

A conceptual approach to artificial intelligence and its relationship to psychology.

مقاربة مفاهيمية للذكاء الاصطناعي وعلاقته بعلم النفس.

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Abstract:

In light of the technological developments witnessed in recent decades and the world's transition to a new phase of rapid change linked to modern scientific and technological developments, represented by the Fourth Industrial Revolution, which has cast its shadow over various human, intellectual, scientific, civilisational and cultural dimensions, 'artificial intelligence' is considered one of the most important outcomes of this industrial revolution due to its multiple economic, intellectual and scientific uses, as it has opened the door to innovations that lead to further changes in human life. The saying 'work smart, not hard' has been widely circulated, and this is what artificial intelligence seeks to achieve in human life through its medical, technical, financial, economic, educational and even cultural applications.

With the rapid scientific and technological development the world is witnessing and the major transformations taking place in the Fourth Industrial Revolution, artificial intelligence will be the primary driver of progress and prosperity in the coming years. This research paper aims to shed light on establishing a conceptual approach to artificial intelligence, while identifying its applications in the humanities in general and psychology in particular.

Keywords: Fourth Industrial Revolution, artificial intelligence.

ملخص:

في ظل التطور الذي تشهده التكنولوجيا في العقود الأخيرة و انتقال العالم إلى مرحلة جديدة من التغيرات المتسارعة التي ارتبطت بالتطور العلمي والتكنولوجي الحديث تمثل في الثورة الصناعية الرابعة، التي ألقت بظلالها على مختلف الأبعاد الإنسانية والفكرية والعلمية والحضارية والثقافية، ويعتبر "الذكاء الاصطناعي" من أهم مخرجات هذه الثورة الصناعية نظرا لتعدد استخداماته الاقتصادية والفكرية والعلمية، حيث فتح المجال أمام الابتكارات، هذا ما يؤدي إلى المزيد من التغيير في الحياة الإنسانية، لقد تداولت مقولة "اعمل بذكاء ولا تعمل بجهد" وهذا ما يسعى الذكاء الاصطناعي إلى تحقيقه في حياة الإنسان من خلال تطبيقاته الطبية والتقنية والمالية والاقتصادية والتعليمية وحتى الثقافية.

مع التطوّر العلمي و التكنولوجي المتسارع الذي يشهده العالم والتحوّلات الكبرى في ظل الثورة الصناعية الرابعة سيكون الذكاء الاصطناعي المحرّك الأول للتقدم و الازدهار خلال السنوات المقبلة، ومنه تهدف هذه الورقة البحثية إلى تسليط الضوء على ضبط مقارنة مفاهيمية للذكاء الاصطناعي مع تحديد تطبيقاته في العلوم الإنسانية عامّة وعلم النفس بصفة خاصّة.

كلمات مفتاحية: الثورة الصناعية الرابعة، الذكاء الاصطناعي.

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1. Introduction

The technology industry has witnessed rapid development in recent years, and ‘artificial intelligence’ is considered one of the most prominent of these developments, used in various scientific, technical, medical and even cultural fields. The world is on the cusp of a fourth industrial revolution, the impact of which is not limited to changing the shape of industries and production methods, but extends to the cognitive perspective of humans towards life and human requirements.

Artificial intelligence is considered one of the most important results and outputs of the fourth industrial revolution due to its wide uses and adoption in various aspects of human life. The dependence on artificial intelligence is expected to increase in the future, especially with the developments in this field and the interaction between information technology and contemporary brain research.

With the tremendous and rapid technological development and the transformations the world is witnessing in the wake of the Fourth Industrial Revolution, artificial intelligence will be the engine of progress, growth and prosperity in the coming years, as it can, with the innovations that will follow, establish a new world that may currently seem like a fantasy. This is why the research idea adopted by the study came as an analytical study of the tools used by social and human scientists in particular.

Although all current signs indicate that the establishment of this world is imminent, what is the concept of artificial intelligence? And what is its relationship to psychology?

2. Importance of the study:

The importance of the study lies in identifying the conceptual dimension of artificial intelligence, which has become the focus of attention of many thinkers and the basis of much research and study, and which will be the engine of progress, growth and prosperity in the coming years. The importance of the study also lies in identifying and defining the applications of artificial intelligence in various fields, especially the cultural dimension.

3. Study objectives:

This study aims to shed light on the basic concepts of artificial intelligence by attempting to define its concept and identify its characteristics.

- Identify the most prominent modern applications of artificial intelligence.
- To identify the implications of using artificial intelligence in the cultural field.

4. Study methodology:

To answer the above question, we rely on a descriptive approach in this study by describing the theoretical frameworks of the concept of artificial intelligence and its intelligent systems through addressing the available research in this field.

