

# AN OVERVIEW OF THE USE, IMPACT AND THE NEED FOR REGULATION OF AI & 5G TECHNOLOGIES

## Abstract

This paper reviews the use and impact of two important emerging technologies, AI and 5G, which are evolving towards a revolution in technology, leading towards achieving an intelligent connected world. In two sections, this paper also discusses the regulatory intervention necessary in the deployment of AI and 5G driven applications.



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## 1.0 INTRODUCTION

Technology advancement within the last decade has envisioned an era of Autonomous transportation, smart homes/cities, intelligent robots and more, all of which will make a better and easier world where ‘intelligent connectivity’ will increase productivity and economic development. This is possible by the research and development of relevant solutions using technologies such as 5G Networks, Artificial Intelligence, Internet of Things (IoT) and Big Data that make the innovation of such advancements possible. The combination of different facets of these powerful tools allow for the implementation of robust and highly efficient intelligent systems.

Looking more closely at AI and 5G, AI deals with building intelligent computer programs that perform actions based on decision making achieved from data obtained from its environment, while 5G deals with enabling a faster and reliable communications technology with lower latency, better than what is available today. Therefore, it is the combination of these AI-driven intelligent programs and robots such as UAVs like drones with 5G-driven communications that tend to make the envisioned intelligent future feasible.

However, an important issue worth considering with utmost importance is the regulation of these technologies in order to reap their benefits in a better way. Regulation as to the standard best practices of implementation and deployment, licensing and other frameworks necessary to deliver Quality of Service (QoS) in both AI and 5G applications.

The rest of this paper is divided into the following two sections, and then finally offers recommendations and a conclusion. These sections are broken down and further reviewed as follows;

- SECTION I: The impact of regulatory intervention in the deployment of 5G
- SECTION II: Is regulatory intervention necessary in Artificial Intelligence (AI) applications?

## SECTION I: The Impact of Regulatory Intervention in the Deployment of 5G

The regulation of 5G is described to be what will deliver or hinder its realization as expected. Governments and other stakeholders in the telecommunications industry have to streamline the various impact of 5G while also considering its utilization in a micro scale to standardize it. As proposed in a telecommunications review paper on 5G by [1], “Regulations for 5G need to address technical improvements and operation in higher frequency bands”.

A report by GSMA Intelligence (Figure 1), forecasts Nigeria and South Africa as the only African countries planned to launch 5G by 2021.

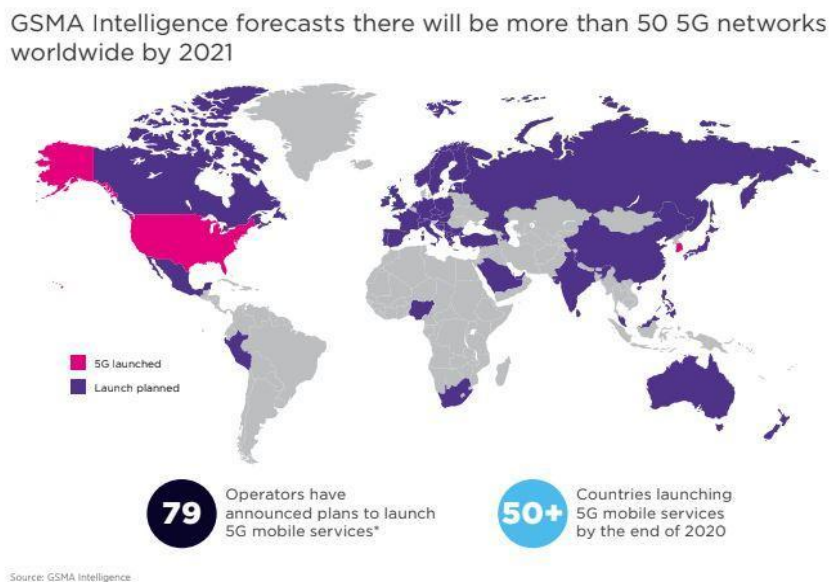


Figure 1: Forecast of 5G Networks by 2021

### 1.1 Literature review

5<sup>th</sup> Generation Networks, short for 5G, are considered as a significant upgrade from the preceding mobile, voice and data networks- 3G & 4G, simply because of its higher speed and low latency providing instantaneous reconnection. As described in one of the reports by GSMA Intelligence [2], it may be defined as a service-led consolidation of 2G, 3G, 4G providing greater coverage, reliability and an improvement in data speed with reduction in end to end latency. 5G’s low latency, however means very little or no delay in the transfer of data through a link. This feature of 5G makes it suitable for real time applications where high data speed is required, like in autonomous vehicles for instance.

