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Artificial Intelligence & Society 5.0

Edgar Gonzalo Cossio Franco[1], María Esmeralda Arreola Marín[2], Juan Humberto Sossa Azuela[3],
Mariela Chávez Marcial[2], José Iraic Alcántar Alcántar[2] & Eduardo Ulises Moya Sánchez[4]

[1] Instituto de Información Estadística y Geográfica de Jalisco, Zapopan, Jalisco, México.
[2] Tecnológico Nacional de México, ITS de Ciudad Hidalgo, México.
[3] Instituto Politécnico Nacional, Centro de Investigación en Computación, México.
[4] Tecnológico Nacional de México, Tecnológico Superior de Jalisco, Jalisco, México.

E-mails: edgar.cossio@iieg.gob.mx, marreola@cdhidalgo.tecnm.mx, hsossa@cic.ipn.mx
mchavez@cdhidalgo.tecnm.mx, jiraic@cdhidalgo.tecnm.mx, eduardo.moya@zapopan.tecmm.edu.mx

Abstract. Artificial intelligence has become an essential technology in industry 4.0. People's daily activities require its use more frequently. Society 5.0, known as the fifth industrial revolution, places people at the center of processes, coupled with the use of artificial intelligence, for the development of the industry.
Keywords: Artificial intelligence, industry 4.0, society 5.0, LLM.

1 Introduction

The fusion of Industry 4.0 (I4.0) with Artificial Intelligence (AI) has come to revolutionize the processes radically and interestingly by which industrial products are worked on and built, including software. Seen from a digital perspective, automation, operation between databases, logistics and the human as the center, I4.0 redesigned the course for a new era in the industry where job rotation and the emergence of new jobs are revealed [1]. Based on this, the idea of Society 5.0 (S5.0) was born, which seeks a balance in the economic-social relationship, putting people at the center of all this technological development. In this new paradigm, AI is fundamental, driving innovation and making the industry more efficient, while helping to build a more inclusive society that cares for the planet.

Analogously, AI4.0 can be seen as building a digital highway filled with intelligent machines that communicate with each other. Now, with AI5.0, we are building the cars that will drive on that highway cars that are not only fast and efficient, but that also lead to a better destination: a society where technology works for people, solving important problems and creating a fairer and more sustainable future for all. AI is the engine that powers these cars, allowing them to go further and do it smarter [2].
I4.0 is also known as the fourth industrial revolution; it is about integrating advanced digital technologies into everything that is done to produce goods and offer services [3]. It can be seen as a large network where everything is connected so that things work better, faster, and more efficiently [4]. I4.0 is composed of the following technologies:

Fig. 1. The technologies to implement industry 4.0. [3]

The Internet of Things (IoT): These are sensors and devices connected to the Internet that collect information from the real world and share it so that the entire system is aware of what is happening [5]. Big Data and Analytics: It is responsible for storing and analyzing huge amounts of data to find patterns, predict problems and help make smart decisions. The Cloud (Cloud Computing): Remote servers that store and process information. Artificial Intelligence (AI): AI creates automated processes of activities that are repeated in such a way that it is possible to make complex decisions. Cybersecurity is responsible for protecting systems and data to safeguard them. Augmented reality is a technique that works based on the superposition of virtual images in a real context, while virtual reality generates somewhat more immersive environments. 3D printing is responsible for printing objects in the third dimension from previously designed plans.

Industry 5.0 is a step in the evolution from Industry 4.0 where humans are at the centre of the processes that connect technological environments. The fundamental basis of Society 5.0 is personalisation and services, through sustainability and resilience, seeking a careful balance between the economy and society.
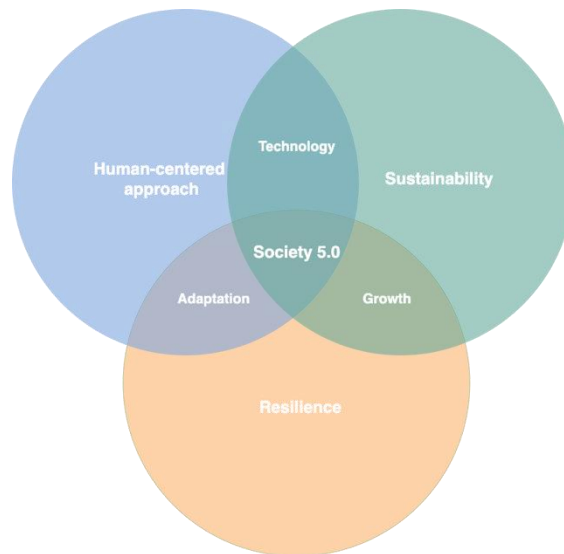

Fig. 2. Ecosystem of Society 5.0

The human-centred approach within Industry 5.0 assumes that humans perform everyday activities and enhance them with the help of technology. Sustainability seeks to optimise processes, ensuring that the impact on the environment is reduced by reducing the carbon footprint.

From a general perspective, resilience has to do with moving forward through adversities and circumstances that a process faces. In society 5.0, resilience has the same definition and makes its way through adversities in the technological aspect, improving people's quality of life.

Product adaptation is about mass customization. This has been in the works for some years and has to do with the customization of suggestions, perhaps through consumer habits. In this way, suggestions are created in a personalized way according to the person.

Artificial intelligence, which plays an important role in the evolution from industry 4.0 to society 5.0, among its most important applications is advanced automation and that has to do with the improvement of activities or processes that are generated through bots or robots that collaborate in activities where humans carry out processes towards intelligent systems.

Predictive maintenance identifies faults in sections of code, robots or machinery to avoid bottlenecks, unidentified faults, detection and maintenance optimizations.

