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Applications of Artificial Intelligence in Higher Education in Algeria

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Abstract

This research paper aims to explore the applications of artificial intelligence in higher education in Algeria, in light of the growing interest among university lecturers, researchers, and students in using its applications in the field of higher education. The Algerian State has also attached great importance to this area. The study concluded that the application of artificial intelligence in higher education has become an unavoidable necessity, given the advantages it offers. It also emphasises the need to provide an appropriate environment for its proper and safe use, and training in its use.

Keywords: *Artificial Intelligence; Higher Education; Artificial Intelligence Applications.*

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Introduction

Artificial intelligence (AI) is considered one of the most important outcomes of the Industrial Revolution, as well as one of its greatest legacies and achievements, owing to the multiplicity and diversity of its uses across various fields, including political, military, economic, technical, service-related, and educational domains, among others. This has made it a central driver of progress and growth across all fields, including the education sector at all levels.

Higher education, through its various institutions, plays an important role in the lives of nations and peoples, as it shapes their present and defining their future. It is primarily responsible for preparing the various administrative, technical, and professional staff, among others, needed by society. It also addresses society's issues and problems, in addition to developing human knowledge. Hence, its institutions have become essential centres for community service. For this reason, the issue of developing university education, improving its level, enhancing its efficiency, controlling its cost, and ensuring the sound use of its resources has become one of the main issues currently raised in response to the challenges posed by rapid change in the different aspects of social and economic life and by the flow of knowledge in various fields as a result of scientific progress and its applications.

This has led the Ministry of Higher Education in Algeria to prioritise digitalisation, the modernisation of the sector, and the gradual move towards the employment and use of artificial intelligence in accordance with the objectives set to ensure the quality of higher education, within three fields as an initial roadmap: education, learning artificial intelligence, and preparing for it through the establishment of a scientific council for artificial intelligence at the level of the Ministry of Higher Education and Scientific Research, composed of experts in the field. Students, teachers, and administrators alike benefit from the advantages of artificial intelligence, owing to the advantages offered by its applications, particularly in processing large amounts of data rapidly and accurately. Its applications also improve teachers' professional performance in teaching, facilitate students' learning, and advance scientific research.

This study attempts to identify the applications of artificial intelligence in higher education in Algeria by answering the following questions:

- What is meant by artificial intelligence?
- What is the importance of using artificial intelligence in higher education in Algeria?

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- What are the main challenges of using artificial intelligence in Algerian universities?

Importance of the Study

The importance of the present study lies in its treatment of artificial intelligence as a contemporary topic of considerable importance and sensitivity, as interest in artificial intelligence applications has increased within academia worldwide. The importance of using these applications in higher education and their capacity to improve its outputs be overlooked. The present study contributes to understanding the nature of artificial intelligence and the importance of using it to improve the quality of university education to meet future educational needs, while clarifying the main challenges of its use in Algerian universities.

Objectives of the Study

- To identify the fundamentals of artificial intelligence.
- To identify the importance of using artificial intelligence in the higher education sector.
- To determine the main challenges facing the use of artificial intelligence in Algerian universities.

Methodology of the Study

The study used the descriptive analytical method, as it is the most appropriate for the nature of the subject, by clarifying the nature of artificial intelligence on the one hand, and analysing the importance of using artificial intelligence applications in improving and developing the outputs of higher education, as well as identifying the main challenges facing its application in Algerian universities, on the other.

The Nature of Artificial Intelligence

Definition of Artificial Intelligence

Artificial intelligence has been defined as "a branch of computer science concerned with creating intelligent machines capable of performing tasks that usually require human intelligence, such as learning, problem-solving, and decision-making. It can be said that artificial intelligence consists of systems and methods that study new concepts and tasks, enabling them to think, analyse, and infer, and to comprehend spoken language visually" (Al-Wardat, 2024, p. 24).

Artificial intelligence may also be defined as "a set of methods and applications that simulate human intelligent performance within technical systems, allowing these systems to make decisions and adapt to changes in data" (Rahali & Latrech, 2025, p. 233).

Thus, artificial intelligence in the field of university education constitutes a simulation of human knowledge and intelligence through electronic programmes and digital applications that can be employed to serve both faculty members and students.

