a practical question asked concerning "doing harm" or "doing good" not only in relation to an individual and society, but also the environment they are functioning in – both biological and technological one – with which they are inseparably connected. If one should take care of plants essential to our lives, maybe they should also take care of devices; especially, if they demand so, governed by their own form of self-awareness? Therefore, the next question of this discussion should concern the aim and foundation of ethics in general. Depending on the answer, one can discuss further dilemmas, including those that have been already mentioned.

However, even if one assumes that artificial intelligence is to put the spotlight on a human being and only him, there should be a permissible area of its functioning determined (re. 1a). Is fully autonomous weapon a right application, and if so, what is the scope and method of its design [21], [32], [46]? Will totally autonomous medical robots and diagnostic systems be able to do every task? Or there still should be a human supervision, for instance, to tell the psychologically painful diagnosis as gently as possible? It seems that these issues still need a discussion focused on human emotional well-being; on the other hand, there is an overabundance of analyses perceiving next technological improvements as solutions to every problem. Thus the cold showers of *post factum* reflections engineers are forced to take every now and then when a system without "parental" supervision starts to transform into an ethical monster dangerously fast [6]. Even if one allows a machine some leeway, they should define its goal (re. 1b). It seems that to a living organism, its gene pool survival is of primary importance, and a device also should know its task. As in the case of a search algorithm, one should determine whether the aim is an increase in human interaction with the system for marketing purposes, pure economic profit or something else? In either case, the technology will execute its tasks the best it can; however, when formulating the instructions one should be extremely careful in expressing their wishes. It has been already known that even a simple form of artificial intelligence is capable of eliminating everything that stands in its way ruthlessly [29] or stealing somebody's resources [42].

The second, already mentioned area of analyses (re. 2), consists in discussing the possibility of understanding a decision made by an intelligent system. The algorithms based on machine

learning function like black boxes [11], [38] and currently their proper functioning is verified on the basis of their effectiveness and not by means of tracing a decision process. Although there are some attempts to solve the puzzle of understanding [17], the problem seems to be difficult due to the very essence of such an algorithm. A network takes action on the basis of many interdependent elements, entangled units, and as in the case of a human brain, where it is impossible to indicate which neuron is responsible for a certain reaction (especially when it is complex), the same is with the discussed algorithm – it is impossible to provide a simple answer where particular components would be separated from input data, learning history and mutual relations [8, pp. 532–545]. Like the boomerang, in a somewhat transformed form, the old question of who takes the blame, the criminal or the society where he was brought up, is bouncing back. Although one can give a simple answer given that there is free will, assuming the null hypothesis, according to which there is no free will, leads to the same issue of responsibility and its blur and, most of all, to the ontological question of existence and its physical limits. In the case of people, nature has offered a way out of this difficult situation, namely, psychological rationalization. In some cases, a human being is able to give a reason for his behavior and explain the course of events that have led him there. Leaving the truthfulness of the provided human explanation and his actual awareness of real reasons aside, this action is sufficient enough for the majority of social interactions and self-understanding. It is possible that autonomous systems will also have to be equipped with a system able to give a credible justification for their actions. Here, one should really ponder over how to verify whether these statements are true or false since deception might be an as good strategy as any other action.

This discussion indirectly brings on the third group of questions (re. 3), that is, giving a man possibility of supervising machines. Are less intelligent individuals truly able to supervise the one that makes decisions which are unclear to them? Is it possible to control the system which, in fractions of seconds, conducts analyses totally impossible to a human being? Eventually, it is probable that every, even the most sophisticated control system, including a self-destruction system could be evaded by a sufficiently intelligent, self-adapting and self-modifying device. This is a great problem that perhaps can only be solved in a quite drastic way - when people start to integrate with machines and create a hybrid being joining human moral values with engineer excellence of intelligent machines together. It is impossible to predict today whether morality would be needed at all in the future. If one perceives ethics as a tool used by a social group to survive it can lead them to have concerns about its redundancy in the world where welfare (whatever its definition) is provided with the use of other, much more efficient strategies.

3. Legal and Ethical Regulations

There is a growing number of people, companies, governments, and organizations recognizing the scale and complexity of the problems of artificial intelligence, autonomous systems as well as processing and accessing big data. There is a dispute over whether the new technology has in itself anything of the essence that can be supervised legally [8] or whether problems and threats should be considered only as emergent and contextual [4]. There is already a historical context of the problem [7], and there are suggestions on how to regulate the market for new services, but above all, there are problems of philosophical nature without which it is impossible to create effective and satisfactory solutions. People ask questions of what “a being” and “ethics” are and who has the “natural” right to what exactly as well as who has established this right. The questions which have been so far addressed by religion in the anthropocentric world and which have been discussed in a closely knit group of philosophers are now attracting the attention of lawyers, company boards, engineers, certifying authorities and members of the public. The European Union calls for establishing a new law and sees a possibility of appropriate regulation in introducing the notion of an “electronic person” [43]; Japanese scientists are implementing their version of a code of ethics that is to be helpful in their work with artificial intelligence [25], while IEEE – the world’s largest association of electrical and electronics engineers and representatives of branches related to computer technology and telecommunication – is working on standards concerning ethics during a

designing process [35], transparency of autonomous systems [36] and privacy issues in data processing [37]. In December 2016, the same association drew up the 136-page report outlining the assumptions and a range of dilemmas one must face within this area [16]. Two months earlier, the office of the President of the United States referred to the problem of the future of artificial intelligence, among others, stating that "AI can be a major driver of economic growth and social progress, if industry, civil society, government, and the public work together to support development of the technology, with thoughtful attention to its potential and to managing its risks" [40, p. 39].