5. The concept of the Fourth Industrial Revolution:

The Fourth Industrial Revolution is considered one of the most important technological transformations on a global level. It began to be referred to in recent years through the use of technology that combines biology and technology, a term coined by Klaus Schwab , founder and executive chairman of the World Economic Forum, in the keynote paper for the 2016 World Economic Forum in Davos, Switzerland, in which he explained what he called the Fourth Industrial Revolution.

The Fourth Industrial Revolution refers to the integration of physical or material sciences with digital and biological systems in manufacturing processes through electronically controlled robots, smart robots connected to the internet, 3D printing, artificial intelligence, robotics and other applications that have permeated all areas of life (Al-Haddad Ibrahim, 2021, pp. 7-8). The Fourth Industrial Revolution can therefore be described as the emergence of cyber-physical systems, and it would not be wrong to say that the symbol of the fourth wave of development has included serious capabilities for individuals and machines.

As a result of the series of previous revolutions that the world has experienced since the 18th century, our world is now experiencing a fourth industrial revolution based on the achievements of the third industrial revolution that began in the last century, particularly with regard to the unprecedented development of communication networks and information technologies.

Just as the first industrial revolution used water and steam to power machines, and the second industrial revolution used electricity for large-scale production, and the third industrial revolution focused on the use of electronics and information technology, the fourth industrial revolution centres on the blending of technologies that eliminate the boundaries between the physical, digital and biological worlds, amid rapid developments that have spread their effects to a large number of countries around the world during the current decade. (Abdul Moneim Galoul, 2019, p. 28).

The Fourth Industrial Revolution relies on automation, a comprehensive concept that aims to enable manufacturing processes and systems to operate autonomously without direct human intervention through the use of programming and computerised control. This will enable technology to replace humans or take over many tasks in an organised, automated manner. This will then extend to the productive and service sectors. It can therefore be said that we are now in a new phase where the integration of many technologies is not limited to the automation of production, but also leads to the automation of specialised knowledge with the development of computers' ability to store vast amounts of information and technologies. The Fourth Industrial Revolution combines hardware and software based on robotics, artificial intelligence, nanotechnology and the internet, connecting all services to humans through contemporary communication technologies. Therefore, humans are

witnessing profound changes in all aspects of their lives, from industries characterised by the emergence of new business models, to the disruption of jobs and the reshaping of production, consumption and transport systems.

That is why he says, "We are on the verge of a technological revolution that will radically change human life and confront us with new transformations unlike anything humanity has ever known before. One thing is clear: the response to these challenges must be integrated and comprehensive, involving everyone, and everyone must work to better understand the emerging changes. There must be a comprehensive and shared global vision of how technology is changing our lives and the lives of future generations.

6. Characteristics of the Fourth Industrial Revolution:

The Fourth Industrial Revolution that the international community is undergoing has had unique characteristics since its inception at the beginning of the 21st century, and it differs from previous revolutions in three dimensions:

- a. Speed and level of complexity.
 - b. Extensive and comprehensive impact on all aspects of life.
 - c. Pluralism of the system, where this revolution can bring about radical change in relations between countries, companies and societies within and between them.
- The process of development through which it comes in the form of huge growth spurts and not in a linear fashion.
 - It relies on taking advantage of all civilisational achievements.
 - The role of creativity and innovation in the production process is becoming more important than capital. (Saad Boubha, 2022, p. 89).

7. Opportunities of the Fourth Industrial Revolution:

Every revolution that humanity has known has brought with it many opportunities, including: Achieving high rates of growth in economic, social and human development: like the revolutions that preceded it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for people around the world. Technology has also provided new products and services that increase individual efficiency and enjoyment, such as ordering a taxi, booking a trip or purchasing a product, or playing a game, all of which can be done remotely.

8. Challenges of the Fourth Industrial Revolution:

Despite the benefits of the industrial revolution, there are a number of challenges that await us, including:

- a. The dominance of large companies over industrial production and the threat of the disappearance of many jobs and employment opportunities by 50 per cent, which poses a challenge in terms of widespread unemployment, especially in countries that are not prepared for the transition.
- b. The challenge of confronting society with economic and social restructuring and bearing the consequences of this change on cultural and social values or on the behaviour of states and non-state actors.