While research and development is still on going in the proofing, testing and deployment of 5G technology, researchers are working on how different techniques could be used to

counter the challenges its deployment will come with. Some of these issues were described in [3], where they highlighted the use of Network Function Virtualization (NFV) and Software Defined Networks (SDN). All of this link up with a unique feature of 5G that makes it suitable for many applications, this feature is the ability to perform “Network Slicing”, a type of network virtualization that allows for the separation of a physical link into different independently managed networks, where each portion/slice can handle a different use case based on its network requirements [4].

## 1.2 Area of Application

The application of 5G in providing smarter and intelligent connectivity has various areas of application, most of which will be facilitated by network slicing as described above and also its other features that will suit the requirements of many applications. Some of the applications of 5G can be described as follows;

- Autonomous transportation: Safe and swift transportation with more connectivity and real time information processing, that will enable easier traffic flow
- AI & Robotics: Fast connectivity will power and connect AI driven robots, drones etc. that could solve tasks better and more efficiently
- Industry 4.0: The dawn of Smart Industries will be enhanced by 5G to facilitate real time tracking, metering and remote controlling in smart grids and plants.
- Internet of Things (IoT); Smart homes, smart buildings etc.
- Entertainment: Virtual Reality, Gaming etc.

## 1.3 Need for Regulation

Concise research for the development of 5G is currently the trend in the telecommunications industry. However, the enormous transformation of the communication ecosystem that 5G offers will change and improve many areas of society and business. Some of the key elements that need 5G regulation include the following;

- Access Regulation: Managing the interconnection and interoperability due to network slicing spanning across multiple stakeholders and local 5G small cell radio access, to fine-tune service delivery and efficient operations.
- Pricing Regulation: Local 5G networks need to be allowed to connect to other networks with reasonable prices to ensure affordable prices for end users.
- Spectrum Authorization and Administration: New local licensing models will be needed to complement existing models to allow different stakeholders to establish local 5G small cell radio access networks with guaranteed quality.
- And so much more areas.

## SECTION II: Is regulatory intervention necessary in Artificial Intelligence (AI) applications?

Artificial Intelligence (AI) is indeed a powerful and evolving field as it was founded on the claim that human intelligence "can be so precisely described that a machine can be made to simulate it" [5]. Some people consider AI to be a danger to humanity if it progresses unabated, whilst others believe that AI, unlike previous technological revolutions, will create a risk of mass unemployment. Indeed, it is not surprising that there is a need for regulation in this promising field that is yet to be fully actualised.

### 2.1 Literature review

Artificial Intelligence (AI) is a broad computer science concept that encompasses the idea of machines displaying cognitive abilities. It is often described as the ability of machines or computers to act like humans by displaying learning and problem-solving skills [6]. AI can be classified into three different types of systems: Analytical, Human-inspired, and Humanized artificial intelligence [7]. Analytical AI has to do with cognitive intelligence; generating a cognitive representation of the world and using learning based on experience to inform future decisions. Human-inspired AI has elements of both cognitive and emotional intelligence i.e. understanding human emotions. Lastly, Humanized AI shows characteristics of all types of competencies i.e., cognitive, emotional, and social intelligence, making the systems self-conscious and self-aware in interactions.

The tech giants — Google, Amazon, Apple and the like — are the heaviest investors in AI applications, pouring billions of dollars into it. McKinsey Global Institute estimated that internal investment in 2016 totalled around \$18 billion to \$27 billion. AI technology is now used for everything from powering virtual assistants, shopping sites and chatbots to curating your social media feeds, analysing medical lab results and enabling smart appliances [8].

### 2.2 Area of Application

Artificial Intelligence (AI) has many applications (or subfields) for example Machine Learning, Computer (or machine) Vision, Natural language processing (NLP), etc. Overall, AI's area of applications includes but not limited to:

- Autonomous Vehicles, UAVs, Robots
- Visual perception
- Speech recognition
- Decision making

### 2.3 Need for Regulation

There have been instances of potential for bias in AI systems as researchers in America tested features of Microsoft and IBM's face-analysis services that are supposed to identify

the gender of people in photos [9]. The companies' algorithms were highly accurate at identifying gender of people with lighter skin but not very accurate with those of darker skin tone. This has the potential for racial discrimination and such issues need regulatory intervention.

