

The necessity of artificial intelligence regulation: an open AI approach

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Abstract—Artificial intelligence (AI) is a fast-growing paradigm of which humans have only explored the tip of the iceberg. An AI-driven future opens up several possibilities for the entire human species. However, we should not underestimate the power of AI and efforts should be made to regulate it as soon as possible and in the best achievable way. We propose the creation of an intergovernmental organization with open-source and democratic ideals, analyze its structure and suggest how this organization should elaborate laws in the fairest way possible for the global community.

Index Terms—artificial intelligence, accelerating innovation, evolution, technology, regulation, legislation, open-source

I. INTRODUCTION

Technology is the practical application of scientific knowledge. For every scientific breakthrough, there is an effort towards applying the obtained knowledge to solve a problem. The result of that effort is a piece of technology. Consequently, technology sets the boundaries for obstacles that humans are capable of surpassing.

Society dictates how engineers develop their creations [1]. The economic success of a technology defines its fate, but so do other factors derived from human nature, like ethics, politics, and bureaucracy. For example, the competitiveness between nations largely contributed to the advancements made in space exploration during the last century. In turn, the investment that went into space exploration helped the progress of diverse scientific areas.

Conversely, technology also shapes society. For instance, the Internet has modified the way people communicate and access to information. Social media, which nowadays is the most significant channel of influence, is powered by the Internet. It has a tremendous impact on important decisions taken by governments and organizations. Also, the fact that Internet allows fast and reliable data exchange from anywhere has turned the globe into a digital world. So we conclude that society changes technology and technology changes society.

Artificial Intelligence (AI) is the field that is currently under the spotlights of the scientific community. Its purposes are endless. It has applications in the most distinctive areas, such as medicine [2], finance [3], and transportation [4]. It has proven itself as a powerful piece of technology. It already had a vast impact on society [5] as more and more machines are responsible for decision making [6]. AI-related research continues to grow, and so does the complexity of chores that computers are capable of executing. Other pieces of

technology have been a target of this "hype cycle" before. The progress rises slowly, then takes an exponential jump until it reaches its limit. However, society should not treat AI as a conventional technological breakthrough.

In this paper, we will address why AI is a unique kind of advancement in science, how it will transform our society and why the global community should urge to regulate it.

II. THE EVOLUTION OF TECHNOLOGY

Humankind invented the first steam engine about three centuries ago. A hundred years later, we started controlling electricity. Ninety years after that, the Industrial Revolution prompted us to mount the first continuous production lines. The Revolution paved the way for the twentieth century, which was full of scientific discoveries and progress in every area. Since then, technology has achieved levels that no human could imagine when the steam engine was created. According to Kurzweil's Law of Accelerating Returns [7], technology has exponential growth. One can agree with Kurzweil by observing that we build innovations with technology that was once an innovation itself. The more advanced are the tools we have at our disposal, the more complex is the technology that we create. It's a positive feedback loop, a snowball that never stops getting larger. For instance, transistors are used to build computers. Computers improve the precision of the machinery used to manufacture electronics. These machines will then be able to produce even better components. Consequently, the new parts will create better computers.

Some people may argue that this loop may not be infinite. One evidence presented might be that Moore's Law [8] is no longer accurate. Leading processor manufacturers are not able to keep shrinking the size of a processor resistor anymore [9], so they cannot double the performance from the previous years' generation. We are beginning to notice a stagnation on the improvement of microprocessor. Figure 1 shows the speed of improvement in new microprocessors is slowing down. The transistor, the current technology paradigm, is running out of potential. Therefore, one might believe AI, as a technology paradigm, also has limited potential. However, the AI revolution is unlike every other revolution that has happened before.

In the Industrial Revolution, the machines replaced basic or routine manual tasks. No longer were dozens of men needed to lift a weight, only a handful of them and a machine controller.

