ARTIFICIAL INTELLIGENCE - THE TECHNOLOGY THAT TRANSCENDS OUR IMAGINATION

Ciprian APOSTOL

"Alexandru Ioan Cuza" University, 11 Carol I Bd., Iasi, Romania

Abstract. The global economy is currently facing a series of major challenges, which is why its main characteristic can be said to be uncertainty. One of these challenges is artificial intelligence (AI). With its spectacular evolution, moving from theoretical concepts to concrete applications that influence almost every aspect of modern life, AI has come to transcend imagination, and the unknown limits of its application truly represent both a challenge and a concern.
The aim of this study is to highlight the evolution and main characteristics of artificial intelligence, in order to try to clarify whether this new revolution will help or endanger us. To achieve this goal, we used non-participatory observation as a *research method*, and the entire process involved a descriptive analysis based on information from *various sources*, such as accredited institutions, media, and literature. *The originality* of this article lies in the fact that the data is up-to-date, and as future research directions, we plan to present the impact of AI on everyday life, to highlight both the benefits and dangers associated with it.

Keywords: *artificial intelligence, benefits, dangers, evolution, challenges, concerns, future.*

JEL code: *F63, I00, O30, O31*

INTRODUCTION

The New Economy, also known as the Knowledge Economy, is centered around information. Thus, the current stage of economic and social development on a global level is characterized by a series of interconnected transformations and trends that influence both the economy and the social structure. Technology in general, and artificial intelligence, automation, big data, and the Internet of Things (IoT) in particular, are redefining production, trade, and services, as well as ways of life. In other words, digitalization is present in all sectors of the economy and influences their development, sometimes bringing major changes in a very short time. It also has a significant impact on social interactions and modes of communication.

The industrial revolution has reached a level once unimaginable. Today, we are talking about the fourth industrial revolution, also known as Industry 4.0, which is based on advanced automation, intelligent robots, and factories connected through IoT. Additionally, traditional relationships between employees and employers are being redefined with the emergence of the digital economy and platform-based services (such as Uber, Airbnb etc.), while the gig economy, based on temporary and freelance work, has gained significant momentum.

In human interactions and modes of communication, digitalization has brought about fundamental transformations. The way people communicate, connect, and form relationships is increasingly influenced by the rapid evolution of digital technologies, such as smartphones, the internet, social networks, and messaging apps. All these have profoundly reshaped the social landscape. While the digitalization of social interactions has brought numerous benefits by expanding the possibilities for connection and communication, it is essential to adapt in a balanced and mindful way to maintain authentic and healthy relationships in an increasingly digitalized world, as this also presents significant challenges.

All these aspects, along with the challenges posed by the sometimes uncontrolled development of the technological process and the unknowns associated with this revolution of humanity, have sparked interest among practitioners, theorists, and especially researchers.

LITERATURE REVIEW

There are numerous articles and studies published about artificial intelligence. The topics covered are very diverse, ranging from the technical and applied aspects of AI to its ethical, social, and economic implications. As technology advances, research and articles are becoming increasingly diversified and in-depth.

The most frequently explored topics related to AI are:
- Technical aspects and recent developments in AI (machine learning, deep learning, natural language processing, computer vision); [1–3]
- Applications of artificial intelligence in various economic and social sectors (healthcare, industry, finance, education, commerce, etc.); [4–6]
- Ethics and challenges related to AI; [7–9]
- Artificial General Intelligence (AGI); [10]
- Artificial intelligence and society (social and cultural impact, policies and regulations, AI-based economy); [11–13]
- Creative artificial intelligence (AI and art, Generative Adversarial Networks). [14–16]

Moreover, there are publications dedicated to artificial intelligence that specialize in specific aspects of the field. For example: Nature Machine Intelligence, which publishes research and reviews in a wide range of topics in machine learning, robotics, and AI; MIT Technology Review, which publishes articles on AI innovations and their impact on society and industry; IEEE Spectrum, which captures technical aspects and innovations in AI, machine learning, robotics, and automation; OpenAI Blog, which publishes research, studies, and articles on the progress made by OpenAI in AI, including ChatGPT etc.