In terms of quality control, the automated identification of defects in products using artificial vision plays an important role. This has to do with barcode or QR code identification strategies, for example, where each product has an identifier that allows for timely tracking.

Personalization of products and services: Adaptation to individual customer needs using AI. Human-machine interaction: Development of intuitive and collaborative interfaces.

Regarding supply chain optimization, it is possible to predict the massive demand for products through identification algorithms and based on this it is possible to improve inventories.

2   State of the Art of AI

AI is defined as the ability of machines to perform tasks that would otherwise require human intelligence, such as learning, reasoning, perception, and problem solving [6]. It is classified into several types:
- Weak or Narrow AI (WNA): Designed to perform specific tasks, such as playing chess or recognizing images. Most current applications fall into this category.
- Strong or General AI (AGI): Ability to perform any intellectual task that a human being can. It is still a developing field. As for superintelligence, it is a hypothetical concept where artificial intelligence is identified as surpassing human intelligence.
- Among the existing elements, techniques such as machine learning are distinguished, where it is possible for machines to learn from data that may or may not be explicitly structured. [7] [8].

Supervised learning trains machines from data that is already labeled or classified based on the source. This naturally helps the algorithm to identify the inputs and predispose the output based on the training itself. Unsupervised learning looks for behavioral patterns in data that is not labeled or classified and in reinforcement learning the machine or algorithm learns based on interaction with an environment, it can be through sensors. As for natural language processing, machines learn based on interaction with human language, it can be through an interface through a sensor.

Machine vision allows machines to have a view of the world in which they interact through cameras or sensors to identify patterns, images, video segments or clips and continue their training.

Expert systems imitate human behavior in a specific aspect and the context in which it is surrounded.

Among the challenges that artificial intelligence faces is data bias. Generally, the algorithms with which artificial intelligence models are trained depend entirely on the data. It is important to note that if the data is mislabeled, misclassified, or unclean, the artificial intelligence that is trained with that data will reflect the results under which it was trained and consequently the results may be unfair or discriminatory.

Another aspect under which artificial intelligence faces a challenge, a bias, has to do with inexplicability, also known as a black box. In some contexts, it is difficult to understand how artificial intelligence makes decisions within the model to reach a conclusion, and in some contexts this generates distrust in the final result.

Regarding the computational requirement to generate artificial intelligence, it is a constant challenge. It is important to note that artificial intelligence models require high-end computers, specialized to generate efficient models. Since data intake is increasing, models require the consumption of that data to understand how it behaves in order to offer a solution. The greater the amount of data, the greater the computational requirement. Both central processing units (CPU) and graphical processing units (GPU). Regarding the implementation of artificial intelligence models, it is important to note the need for the personnel who will deploy the models to have the required skills and knowledge. Regarding the impact of artificial intelligence on ethical and social aspects, it is important to consider that the use and implementation of artificial intelligence must always take care of its ethical and responsible use and be in favor of humanity.

3 AI integration in I4.0:

The success of integrating artificial intelligence in industry 4.0 involves aspects of architecture and platforms. On the one hand, there are architectures based on the cloud or cloud computing. This concept implies a distribution of the services that are available in an interconnected network of servers, not only centralized, but distributed. This is considered cloud computing. The advantage of this approach is that the services are distributed and collaborate permanently and it has to do with flexibility and scalability, among other aspects that contribute to the training and processing of artificial intelligence models. Another important aspect is the Industrial Internet of Things, where elements connected to collaborate live in the cloud and share data with each other to communicate and learn collaboratively. It is important to note that artificial intelligence is built based on libraries available for use and collaboration. As for resistance to change in the adoption and use of artificial intelligence from the services side as well as from the consumer side, it is an important element given that, according to the company, there may be resistance. The part of using traditional technology is perhaps sometimes more convenient than adopting a new technology [9].

4 Towards a 5.0 society: the role of AI

The concept of society 5.0 was proposed by Japan and in its vision, artificial intelligence has a strong presence in the daily activities of human beings, in which scenario it is the one who is at the center of every activity and process.

According to the evolution of society, society 5.0 is considered the last link in a chain where society 4.0 is defined as the information society, society 3.0 as the industrial society, society 2.0 as the agricultural society and society 1.0 is when society was in the hunting season. Society 5.0 in this sense is identified as super intelligent given the characteristics of the use of technology but specifically of artificial intelligence as a central element or tool in daily activities as already mentioned.

One of the characteristics that distinguishes society 5.0, in industry 4.0, has to do with the process of optimizing activities based on technologies, whether big data through the processing of large volumes of data, communication between devices or the Internet of Things and frontier technology, among others.

Currently, the use of LMMs, which are distinguished by text generation technologies but also through voice, images, documents, increasingly establish the use of artificial intelligence to facilitate daily tasks of human beings. Previously, they were known as text generators, but today it has been shown that these technologies enhance daily activities towards industry 4.0.

As mentioned in point 3, the use of artificial intelligence in society 5.0 is promising and provides an optimistic outlook; however, there are aspects to consider, for example, there are ethical and social challenges that accompany the use of this type of technology and the issue of bias, automated decision-making and the analysis of unstructured data has been discussed in this document.

Regarding the myths that have been generated around the use of artificial intelligence, on the one hand there are those who believe that AI will replace human beings, although it is true that through optimization it is possible to improve some jobs, what is established is the use of artificial intelligence not as a replacement for human beings or the activities they carry out, but rather as a tool to facilitate the performance of people's activities.

5   Conclusions

Artificial intelligence has become the core technology in society 5.0, where people are at the center of processes. It is important to establish optimal channels that allow regulation in favor of its use.

The future of artificial intelligence is promising and offers a window of opportunity that reveals an interesting range of benefits for society through the integration of supercomputers and quantum computing.

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