AI systems also have the potential of threat to privacy, as AI program that recognises speech and understands natural language is theoretically capable of understanding each conversation on emails, telephones, etc. Recently, for example, there have been reports of privacy concerns regarding Amazon Alexa; a virtual assistant developed by Amazon for its smart speakers. As Alexa is powered by AI, researchers in 2018 managed to turn the Echo into a spy device [10]. By making it listen to specific words and once picked up, it automatically records the conversation and send it to its cyber attackers.

There are also lots of ethical concerns regarding the use of AI, especially in robots. As some are calling for the Rights to Robots i.e. giving human-like AI robots rights as humans. However, the closest example is Sophia, which was granted citizenship by Saudi Arabia in 2017 [11]. Perhaps it is not surprising that some countries are already working to regulate the use of AI for example China and US have ongoing proposals regarding AI regulation. And just last year, in 2018, a total of 26 countries created national AI strategies. Also, the EU is pressing ahead with rulemaking for AI. The guidelines published by the European Commission draws on high level experts following the idea of "Trustworthy AI" [8]. They provide clear ethical principles and a checklist to be used when developing AI systems. The principles will now be tested by companies and other stakeholders in a pilot project to start in the summer of this year.

However, there have been arguments on the regulation of AI. Especially debates on the need for governance of AI or not, this got more heated since the summer of 2018. Some members of the public even describe it as "an equal or bigger threat to mankind than nuclear weapons" [12], while other pioneers in AI development argue that they are the best to develop the standards and rules that will guide innovation and still make the world safe while benefiting from the technology. Regardless of such discourse on the AI regulation issue, it is important to offer regulation considering these viewpoints;

- Differentiating between "narrow AI" which deals with machine learning, exploring a specific domain and Artificial General Intelligence (AGI) which deals with a broad scope of capabilities, where machines could possibly exceed humans in performance.
- Identifying and investing in the relevant actors in the AI industry, that could support the building of AI frameworks that will achieve self-regulation

### 3.0 RECOMMENDATIONS

Some recommendations, which important stakeholders in the communications technology realm need to consider in reaping the benefit of AI and 5G technologies can be described as follows, considering the impact that these fields have to business and society as a whole;

- As 5G can be an enabling technology for AI, regulatory intervention that will make the adoption of both technologies is required to maintain their efficient utilization.
- For 5G, it is necessary to review Micro licensing, because 5G comes with various applications that independent businesses will choose to utilize, regulators will need to give licenses and support these use cases with several regulatory methodologies.
- Micro licensing will therefore allow new stakeholders to become micro operators and deploy local 5G networks with quality guarantees.
- Coming up with a revised strategic operational plan for the MNOs, towards the implementation and deployment of 5G services.
- AI is a powerful tool, which whether governed or not, requires a framework that will guide its development while considering curtailing the risk it may have to public welfare.
- Both government, academia and industry collaborating towards supporting Research & Development, and innovation in achieving AI & 5G solutions, and working together on building a roadmap for the regulation of such technologies in a collaborative effort.
- Training and Capacity development on ethics and responsible innovation in AI and 5G will drive significant success in achieving a better technologically advanced safe world.

### 4.0 CONCLUSION

The 21<sup>st</sup> century has seen a significant transformation from the impact of technology. Evident in the advancement and trends such as AI, IoT and 5G, this is just the beginning. All areas such as Healthcare, Agriculture, and even Industries are being transformed with digital solutions that have huge impact on the way things are done, which is for the better. For instance, 5G recently made it possible for a doctor to remotely perform brain surgery on a patient that was 3000KM away. Similarly, current research in Artificial Intelligence is innovating the use of AI driven drones to deliver agricultural technology solutions, emergency response and so much more by the possibility of multi-robot coordination.

Conclusively, it is without doubt that regulatory intervention is indeed required and very necessary to guide and support innovation in AI and 5G, especially by establishing standards and frameworks that will deliver the best Quality of Service (QoS), in collaboration with all stakeholders in the technology industry. This is because without regulatory intervention, it is certain that all innovative solutions that could change the world will derail, as a result of the lack of guiding principles in the use, impact and application of such technologies.



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