MATERIALS AND METHODS

The aim of this study is to highlight the evolution and main characteristics of artificial intelligence, in order to try to clarify whether this new revolution will help or endanger us. Non-participatory observation is *the research method*, and the entire process involved a descriptive analysis based on information from *various sources*, such as accredited institutions, media, and literature. *The originality* of this article lies in the fact that the data is up-to-date. In terms of *future research directions*, we intend to present the impact of AI on everyday life, in order to highlight both the benefits and especially the dangers of the unknown in the use of AI.

RESULTS AND DISCUSSIONS

Our study focuses on the evolution of artificial intelligence, the fields in which it is applied, as well as its benefits and the challenges involved in its use.

Regarding *the evolution of artificial intelligence*, it has gone through several stages, starting with concepts and ideas developed over centuries, as follows: [17]

- *Antiquity and the Middle Ages*: Thinkers like Aristotle and medieval philosophers began exploring concepts of reasoning and logic, which form the basis of artificial intelligence. In the 13th century, philosopher and mathematician Ramon Llull developed the "ars combinatoria" technique, influencing the development of logic and computers;
- *17th–20th centuries*: In the 17th century, philosopher and mathematician Gottfried Wilhelm Leibniz developed the "Characteristica Universalis," an early form of automatic computing. In the 19th century, mathematicians such as George Boole and Ada Lovelace made significant contributions to the development of symbolic logic and programming concepts;
- *1940s–1950s*: This period saw the development of the first computers and the formulation of programming and human thought simulation concepts;
- *1950s–1960s*: Researchers began exploring the possibility of creating machines that could simulate human intelligence, and the term "artificial intelligence" emerged at the 1956 Dartmouth Summer Conference, where John McCarthy, Marvin Minsky, and other researchers discussed and developed ideas in this field;
- *1960s–1970s*: During this time, programming languages and algorithms were developed to enable computers to simulate human reasoning. IBM developed chess programs;

- *1980s–1990s*: Significant development occurred in neural networks and machine learning, and expert systems were created to simulate human knowledge and skills in specific fields;
- *1990s–2000s*: This period saw a focus on natural language processing and the development of algorithms capable of understanding and generating human language. The early 2000s witnessed increased popularity in machine learning and deep learning algorithms;
- *2010s to the present*: Major technological advances led to an exponential increase in computational power and efficiency, facilitating the effective application of deep neural networks. Significant achievements have been made in voice recognition, natural language processing, computer vision, and other fields.

The evolution presented by a brief inquiry to ChatGPT is also very interesting. The stages outlined are as follows:

- *Early and theoretical stage (1940s–1950s):* The idea of artificial intelligence emerged with the development of the first computers. In 1943, Warren McCulloch and Walter Pitts proposed the concept of the "neural network," laying the groundwork for neuron-based AI, and in 1950, Alan Turing proposed the famous Turing Test to determine if a machine could imitate human thinking. Together with John von Neumann, they explored computing models and algorithms;
- *Founding the field (1950s–1970s):* In 1956, the Dartmouth Conference took place, marking the official birth of AI, where John McCarthy, Marvin Minsky, and other researchers discussed the creation of machines that could simulate human intelligence. During this period, simple programs appeared, demonstrating that machines could solve problems (for example, the Logic Theorist program (1955) created by Newell and Simon could prove mathematical theorems), and expert systems were developed (such as DENDRAL for chemistry and MYCIN for medicine);
- *AI crises and stagnation (1970s–1980s):* During the '70s and '80s, investments and interest in AI drastically declined. The limitations of technology and high costs hindered the expected progress. Despite these challenges, new techniques were developed, such as specialized programming languages (LISP and Prolog) and symbolic knowledge representation techniques;
- *AI renaissance and machine learning (1990s–2010):* This period is marked by advances in hardware and machine learning. The fact that IBM's supercomputer Deep Blue defeated world chess champion Garry Kasparov in 1997 demonstrated the power of AI in complex strategic games;
- *The deep learning and modern AI era (2010–present):* Characterized by the explosion of neural networks, the emergence of virtual assistants (Siri, Alexa, Google Assistant), generative AI (Generative Pre-trained Transformer - GPT), generative neural networks (Generative Adversarial Networks, GPT-3, GPT-4, ChatGPT), and applications in industry;
- *The future of AI:* Researchers are exploring the possibility of creating AI capable of learning and performing similarly to human intelligence (Artificial General Intelligence - AGI), and debates on the ethical and social implications of AI continue, considering its impact on the job market and data privacy, as well as the potential risks of superintelligent AI.