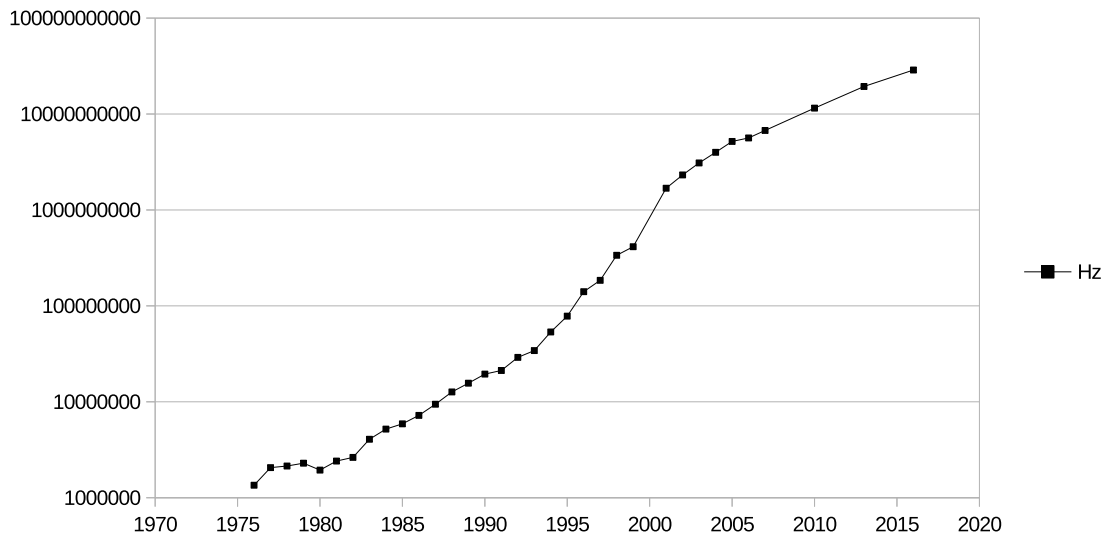


Fig. 1. Microprocessor clock speed throughout the recent years. [10]

Also, the repetitive chore that a person would execute in a mounting line started to be performed by a specialized machine. Mechanical power grew as instruments became more and more capable. The effects on society were remarkable [11]. One of the most affected areas was transportation. Most transports were made by horses before steamboats and trains started doing the hard work. With enough coal, large quantities of raw material could be sent to factories hundreds of kilometers. Because factories had supplies delivered to them, cities emerged around industrial centers. Factory workers would live in poor conditions, but with the surge of unions, workers started establishing rights and earning benefits.

In the Digital Revolution, the change was in another direction. Computers substituted humans for standardized mental tasks. It began with computers making complex math operations in a matter of seconds. First for scientific research, then for businesses. Eventually, computers became essential in the quotidian of modern-day companies, relieving humans from most routine tasks. Technology has been facilitating patterned tasks, with higher and higher degrees of complexity. Smartphones are the pinnacle of this revolution. A regular smartphone gives access to unimaginable amounts of information, infinite services, and endless experiences. The fact that smartphones are cheap made them available to the masses. About 3 billion people are using smartphones nowadays [12]. Electronic media was predicted to have an impact on social behaviour early on, in 1986 [13]. We are observing that impact nowadays everywhere we look: to children and teenagers [14], to politics [15] [16], and to marketing [17]. We can observe that technology does indeed have a great impact on society.

In the AI Revolution, machines will replace practically all mental tasks. AI programs do not only perform standardized tasks. They also learn with each assignment they are given, much like a human being. Artificial neural networks, for example, are a mathematical model that simulates the actual neural

network of a person’s brain. Neural networks have already had an impact in analyzing vast amounts of data faster than any human ever could. The key here is that the machines are learning how to make the analysis. Figure 2 displays the results the Large Scale Visual Recognition Challenge (LSVRC) [18] in recent years. This challenge “evaluates algorithms for object detection and image classification at large scale”. The average error for a human is around 5% (0.05), which was surpassed in 2015. Effectively, this means that algorithms are becoming better than humans very fast. Newer techniques focus on giving computers a learning capability without any human input or feedback. For example, the recent AlphaGo Zero [19] program became the world’s best player of Go in less than two months, learning from scratch and practicing with itself. The scientific community didn’t expect AI to surpass this barrier so soon. However, we are well ahead in the exponential curve of technological growth. The AI-future is closer than we think.

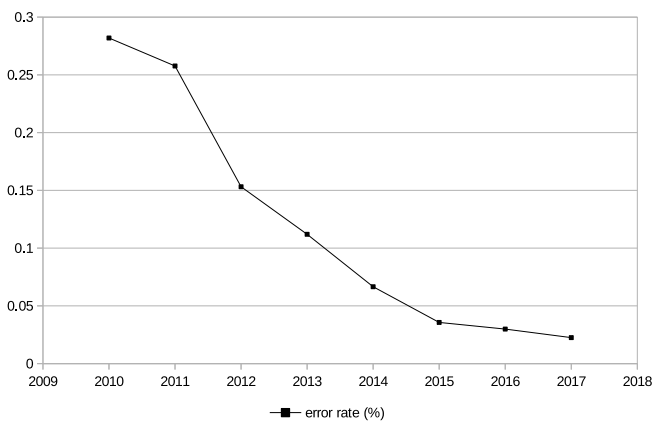


Fig. 2. Large Scale Visual Recognition Challenge (LSVRC) results.