- c. A number of governments are facing the dilemma of the shift in the balance of power between industrial sectors and government agencies on the one hand, and developing and developed countries on the other.
- d. The possibility of exploiting the capabilities and advantages of Fourth Industrial Revolution technologies to carry out illegal or unethical acts that could harm society, values and individuals, such as the growth of cybercrime.
- e. 5- The need for new frameworks, approaches, systems and legislation to deal with issues such as crime involving robots and the extent to which robots can be granted legal personality.
- f. The Fourth Industrial Revolution could result in greater inequality, particularly in terms of its potential to disrupt labour markets, given the possibility that automation will replace labour in the economy. In addition, the most scarce and valuable resource in an era driven by digital technologies will not be ordinary labour or ordinary capital, but rather people with good ideas and innovations, and therefore talent will be the decisive factor of production.

9. Pros of the Industrial Revolution:

- Achieving high rates of economic, social, and human development.
- Improving and raising the standard of healthcare for humans.
- Saving a lot of time in the development process and spreading its achievements around the world.
- Reducing production costs and providing highly efficient and less expensive services, means of transport and communication. (Research and Information Centre, 2021, p. 4)

10. Basic concepts of artificial intelligence:

The subject of intelligence has been the subject of much debate and interest as a human trait, falling between the theory of heredity and the theory of evolution, with science unanimously agreeing on the role of the innate aspect of intelligence. Studies have found that between 60 and 80 per cent of intelligence at puberty is linked to genetic factors. However, some scientists believe that the social environment in which individuals live can influence the development of their intelligence.

If intelligence is the ability to adapt to a particular environment, then animals and even plants possess a form of intelligence. Nevertheless, intelligence remains a trait and characteristic unique to humans, Intelligence is the ability to understand, recognise and discover relationships between things and facts, whether identity-based or causal. It is also the ability of beings to find solutions to various problems in life, as intelligence is linked to logic and thinking, and the mind's ability to react logically.

Intelligence is linked to the abilities possessed by the human mind, through which it thinks and reaches conclusions and deductive relationships between ideas. (Azouz and Heiba,)

10.1 The emergence of artificial intelligence:

Artificial intelligence emerged in the 1950s, and the term was first used during a conference at Dartmouth University on artificial intelligence in 1956. Since then, innovators

and researchers have published 1.6 million publications related to artificial intelligence and filed patent applications for approximately 340,000 innovations related to artificial intelligence.

The roots of artificial intelligence research date back to the 1940s with the spread and use of computers. In the early 1950s, attention focused on neural networks, In the 1960s, research began to shift towards systems based on knowledge representation, which continued throughout the 1970s. At the beginning of the 1980s, there was a major boom in artificial intelligence research. (Saad Boubha, 2022, p. 91)

10.2 The concept of artificial intelligence:

In light of the technological renaissance the world is witnessing in the field of machine development, the term ‘artificial intelligence’ has become increasingly common. What was once merely a dream presented by directors in science fiction films in the mid-20th century has now become a tangible reality that we resort to many times, even if we are sometimes unaware of it. Artificial intelligence is a branch of science concerned with machines that can solve the kind of problems that humans resort to their intelligence to solve.

This definition was presented by Marvin Minsky, one of the most famous scientists specialising in management and cognitive sciences in the field of artificial intelligence, in his book *To Build an Intelligence*.

Based on this definition, not all machines that perform specific tasks fall under the term artificial intelligence. One of the most prominent examples of intelligent machines are those that, while performing their tasks, study the issue and make decisions based on the results of the study, thus mimicking human thinking.

Artificial intelligence also aims to understand the nature of human intelligence by creating computer programs capable of simulating intelligent human behaviour. This refers to a computer program's ability to solve a problem or make a decision in a given situation based on a description of that situation. The program itself finds the method that must be followed to solve the problem.

Artificial intelligence is concerned with the cognitive processes that humans use to perform tasks that we consider intelligent. These tasks vary greatly in nature; they may include understanding spoken or written language, playing chess, solving a puzzle or a mathematical problem, writing a poem, or making a medical diagnosis. (Al-Bounie, 1990, p. 12)

Artificial intelligence refers to systems or devices that mimic human intelligence in performing tasks, with the aim of significantly enhancing human capabilities and contributions, making it an asset of great value to

businesses and radically transforming the way businesses operate for the better. (Hani Fahim, p. 4)

Artificial intelligence is the simulation of human intelligence and understanding of its nature through the creation of computer programs capable of simulating intelligent human behaviour. Artificial intelligence is found in various areas of life, from self-driving cars and unmanned aerial vehicles to translation software, investment and other applications that are widespread in everyday life.