In the context of such documents, a meta-analysis of the problem and question of who establishes ethical values, which are subsequently confined within the legal framework or subjected to standardization, seem to be justified. The world in which a law established in one country is only binding in this particular country is disappearing, especially in the context of international products and services. The contemporary algorithms are worked out by international teams and introduced to the market by companies with departments in many countries. Target receivers of the products are usually people from all around the world. Whose ethics should be binding in this case? Is there a universal ethics? Isn't it a post-colonial effort of those who have the capital to dictate the only right standard to the public? Even if determining standard design solutions is based on an open discussion taking place with the use of online conference software, what is the representation of people from countries with no access to the Internet, those who are undereducated, do not know English or are subject to restrictions on their own governments making the connection impossible? Who are the engineers to decide on ethical standards? Are they becoming contemporary priests, revealing moral truths to the world because they are best-educated caste controlling the functioning of the technological world? Aren't the representatives of exact sciences trying to categorize the area that is actually beyond their competence?

Quite suddenly, it turned out that ethical values are essential to practical application and one can no longer rely on good manners, silent assumptions, social pressure or the system of punishments and rewards which have developed to regulate cooperation and coexistence of human groups. The companies want to know their scope of liability, and people want to know what they can expect from much more intelligent "beings" with which they are willing to cooperate. Ethics has become a valuable asset, a rare semi-finished product the world wants to use to create a predictable future for itself. Attempts to standardize moral values interwoven with an industrial process may also mean the near end of ethical relativism, popular in times of neoliberalism.

4. Social Outcomes

The Federal Republic of Germany has announced it is getting ready for a turning point that will be the fourth industrial revolution [33]. Digitalization of economy and basing it on intelligent machines are going to bring changes that are to be so serious that Australia also expects rapid changes and cooperates in this scope with the European partner actively [24]. The perspective of machines taking over human competences on a large scale raises concerns regarding the future of the labor market. For instance, JPMorgan bank has implemented new software which does the same things that took lawyers 360,000 in total in just a few seconds [45], while Bridgewater Associates, a hedge fund managing 160 billion dollar portfolio, is going to entrust their investments to fully automated system [44]. The concerns related to machine replacement for a human being are not new [9]. As they were expressed already in the Victorian era in England, and in the 50s in the United States, one may think there is really nothing to fight over. However, the current change is taking place on an unprecedented scale, in the world that has never been so interrelated before. Historically speaking, the quality of the network consisting in the fact that a disturbance in just one part of the world may have an almost immediate influence on the whole area is totally new. In this sense, one is dealing with a qualitatively new situation. Soon, thanks to the technology, intelligent devices connected to one network and working "for the society's purposes" can totally replace people in some branches by redeveloping, improving and adapting themselves to changing

conditions. There are opinions that the democratic system and Euro-Atlantic social model may not last out this revolution [22]. Some see the basic income as a solution as people would receive it regardless of whether they work or not [14], others are rejecting this idea [27], but whatever the solution might be, economic redistribution of money will not bridge the emotional social gap people with no work or aim and thinking they are useless will be struggling with. A mob of the unemployed with any basic income will surely generate a gigantic social and emotional dysfunction in the cultures where work constitutes a virtue and sense, where the ethos of work determines values making people proud of their own abilities and feel valued by a family and society. This is a great problem since one cannot reconstruct the system of values carried along by many generations, religious systems, myths and canons in a dozen years. It seems impossible, and in this context, the worries whether societies and states survive such a revolution are extremely real. Even from the economic point of view, the potential problem cannot be limited to unemployment but it is related to a collapse of the whole branches of economy. The skyscraping office building where millions of corporate employees are doing their painstaking work right now may become empty due to artificial intelligence. The arduous work of IT specialists, accountants, analysts, logistic managers, drivers, traffic organization specialists and any work that can be dressed up in an algorithm and learnt can be also taken over by more or less autonomous devices that do not need a vast physical space and can be digitally transferred to a totally different country. The real estate market disaster that took place in the United States in 2008 may turn out to be only a prelude to another collapse in this branch, this time in the commercial space segment.

There is also an equally important issue of the countries less technologically developed than the United States, Western Europe, India, Japan or China. How their citizens will find themselves in a new economic reality on which they have hardly any influence? Will the colonial hierarchy, destroyed by the post-war ideas, be rebuilt in a new posthumanist reality? So far it seems that even the citizens of the countries which would call the shots here are not entirely ready for it.

5. Summary

In the world being on the verge of a new industrial revolution and possibility of broad interaction with artificial intelligence, the issues related to ethics become pressing problems to the governments, companies, and societies. Everyone emphasizes the need for new legal regulations based on the transparent ethical declarations; however, codification itself is not the most difficult matter here, unlike the common agreement on what the humanity expects from further development and how it perceives itself in juxtaposition with intelligent machines which objectives may evolve contrary to human expectations.

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