III. AI FUTURE SCENARIOS

Even if AI potential is not unlimited, we're in a phase where we're only beginning to witness it. We have no idea how AI will affect the coming decades. One can't predict the future, but there are at least three stances a person might take regarding what's coming: optimistic, pessimistic or skeptical.

For an optimist, AI will help humans improve on fields like genetics, nanotechnology, and robotics (GNR). This *trifecta* is essential to the evolution of the human being as a species and the power AI will enable several significant breakthroughs. Genetics, for example, would let humans change our genetic code to slow down aging and prevent several diseases. Nanotechnology helps creating any tool or product cheaply, with high precision and robustness. Robots would execute most working duties, leaving people with the choice of performing whatever activities they desire.

For a pessimist, the power of AI will be the doom of Men. When AI proves itself more efficient and more intelligent than humans, it will start making the important decisions. For example, self-driving cars are on their way to becoming safer than human drivers. Once people start being banned from driving because a computer does it better, there's no limit to what other things people may get denied of. If AI is doing all the reasoning, what guarantee do we have that it's doing the right thing if we can't comprehend its thought process? Many believe a superior AI will eventually turn against its creators, putting our whole species at risk. If not AI itself, maybe governments with powerful AI systems will start a world war and begin a dystopia of control through machines.

A skeptic doesn't believe AI will ever be a threat to humanity and that it's potential is severely overestimated. At the very least, a skeptic thinks that AI will only have consequences in the distant future. However, the increasing number of AI developments rejects this point of view. The rhythm at which AI is accelerating means that it will definitely have substantial consequences in the coming decade. Those who aren't aware of the urgency of the situation should be alerted to it. The effects of looking to the side or underestimating its impact can be quite dangerous.

IV. NECESSITY OF REGULATION

The haste of technology proliferation makes it extremely difficult to create regulations to control and enforce good behavior from the entities that control it. For example, Facebook was founded in 2004. By 2005 it had a million users, and just seven years later it was breaking the billion users barrier. Nowadays, Facebook is involved in several scandals related to the privacy of its users. Governments have reached a consensus that they must create specific regulations targeting Facebook [20]. However, this judgment comes only after the fact that Cambridge Analytica, a data mining company, harvested Facebook user data for years with political agendas in mind [21]. Uber is an example of inadequate legislation generating conflict with new technology. As no one predicted the growth of a service like Uber, no laws were created to regulate it. Once Uber started owning a large and growing market share,

protests arose regarding their unfair practices, when compared to regular taxi companies [22] [23]. A loophole in regulation permitted Uber to act like a taxi service without most of the requirements and taxes of normal taxi companies, allowing it to charge less for the same service. While the intention for regulation now exists, governments are slow to implement it, giving other dangerous parties the time to capitalize on the lack of legislation. Many other platforms took and continue to take advantage of holes in the law. Most of the time, these holes exist because laws are often created *a posteriori*, after a severe event has occurred and prompted regulators to sign new bills. However, with AI, it becomes progressively more dangerous to wait for a critical misuse of it to happen to encourage legislation. The more time governments remain still, the harder it'll be to control or revert AI abuse. The pessimistic scenario that many envision may become real.

In order to ensure a safe and fair use of AI as it becomes a dominant technology, we must create legislation *a priori*.

V. PROPOSAL FOR REGULATION

A. Background

Laws regarding Artificial Intelligence must have an international scope. If countries start regulating AI on a national level, eventually the rules between different countries will diverge. Instead, nations should coordinate AI control through cooperation on an international level.

Erdélyi and Goldsmith discuss the dynamics of transnational lawmaking regarding AI [24]. Their proposal is the creation of the Intergovernmental Artificial Intelligence Organization (IAIO), which would have the responsibility of regulating AI on a global scale. The definition of *intergovernmental organization (IGO)* here is important. While *non-governmental organizations (NGOs)*, such as *Médecins Sans Frontières*, are a result of multiple countries effort, they are regulated by national laws. In an IGO, governments sign a treaty that binds them to the agreement. Given the importance of AI, its regulation should have the written commitment of countries. It allows collective oversight and enforcement mechanisms to prevent violations or opportunistic behavior. However, Erdélyi and Goldsmith recognize that governments will be reluctant in giving up law-making to an organization. With that in mind, they propose laws regarding AI should start as "soft" laws. These are non-binding recommendations, guidelines, and standards that entities should follow when dealing with AI. Eventually, this organization should galvanize international cooperation and start implementing "hard" binding laws.