There are *several types of artificial intelligence*: [18]

- *Weak AI (Narrow AI):* Specialized in a specific task (e.g., virtual assistants, facial recognition etc.);
- *General AI (Artificial General Intelligence - AGI):* A theoretical concept in which an AI system would have cognitive abilities similar to those of humans, allowing it to solve a wide range of problems;
- *Superintelligent AI:* A concept in which AI would surpass human cognitive abilities in all domains;

- ***Reactive Machine AI:*** Able to respond to external stimuli in real-time but cannot build memory or store information for the future;
- ***Limited Memory AI:*** Stores knowledge and can use it to learn and train for future tasks;
- ***Theory of Mind AI:*** Can sense and respond to human emotions; it can also perform the tasks of machines with limited memory;
- ***Self-Aware AI:*** The final stage of artificial intelligence, where it can recognize the emotions of others, has a sense of self, and possesses human-level intelligence.

There are also *several branches or fields of artificial intelligence*, such as:

- ***Machine Learning (ML):*** A branch of AI where systems are trained to learn and improve performance from experience without being explicitly programmed to do so. [19] ML algorithms include neural networks, decision trees, regression algorithms, and many others, identifying patterns in data and learning from them to make predictions or decisions;
- ***Deep Learning:*** Utilizes complex artificial neural networks inspired by the human brain, with many layers (deep neural networks), and is predominantly used in image recognition, natural language processing, and games (e.g., Generative Pre-trained Transformer – GPT, Convolutional Neural Networks – CNN, etc.); [20]
- ***Natural Language Processing (NLP):*** A field that deals with the interaction between computers and human language to enable machines to understand, interpret, and generate natural language. Its applications include machine translation, chatbots, sentiment analysis, speech recognition, and text synthesis; [21]
- ***Computer Vision:*** Processes and interprets visual data, such as images and videos; [22]
- ***Planning and Decision Making:*** AI can be used to develop systems that plan actions and make decisions based on data.

Artificial intelligence is increasingly present in all sectors of the economy and in daily life. Today, we talk about autonomous vehicles, virtual assistants (Alexa, Siri, Google Assistant), industrial robots, algorithms used for financial market analysis, automated trading, fraud prevention, and the use of AI in medicine has yielded results that were perhaps unimaginable until now (e.g., medical diagnosis, imaging analysis, drug production, highly precise surgeries, etc.).

No one disputes that artificial intelligence (AI) brings a series of significant benefits that transform various areas of human life, the economy, and technology, with the potential to improve efficiency, productivity, and overall quality of life. Several authors have highlighted a range of benefits of artificial intelligence, including those in Table 1. [23]

Table 1. Benefits of AI in Various Sectors

Sector	Applications	Tangible Benefits
Healthcare	Disease diagnosis, drug discovery	Improved patient outcomes, cost savings
Autonomous Vehicles	Self-driving cars, traffic management	Increased safety, reduced congestion
Retail	Customer recommendations, inventory management	Enhanced customer experience, increased sales
Agriculture	Precision farming, crop management	Higher yields, resource optimization
Manufacturing	Predictive maintenance, quality control	Reduced downtime, improved product quality
Finance	Fraud detection, risk assessment	Enhanced security, efficient operations

Of course, these are just a part of the benefits of artificial intelligence. If we read the specialized literature, we observe that they are numerous. Thus, we can also highlight the following:

- Automation of repetitive processes in any sector, leading to increased productivity and reduced operational costs;
- Improvement of decision-making through the analysis of complex data and recommendation systems;

- Personalization of user experiences through tailored services and adaptive learning;
- Enhancement of security and fraud detection;
- Reduction of errors and execution time in industry through advanced manufacturing and predictive maintenance;
- Support for innovation and scientific research through rapid discoveries and advanced simulations;
- Easy access to information and services through virtual assistants, chatbots and customer support etc.