The Emergence and Development of Artificial Intelligence

Artificial intelligence (AI) is a broad and fascinating field with a rich history. The earliest beginnings of artificial intelligence date back to 1956, when a group of computer scientists met at the "Dartmouth" Conference. Since then, the term artificial intelligence has come to refer to a promising technological future for human civilisation. A series of developments followed in subsequent years, culminating in significant expansion in 2015 due to the emergence of graphics processing units (GPUs), which are capable of performing parallel processing more rapidly and efficiently. The following is a brief account of the most important stages in the development of artificial intelligence over the years:

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- 1940–1950: The science of neural networks was established, with neural networks simulating and organising cells in the human nervous system. The researcher Alan Turing introduced a test bearing his name to evaluate machine intelligence and machine science.

- 1956: John McCarthy coined the term artificial intelligence, and its first programme was presented at Carnegie Mellon University.

- 1965: Joseph Weizenbaum built a computer programme for natural language processing to enable communication between humans and machines.

- 1990: Major progress was achieved in all areas of artificial intelligence, including machine learning, case-based reasoning, multi-agent planning, and scheduling.

- 2000: Interactive robots became commercially available.

- 2017: The Future of Life Institute Conference concluded with the formulation of several guiding principles for beneficial artificial intelligence research.

- 2018: An artificial intelligence model outperformed humans in language processing for reading and comprehension, and the "Google Duplex" service was announced (Jaqrief, 2024, p. 3).

The Importance of Artificial Intelligence in Education

In view of rapid technological developments, artificial intelligence has become one of the most prominent modern technologies to have affected the field of education. The following points highlight the importance of artificial intelligence in education:

- Contributing to increasing the efficiency of administrative work in the educational institution and reducing effort and time by completing routine operational tasks, including assessment, correction, and other tasks.

- Addressing the shortage of competent teachers in certain fields, assisting them in developing their abilities and facilitating their work, increasing teachers' productivity, and helping them make appropriate decisions to increase student participation and use more effective teaching methods.

- Enhancing the efficiency of curriculum development processes by identifying the skills and knowledge required at a given time.

- Promoting creativity and innovation and reducing economic, social, and other forms of disparity.

- Improving the quality of education and enhancing access to high-quality educational materials for different groups.

- Supporting students while taking different levels of intelligence into account, understanding their requirements and behaviour, and delivering lessons in a manner suited to their needs and abilities.

- Contributing to facilitating and accelerating the learning process.

- Assisting the teacher in carrying out certain diagnostic tasks and then making the appropriate decision for the educational situation.

- Providing the teacher with space to perform other tasks with accuracy and concentration (Al-Zahrani, 2014, p. 184).

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Types of Artificial Intelligence

The types of artificial intelligence vary according to the fields in which it is used and the methods it relies on. They may be divided into three main types, as follows (Ben Seghir & Regani, 2025, p. 533; Latroche, 2025, p. 14):

- **Narrow or weak artificial intelligence:** This is the simplest form of artificial intelligence, whereby artificial intelligence is programmed to perform specific functions within a defined environment. Its behaviour is considered a response to a particular situation, and it can only operate within its own environmental conditions. Narrow artificial intelligence cannot simulate human intelligence; rather, it uses sensors, such as vision, heat, images, and sound, with either a two-dimensional representation, such as avatars, digital assistants, and robots, or a three-dimensional representation, such as robots with muscles and artificial skin.

- **Strong or general artificial intelligence:** This type is characterised by the ability to collect and analyse information and to accumulate experience from the situations it encounters, which qualifies it to make decisions autonomously. Examples include self-driving vehicles. This type operates with a capacity similar to that of humans in terms of thinking, as it is based on a machine capable of independent thinking and planning, like the human mind.

- **Super artificial intelligence:** This is one of the models that are still under development that simulates the capacities of the human mind. Two main types may be mentioned: the first attempts to understand the "thoughts" produced by the human brain and the emotions that influence human behaviour, while the second is the "theory of mind" model. Therefore, such systems can express their internal state, anticipate others' feelings and opinions, and respond to them.