In his book "End of Politicians" [25], Brett Hennig introduces an innovative idea regarding democracy. While Hennig believes liberal democracy is the best system for a society to live in, he knows most democracies don't function well. That is because the democratic political systems are not actually implementing the ideals of democracy. The weight of an opinion is not the same for everyone. Instead, a small minority distorts the system, whether through legal or illegal channels. In his view, representative democracy is flawed the way it is currently practiced. Hennig proposes a different approach

to enforce the true ideals of democracy. Instead of having political parties place their deputies in parliament, he suggests choosing random people to put in the parliament. Randomness would allow the selection of a representative sample of the population. One could verify if the selection process follows the same profile as the general population, to better represent it. For example, fifty percent of the chosen people would be women and the other fifty would be men. A few people would be millionaires, but the majority would be regular, ordinary people. These people would be given proper instruction in matters of the law and legislation beforehand. They would be a *microcosmos* of the people, and their opinion in the parliament would be a simulation of the average opinion of the population. This randomness could contribute to a fairer political system. The majority of the people would actually heard, and the minorities would still have people defending their interests. Also, the *wisdom of the crowd* [26] would inherently often lead to the best possible decision that could be made.

B. Open-source artificial intelligence organization

The IAIO organization proposed by Erdélyi and Goldsmith is crucial to establish international AI legislation. However, its representatives should not be elected the same way as other organizations. The IAIO would be responsible for regulation on a global scale. It must speak for and act for the global community. Following traditional nominations would fall in the same error as representative democracy. Hence, we propose an organization where we merge both the principles of Erdélyi and Goldsmith and the ideals of Brett. We can take the ideals of transparency, fairness, and wisdom of the crowd even further by introducing a new concept: an open-source regulatory organization.

Open source is generally a term associated with software. An open source project is a project which "anybody can view, use, modify and distribute for any purpose" [27]. An open source project has lots of advantages. People from anywhere in the world can collaborate and improve the project. When several people, from different backgrounds, contribute to the same project, its quality increases. A mistake that might go unnoticed by someone can be detected by another person. Because a project is free to use, many people notice flaws when they are utilizing it for the most diverse purposes. Above all, open source brings transparency to a project. Every detail is public and permanently recorded.

We can apply the open source ideals to a regulatory organization. The purpose of the organization is to create a set of rules to govern a certain community. Anyone belonging to that community should have the right to access to the rules, who created them and why and to propose alterations for the rules. However, we still need to define who approves or disapproves each contribution. As it happens in an open source project, a group of *maintainers* should decide whether a change should be integrated or not. The community would be able to contribute to laws, following the *contributor funnel* scheme [28]. The "users" of the law are the people and institutions that practice the law. "Users" that contributed to

the set of rules with suggestions would be considered "contributors". The "maintainers" of the organization are effectively the administration of the organization. This administration should be chosen by random selection following Brett's idea.

The proposed IAIO, being a global organization, should profile the world's population and randomly select a sample of people following that profile. The decisions would be made by these arbitrary people. The number of selected people would depend on the recognition given to IAIO by nations. The more countries adhere to its regulations, the larger should be the administration.

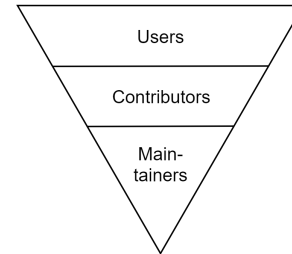


Fig. 3. The *contributor funnel* of an open source project.

With this structure, an open source IAIO should be able to reflect the best interests of the global community.

C. Agile legislation

An open source organization would resolve the problem of transparency and fairness. However, it does not answer the difficulty of falling behind with innovation and having antiquated laws. Software developers have figured out that there's always one constant when it comes to creating a product: change. Requirements change, therefore the product must adapt to them. In the case of legislation, requirements will evolve because AI will evolve as well. As such, we propose applying the same principles of agile software development [29] to the IAIO. An agile methodology is characterized mainly by adaptive planning, early delivery and continual improvement.