Psychologists have defined intelligence as:

- The ability to use memory, knowledge, experience, understanding, reasoning, imagination, and judgement to solve problems and adapt to new situations.
- The ability to discover and apply knowledge.
- The ability to learn, understand, and make judgements.
- The ability to think, plan, solve problems, think abstractly, understand complex ideas, learn quickly, and learn from experience.
- The ability to learn facts and skills and apply them, especially when this ability is highly developed.
- The ability to adapt effectively to the environment, either by changing oneself, changing the environment, or creating a new environment. Intelligence is not a single mental process, but a combination of many mental processes directed towards effective adaptation to the environment.
- Artificial intelligence is similar to human intelligence in terms of the diversity of definitions. The definition of artificial intelligence is broad and linked to algorithms. However, algorithms predate artificial intelligence. The term ‘algorithm’ is derived from the name of the 9th-century Persian mathematician Muhammad ibn Musa al-Khwarizmi, which refers to specific instructions for solving a problem or performing a calculation.
- Artificial intelligence refers to computers simulating or imitating the intelligence inherent in humans, and researchers in the field point out that many current applications are still relatively simple (Yassin Al-Hamwi, 2024, p. 16).

11. Areas of artificial intelligence:

11.1 Natural language processing:

This involves developing programmes and systems capable of understanding and generating human language. Research into natural language processing has led to the development of programming languages suitable for this purpose, with the aim of enabling natural communication between humans and computers. This field is divided into two main parts:

- a. **Understanding natural languages:** This field explores ways to enable computers to easily understand human language.
- b. **Producing natural languages:** This field explores ways to enable computers to produce natural language, such as sentences in Arabic or English.

❖ Speech recognition:

Artificial intelligence applications seek ways to enable computers to recognise human speech, meaning that humans can give commands to computers verbally and the computers can understand and execute these commands.

Automatic programming: This refers to the ability to find interpreters or translators that enable computers to receive source code written in natural language and then generate code that computers can execute and process.

❖ Computer vision:

This refers to equipping computers with optical sensors that enable them to recognise people or shapes by developing technical methods for image analysis and face recognition, with the aim of enabling computers to see and recognise their surroundings.

❖ **Expert systems:**

These are complex computer systems based on the collection of specialised information from human experts to enable the computer to apply that information to solve similar problems (Al-Sayed, 2020, p. 26).

❖ **Robots:**

Robotics technology is considered one of the most advanced artificial intelligence technologies in terms of applications that provide solutions to problems. It is an electromechanical machine that receives commands from a connected computer and performs specific tasks. Artificial intelligence in this field gives robots the ability to move and understand their surroundings. (Mr. Mohamed, 2020, p. 25)

- Self-driving cars and drones.
- Non-linear control, such as railway control.
- Smart devices capable of performing mental operations such as examining industrial designs, monitoring operations, and making decisions.
- Cognitive simulation using computers to test theories about how the human mind works and the functions it performs, such as recognising familiar faces and voices, recognising handwriting, processing images, extracting useful data and information from them, and activating memory.
- Computer applications in medical diagnosis in clinics and hospitals and in performing surgical operations.
- Game programmes such as chess and video games.
- Applications for teaching different natural languages and the rules for understanding written and spoken languages, and responding to questions with pre-programmed answers.
- Smart home services, autonomous weapons, phones, and smart applications.

11.2 Artificial intelligence from simulating the human mind to surpassing it:

With the development of science and technology, machines began to approach the capabilities of the human mind, an old dream of creating intelligent machines that perform tasks that only humans can do. In 1950, Alan Turing proposed an experiment to clarify the issue of machine intelligence and predicted that a system equipped with learning capabilities would succeed in this experiment. According to him, building a machine that can understand the meaning of what is said is equivalent to building an intelligent machine. Thus, an intelligent machine is one that approximates human thinking and information processing through its advanced programming, as science has succeeded in equipping machines with intelligence that enables them to interact and evolve.

The 1956 Dartmouth Conference is considered to be the origin of the term ‘artificial intelligence,’ as it addressed the topic of the mechanisation and automation of thought processes. The first recognised works in the field are attributed to Warren McCulloch and

Walter Pitts in 1943, who focused on scientific advances in the physiology and functioning of nerve cells in the brain.

This marked the birth of artificial intelligence as a scientific and technological discipline aimed at enabling machines to perform cognitive processes that had previously been the exclusive preserve of the human mind, such as understanding, communication, memory formation, critical thinking, adaptation and independent learning. Artificial intelligence is defined as a system that performs intellectual tasks reserved for the human mind.

Artificial intelligence is a field of computer science that aims to build programmes that replicate human behaviours considered intelligent, such as analysing the environment, problem solving and decision making. Minsky defined it as a field related to the fabrication of tasks that humans perform using their intelligence. Artificial intelligence thus aims to replicate the workings of the human mind by harnessing various technologies that enable machines to mimic a form of intelligence. (Ezzouz and Heiba, 2022, p. 60).