Characteristics of Artificial Intelligence

Artificial intelligence has many characteristics, including:

- The ability to solve problems even in the absence of complete information.
- Thinking, comprehension, and the acquisition and application of knowledge.
- Learning and benefiting from previous experiences and expertise.
- Employing previous expertise in new situations.
- Dealing with complex and difficult cases.
- The ability to process ambiguous situations in the absence of information.
- Distinguishing the relative importance of the elements of known situations.
- Creativity, imagination, understanding, and perception of visual phenomena.

Artificial Intelligence in Algerian Universities

Requirements for Applying Artificial Intelligence in Higher Education

- Raising awareness of artificial intelligence applications, introducing them, and fostering an educational environment receptive to them.
- Ensuring the safety and security of the transfer, translation, and localisation of artificial intelligence applications.

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➢ Using applications and programmesofficially, and ensuring that educational institutions and ministries contract directly with the companies that develop them.

➢ Providing training and qualification to develop the ability to use artificial intelligence applications.

➢ Verifying the accuracy of the information provided by the applications used.

➢ Ensuring intelligent and aware administrative leadership capable of providing qualified personnel and experts able to design and develop artificial intelligence applications.

➢ Providing qualified scientific staff and trained students who are capable of interacting and engaging with artificial intelligence applications.

➢ Providing technicians to maintain and repair computers and network failures.

The Importance of Artificial Intelligence Applications in Improving the Quality of University Education

Artificial intelligence applications, owing to their advantages, have become firmly established in the field of university education. They have facilitated activities on the university campus and transformed the learning process from its traditional form into interactive digital learning. The classifications of artificial intelligence in higher education include two fields. The first relates to the development of the educational process and includes the following:

• **Preparing lesson and course plans:** Among the most prominent tools used in this area are those that generate a lesson plan after questions and information are submitted concerning the topic to be prepared, in addition to their use in creating lesson material and preparing lesson plans.

• **Managing and automating tasks:** Through artificial intelligence applications that use machine learning algorithms, teachers can automate manual processes, thereby reducing their workload and saving time and effort. These activities include evaluating homework, preparing reports, and other tasks.

• **Virtual and personalised tutoring:** University teachers and students benefit from artificial intelligence applications for tutoring, enabling students to obtain academic support and identify their strengths and weaknesses.

• **Automatic grading:** Using machine-learning algorithms, tasks and assessments undertaken by teachers are graded automatically, facilitating the review of marks before they are announced to students.

• **Identifying knowledge gaps:** This is achieved by analysing students' data and creating a personalised assessment for each student, highlighting their weaknesses and the areas where their level needs improvement.

• **Preparing tests:** Some applications contribute to preparing tests and analysing students' data, based on which tests are designed.

• **Creating smart content:** Some applications generate smart content from digital textbooks and study guides, thereby enabling the provision of customised digital learning environments with numerous features and customisation options.

• **Detecting cheating in examinations:** University institutions benefit from artificial intelligence applications in detecting cheating behaviour during examinations through facial-recognition programmes or voice analysis, which verify the student's identity and detect suspicious behaviours.

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- **Providing secure learning systems:** University institutions use artificial intelligence technologies to create decentralised networks that prevent anyone from accessing stored data without authorisation, thereby limiting hackers' access to important data such as grades (Jaqrief, 2024, p. 7).

The second field includes applications designed to develop scientific research, including:

- **Data analysis and knowledge extraction applications:** Machine-learning and data mining tools enable the extraction of useful patterns and relationships from large datasets, thereby contributing to the discovery of new knowledge and research hypotheses.

- **Applications for simulating complex phenomena:** These include using neural networks to model the behaviour of living cells or to process complex climatic and environmental phenomena, thereby understanding and predicting their behaviour.

- **Natural language processing applications:** These include automatically summarising, classifying, and indexing the content of scientific research using deep learning algorithms.

- **Decision-support applications:** These include the use of predictive models to recommend the best research hypotheses or to determine priorities for expenditure on scientific research.

- **Applications for accelerating scientific discoveries:** This is achieved through the rapid simulation of laboratory experiments or self-learning mechanisms capable of independently formulating and testing research hypotheses (Pannu, 2015).