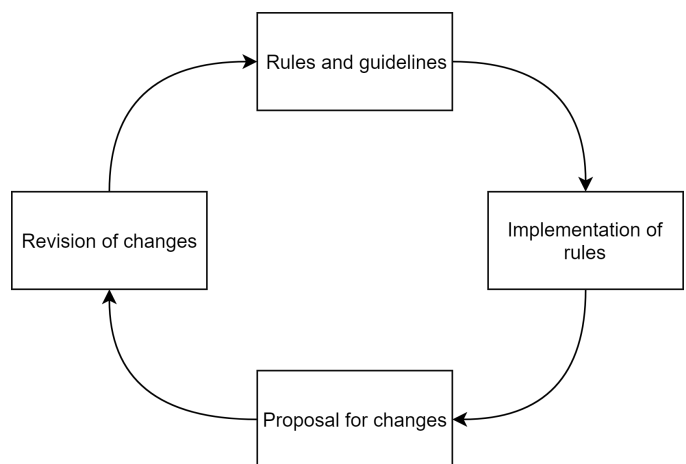


Fig. 4. The work-flow in an agile legislation.

In figure 4 we describe how the cycle of legislation creation could be done using an agile methodology. To make sure that legislation is up to date with AI advancements, this cycle should have a small duration. The more times the law is updated, the better. The rhythm at which technology will evolve demands an equally high rhythm of legislation adaptation. While the use of agile methodologies is uncommon outside software development, it has potential to be used in different contexts [30]. Methodologies such as Scrum [31] or Extreme Programming (XP) [32] have proven themselves useful when it comes to the development of some of the most complex software products. Some of the principles these methods borrow from the Agile Manifesto [29] can be naturally applied to other complex contexts. A short cycle for rules review would allow more feedback from the community to be used in modelling those rules. If the legislation fails to predict and regulate a certain scenario, the time between discovering a new scenario and creating regulation for it should be considerably shorter thanks to the agile methodology.

D. Laws

The main purpose of AI legislation is to stop bad behavior. Generally some rules are made after events that already happened and other rules try to prevent an incident from happening. The latter rules will be based on predicted scenarios that have a certain predicted outcome. However, when simulating a scenario, there may be some sort of constraint or influence left out of the equation. This may lead to a different outcome than the one observed, so the law may become invalid for that scenario. To separate laws that are put in place to prevent a situation that has occurred and laws that try to prevent a new situation, laws should be separated in two different categories depicted in table I. *Static laws* should only be changed if some new law substitutes it or if the organization has determined that the law should no longer exist. These fixed laws should prevent a bad usage of AI that has already happened before and that is documented. *Dynamic laws* are laws made to prevent bad behaviour from happening, that has not been observed yet. Dynamic laws should be a constant focus of revision during the legislation. New knowledge should be used to improve the accuracy of these laws. It is important to keep dynamic laws flexible enough to allow innovation while clearly prohibiting bad behaviour.

TABLE I
TYPES OF LAW

Static laws	Fixed laws
Documented scenarios	Predicted scenarios
Focused on infrequently	Focused every few sprints
Small rare changes	Detailed changes

E. Challenges

The random selection process suggested of the IAIO administration can be quite complex, given that people might refuse becoming part of the board after being picked. This simple

fact makes the process not be truly random. However, some measures, such as providing a higher than average income and facilitating integration with the rest of the administration, should appeal to people and entice them to accept the selection on their own.

Although we believe the proposed structure for the IAIO would help solve some of the greatest hurdles in AI regulation, it is challenging for an organization of this kind to establish itself. Countries will hardly be willing to give up their authority to an international organization. Moreover, nations that have advanced AI technology do not have the desire of being regulated by international law. The necessity for AI regulation needs to become a major concern of important technological institutions, in order to persuade governments as soon as possible, as controlling AI will become exponentially more difficult.

VI. CONCLUSION

In this article, we describe how the accelerating rhythm of technological evolution will continue to grow exponentially and how it has an impact on artificial intelligence development. The unstoppable innovation in AI will eventually lead to an opportunistic behaviour of advanced technology. We predict the possible outcomes of an AI-driven society. We also relate those scenarios with the current reality to justify the urgent and necessary global regulation for AI. In our proposal for regulation, we recommend creating an intergovernmental organization. Because the current legislative structures are unfit for the rapid evolution of technology, we introduce a novel legislative structure, based on the open-source concept. The laws for this organization be created and updated adopting an agile methodology. With this structure, we hope to be able to keep legislation up with the speed of AI development, contributing to a better and fairer use of this technology.

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