With the development and implementation of artificial intelligence (AI), a series of complex and diverse challenges have also emerged, impacting both the technology itself and society, the economy, and ethics. Some of these are summarized in Table 2. [24–26]

Table 2. The main challenges associated with artificial intelligence

Challenge	Examples	Explanations
Ethics and Responsible Use	Discrimination and Bias	AI algorithms can reflect and amplify existing biases from the data they were trained on.
	Surveillance and Data Privacy	AI is increasingly used to monitor and analyze individuals' behavior, violating the right to privacy and personal freedom.
	Autonomous Weapons	The development of AI for military applications raises serious risks, including the loss of human control over life-and-death decisions.
Impact on the Job Market	Job Losses	Manual labor or repetitive tasks are particularly vulnerable.
	Creation of New Jobs	New jobs will emerge in technology fields, but they will often require new skills, such as programming, data management, and complex analysis.
	Economic Inequalities	Profits could accumulate at companies that own the technology.
Transparency	Lack of Transparency	Many AI models, especially deep learning, may make efficient decisions, but it is difficult for humans to understand exactly how they arrived at those decisions.
	Explainability	Developing explainable algorithms so that people can clearly understand the reasoning behind an AI decision provides transparency and accountability in using these systems.
Safety and Control	Uncontrolled AI	There is a danger of AI evolving to a point where it becomes difficult to control, and making decisions that are not aligned with human interests could have unpredictable negative consequences.
	Cyber Attacks and Vulnerabilities	AI systems can become targets for cyber attacks, and the impact could be devastating.
Regulation and Governance	Legislative Gaps	An appropriate legal framework is needed to regulate the use of AI properly and to prevent abuses, but legislation often fails to keep pace with AI development.
	Standardization	AI is unevenly regulated globally. The lack of international standards makes it difficult to monitor and regulate its implementation.
	Legal Responsibility	Questions arise about who is responsible in the event of AI failure.
Data Security and Privacy	Big Data	A balance must be found between using data to improve AI and protecting individuals' privacy.
	Data Abuse	AI can extract sensitive information from personal data, leading to privacy violations, manipulation, or misinformation.
National Security	AI Race Between Nations	Superior AI can provide a significant strategic advantage across various fields, and the competition for it could escalate into international tensions or even conflicts.
	Information Manipulation	Using AI to generate fake news or manipulate public opinion amplifies the risks of social and political destabilization.

| Philosophical and Moral Dilemmas | Consciousness and AI | ould AI ever become conscious or possess some form of awareness? And if so, should it be granted rights similar to those of humans? |
| | Values and Morality | There is the following dilemma: can AI be used to make moral or ethical decisions, and who decides what values to integrate into AI? |

Progress in computing power, Big Data, Deep Learning, increased investments, Cloud Computing, academic research, and collaborations with the tech industry have led to an explosion of AI applications and a growing interest in this technology, accelerating its development and widespread adoption in recent years. As such, there is hardly a day that goes by without news of new discoveries in the field (for example: Humanoid Robot Fair in Beijing. Some have been created to assist with household chores; Cognitive robots tested at IFA Berlin 2024. Artificial intelligence enables them to perform almost any activity; Is this the fastest robot in the world? Star1 moves at 13 km/h, etc.).

Given the impact of AI technologies on the economy, society, and daily life, regulation is absolutely necessary. Various governments and international bodies are working to create a legislative framework to ensure that AI is developed and used responsibly, ethically, and safely. For example, the OECD launched a set of principles on AI in 2019, emphasizing transparency, accountability, and the protection of human rights; the European Commission proposed the Artificial Intelligence Act, the first comprehensive legislative framework dedicated to AI, in 2021; in 2022, the Biden Administration published a document titled "Blueprint for an AI Bill of Rights," highlighting citizens' rights concerning the use of AI, and China introduced regulations regarding recommendation algorithms, mandating that these systems be transparent and avoid discrimination, among other requirements.

CONCLUSIONS

Artificial intelligence is a vast field of computer science that focuses on creating systems and machines capable of performing tasks that typically require human intelligence. These tasks include learning, reasoning, speech recognition, natural language processing, visual perception, and decision-making. AI aims to imitate and enhance human cognitive abilities.

The evolution of AI has been rapid, moving from theory to practice, and it continues to accelerate, promising radical changes in nearly every field. While it brings numerous benefits and advancements across various domains, it also comes with a series of significant risks that must be managed carefully. The risks associated with artificial intelligence are complex and varied, involving technological, social, economic, and ethical aspects. To mitigate these risks, international collaboration, the development of an appropriate legal framework, and the promotion of ethical and responsible AI development and implementation practices are essential.

AI must be approached with caution and responsibility. Collaboration among governments, companies, researchers, and the public is necessary to manage risks and maximize the benefits of this evolving technology, and AI regulation is crucial to ensure that emerging technologies are developed and used in a way that protects human rights, promotes transparency, and minimizes risks.

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