Based on this orientation, it may be stated that artificial intelligence in higher education can be applied in the following contexts: classroom teaching and interaction, homework, and personalised assessment tests, according to each case. These contexts pave the way for artificial intelligence-based education by providing customised educational content that suits each student's preferences and learning abilities. It can also be used to analyse vast amounts of data, such as students' attendance records and grades, thereby enabling teachers and administrators to make informed decisions quickly. Many artificial intelligence applications also assist in writing and publishing scientific research, as several tools specialise in performing parts of the research process, such as Google Scholar, Research Rabbit, Mendeley, and Grammarly (Kebir, 2025, p. 155).

Based on the foregoing, it may be said that artificial intelligence is of great importance in education, as it supports learners' self-directed learning and contributes to the creation of educational content and the presentation of information. It can also be used to assess students, record their grades, correct errors immediately, and provide detailed reports to teachers on their educational status, while also providing them with continuous assistance.

Challenges of Using Artificial Intelligence in the Algerian University

- **Infrastructure and technology:** This includes updating devices and networks and providing specialised software. In addition, intelligence-based systems require continuous maintenance and regular updates to ensure efficient operation. Failure to maintain these systems results in disruptions to the educational process.

- **Training and competence:** Faculty members and administrative staff may need additional training to understand how to use advanced technologies, such as artificial intelligence, in the educational and scientific research environment.

- **Privacy and security:** Artificial intelligence applications require processing large amounts of data, raising issues related to privacy and security. Universities are therefore required to adopt the necessary policies and procedures to protect the data of students and staff.

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- **Preserving human interaction:** Artificial intelligence should not replace the essential elements of learning based on human interaction. It is therefore necessary to ensure that relationships between teacher and student continue and are strengthened.

- **Excessive reliance on artificial intelligence:** Excessive reliance on artificial intelligence may diminish teachers' roles and the human element in learning, leading to a deterioration in students' interpersonal skills. To avoid this, reliance should be placed on blended learning, a model that combines artificial intelligence with traditional teaching methods. Teachers' use of artificial intelligence should also serve as an assistive tool, strengthening their roles rather than reducing them.

- **Integration of culture and technology:** Universities need to foster a culture of technology use and innovation among members of the university community to ensure the effective adoption of, and benefit from, new technologies (Babah, 2024, p. 123).

Conclusion

In conclusion, it is possible to affirm the importance of artificial intelligence across all aspects of life, given the vast technical capabilities these applications offer in higher education at several levels. In response to the questions raised by this research paper, the following points may be emphasised:

➢ Most definitions of artificial intelligence emphasise that it is a simulation of human intelligence through electronic programmes and digital applications that can be employed to serve both faculty members and students.

➢ The application of artificial intelligence in university institutions has become an unavoidable necessity, owing to the advantages it offers across teaching, scientific research, and administration, as well as its vast capabilities in other fields.

➢ The Algerian State, represented by the Ministry of Higher Education and Scientific Research, attaches great importance to the use and development of various smart technologies in the higher education sector through the establishment of several higher schools of artificial intelligence and the provision of specialised laboratories and centres to various universities across the national territory.

➢ On the basis of the findings of some studies and reports, the application of artificial intelligence in Algeria faces many challenges, including weak infrastructure and a lack of financial resources. Comprehensive strategies should therefore be adopted to strengthen the integration of artificial intelligence, higher education, and scientific research, develop technical capacities, and provide the necessary resources.

○ Thus, the present study recommends the following:

➢ Developing a national strategy for disseminating and mainstreaming artificial intelligence and big data technologies within the higher education and scientific research system.

➢ Developing the technological infrastructure necessary to integrate artificial intelligence into big data analysis within research programmes.

➢ Providing continuous training for teachers and administrators in the use of artificial intelligence applications in the field of university education.

➢ Establishing a legal and ethical framework governing the use of artificial intelligence, with local and international support.

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➢ Organising awareness-raising days for students to introduce them to the advantages and disadvantages of artificial intelligence and to the ways of benefiting from its advantages without exploiting it negatively in a manner contrary to the ethics of education and scientific research.

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