12. Artificial intelligence and the fields of psychology:

12.1 Artificial intelligence and educational psychology:

Educational psychology is primarily concerned with the psychology of teaching for teachers, the psychology of students, and the application of educational theory. It also helps students learn and form a special 'interactive system,' where the purpose of educational psychology is to ensure the effective and harmonious operation of 'an interactive system between the elements of the educational process.' With the rapid development of electronic technology in the current era, artificial intelligence techniques and the theory of 'deep learning' have been widely applied in educational design to respond to the call of educational psychology, as artificial intelligence is highly regarded by educational circles. In 2017, the Chinese State Council indicated that artificial intelligence education is an important part of the national strategy, and by 2018, the Chinese Ministry of Education had issued a series of artificial intelligence education policies, which represented the full opening of the modern education system.

Deep learning theory refers to learning through which students can understand and absorb the knowledge they have learned and apply it through measurement to develop their advanced thinking skills. After 2000, the theory called for active, participatory and critical understanding of the learning process, including deep engagement in advanced thinking and a focus on learning outcomes.

Currently, artificial intelligence techniques and deep learning algorithms are widely used in various areas of life, including medical treatment, manufacturing, and education, where artificial intelligence techniques are combined with statistical modelling and integrated learning and applied to teaching assessment.

Serin and Özkan pointed out that the main importance of applying artificial intelligence in education lies in enhancing students' ability to adapt to learning in order to improve their enthusiasm for learning.

12.1.1 The objectives of educational psychology in the light of artificial intelligence technologies:

Educational psychology sought to keep pace with the rapid developments in artificial intelligence technology through new methods, approaches and objectives capable of:

- Making the school environment based on artificial intelligence technologies more responsive to the elements of the educational process (student, teacher, curriculum).
- Make students more open and receptive to artificial intelligence technologies by stimulating scientific research that examines student behaviours and problems in the context of artificial intelligence technologies.
- Make teachers more open to artificial intelligence technologies and more flexible in their knowledge of how to use them to develop their teaching methods, prepare tests, assess students, and meet their cognitive requirements and learning needs.
- Make the curriculum more positive and interactive, not only by digitising it, but also by making it more attractive to students, considering that the curriculum is the means by which students develop their abilities and knowledge and become more informed and understanding of what is happening.
- Enabling school administrators to develop their techniques and methods of controlling and managing educational institutions in accordance with an interactive electronic system that does not exclude their role but rather enhances their ability to control, monitor and follow up continuously, thereby reducing the burden on human resources.

Analysing new data related to the current reality based on artificial intelligence technologies in education and clarifying their objectives and mechanisms for utilising them, such as virtual teachers, digital curricula, or smart tools in education. (Yassin Al-Hamwi, 2024, p. 101)

12.2 Artificial intelligence and ethics:

The ethics of artificial intelligence is not a philosophical concept of ethics, but rather we need to be clear about our use of the term ‘ethics.’ The concept of ethics is used for ethical discussion and key positions such as those based on the assessment of the moral agent's duty. Artificial intelligence has ethics such as systems ethics, which provide a set of ethical responses. The main challenge we face now is to coordinate current ethical approaches in a way that is useful for achieving societal benefit. Artificial intelligence software takes systems theory seriously as an ethical reference, through which it will need to find ways to combine methods and responses to ethical challenges. The responses and mitigation strategies proposed here do not claim to be comprehensive. There are many other bodies, including professional bodies, standardisation, certification and the use of AI incident databases, for example the proposed EU AI Act, and the creation of AI regulators such as professional bodies, trade unions, universities, ethics committees, the media and civil society.

12.2.2 Ethical conditions for the use of artificial intelligence:

Ethics in the context of artificial intelligence is a subject of concern for important companies, the European Commission, the European Parliament, the Council of Europe and

UNESCO. The European Commission's artificial intelligence experts have identified four ethical principles, which are:

- a. Respect for human autonomy.
- b. Harm prevention.
- c. Fairness.
- d. Explainability.

In addition to these ethical principles, the same group has presented six requirements that must be met for the development of artificial intelligence applications, namely:

- a. Human involvement and oversight.
- b. Technical robustness and safety.
- c. Respect for privacy and data management.
- d. Transparency and accountability.
- e. Social and environmental well-being.
- f. Diversity, non-discrimination and fairness.

13. Conclusion:

Major global companies continue to compete in the field of artificial intelligence technologies, resulting in the emergence of numerous methods and tools based on algorithms and information technology that enable researchers in various scientific, medical, financial, humanitarian and cultural fields to renew, transfer and develop information using modern methods and artificial intelligence.

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