E-LEARNING

ΠΑΝΕΠΙΣΤΗΜΙΟ ΔΥΤΙΚΗΣ ΑΤΤΙΚΗΣ
UNIVERSITY OF WEST ATTICA

DEPARTMENT OF INFORMATION AND COMPUTER ENGINEERING

PART I THEORY

ARTIFICIAL INTELLIGENCE IN EDUCATION

TEAM MEMBER DETAILS

NAME : ATHANASIOU VASILEIOS EVANGELOS
STUDENT ID : 19390005
NAME : ROMANIUK VIKTOR
STUDENT ID : 713242017024

E-LEARNING

CONTENTS

Prologue **5**

References 6

1. Introduction to artificial intelligence and its application in the field of education **7**

Definition of Artificial Intelligence 7

Artificial Intelligence Application Areas 7

Artificial Intelligence in Everyday Life 12

The Ethics of Artificial Intelligence 12

Artificial Intelligence in Education 13

Expert Teaching Systems 13

Automated Evaluation Systems 15

Facial Recognition Systems 16

Early Warning Systems 16

Chatbots 17

Chatbot FAQ 17

Short Response Quiz Chatbox 18

Physical User Interface in Education 18

References 20

2. Using artificial intelligence to personalize education and adaptive learning **21**

Personalized Teaching 21

Evaluation 21

Persons with Special Needs 21

Data Analysis 22

Machine Learning (Machine Learning) 22

Deep Learning (Deep Learning) 22

Content Creation 22

Custom Knowledge Quizzes 22

Interactive Lessons 23

Educational Games 23

Customized Learning Programs 23

Collaborative Learning Platforms 23

Personalized Feedback 24

Adaptive Learning 24
Personalization of Learning 24
Real Time Feedback 24
Development of Autonomy and Self-Confidence 25
Data and Analysis 25
Personalized Learning 25
Incorporating a Variety of Educational Resources 25
Continuous Improvement and Adaptation 26
References 27
3. Analysis of problems that can be solved using artificial intelligence in the educational field 28
Personalized Learning 28
Evaluation and Feedback 28
Teacher Support 29
Learning Details 29
Support for Students with Special Needs 29
Virtual Assistants and Tutors 29
Emotion Recognition 30
References 31
4. Applications of artificial intelligence at different levels of education 32
Primary Education 32
Personalized Learning 32
Interactive Educational Games 32
Secondary Education 32
Suggestion Systems 32
Evaluation and Grading 33
Higher Education 33
Personalized Consulting Services 33
Research and Data Analysis 33
Administrative Functions 33
Management of Study Programs 33
Registration and Admission Support 33
Support for Students with Special Needs 34
Speech Recognition Technologies 34

Interactive Applications 34
References 35
Epilogue **36**
References 37

Prologue

Artificial intelligence is one of the most innovative technological developments, with applications that permeate every field of human activity. One of the areas where artificial intelligence has begun to demonstrate significant benefits is education [1].

The integration of artificial intelligence into the educational process promises to revolutionize traditional teaching and learning methods by adapting the educational experience to the needs of each student, automating assessment and providing support tools for teachers [1].

This report examines the use of artificial intelligence in education, analyzing its potential and applications at various levels of education.

We start with chapter 1 , where we give an introduction to artificial intelligence and its importance in the field of education.

Then, in chapter 2 , we look at how artificial intelligence can be used to individualize education and adaptive learning, offering personalized learning experiences.

This is followed by chapter 3 , where the problems that can be solved by the use of artificial intelligence in the educational field are analyzed.

Closing in chapter 4 , we present a multitude of applications of artificial intelligence at different levels of education.

References

[1] (Michail Paraskevas, ?): Artificial Intelligence in Education
https://eclass.uth.gr/modules/document/file.php/PRE_P_112/%CE%95%CE%BA%CF%80%CE%
B1%CE%B9%CE%B4%CE%B5%CF%85%CF%84%CE%B9%CE%BA%CF%8C%20%CF%85%CE%BB%CE%B9%CE%
BA%CF%8C%20%CE%B4%CE%B9%CE%B4%CE%AC%CF%83%CE%BA%CE%BF%CE%BD%CF%84%CE%B1%20%
CE%A0%CE%B1%CF%81%CE%B1%CF%83%CE%BA%CE%B5%CF%85%CE%AC%20%CE%9C%CE%B9%CF%87% CE%B1%CE%AE%CE%BB/01%20-%20%CE%94%CE%B9%CE%B1%CE%BB%CE%AD%CE%BE%CE%B5%CE%B9%CF%82/%CE%95_%CE%A4%CE%B5%CF%87%CE%BD%CE%B7%CF%84%CE%AE_%CE%9D%CE%BF%CE%B7%
CE%BC%CE%BF%CF%83%CF%8D%CE%BD%CE%B7_%CF%83%CF%84%CE%B7%CE%BD_%CE%95%CE%BA%CF%
80%CE%B1%CE%AF%CE%B4%CE%B5%CF%85%CF%83%CE%B7.pdf

1. Introduction to artificial intelligence and its application in the field of education

Definition of Artificial Intelligence

Artificial intelligence is the ability of a computer or device in general to simulate human cognitive functions, such as the ability to design, learn and create [4].

With the introduction of artificial intelligence, machines can now perceive their environment and interact with it to achieve some specific goal - purpose [3].

By using sensors such as:

1. Position
2. Temperature
3. Image (cameras)
4. Motion

collect and process information in order to choose the appropriate function – action [2]. Beyond data collection, these systems can be fed with existing data [1].

These systems are able to retain the previous states found and use them to achieve their next goal. In other words, they could be characterized as autonomous to a certain extent [4].

Artificial Intelligence Application Areas

Artificial intelligence as a field of computing, can contribute to any activity that has to do with human intelligence and thinking since that is exactly what it tries to emulate. As general areas of application of artificial intelligence are the following:

1. **Cognitive science:** Artificial intelligence is used to understand and replicate the cognitive functions of the human brain, such as learning and decision making [2].
2. **Mathematical sciences:** The algorithmic and mathematical design of artificial intelligence systems enables solving complex problems and analyzing big data [6].
3. **Informatics:** Artificial intelligence systems are widely applied in the development of software and applications that automate processes, improve performance, and enhance user experience [1].

Natural Language Processing

The specific branch is contained in the science of artificial intelligence and has as its main goal the interaction of man with the computer and more specifically the interaction with the use of natural language. This branch has done studies related to:

1. Discourse analysis
2. Automatic speech recognition
3. Automatic questions and answers
4. Automatic summary
5. Mechanical automatic translation
6. Automatic character recognition
7. Discourse composition and syntactic analysis [2]

Speech Recognition

Speech recognition in artificial intelligence aims to transform spoken language into written language. Factors that affect speech recognition are the pronunciation, volume and tone of the voice, but also external noise that may be present. When a person listens to someone else speak, in addition to their voice, they also observe facial expressions, gestures, factors that can very easily change the context. The ultimate goal of this science is for the computer to listen, infer context, and interpret it as if it were a real human [3].

Multisensory Interface

In this part, the artificial intelligence analyzes the sensory data and combines it, imitating the way a human perceives it. This is how they manage to gain experience and perception of the outside world.

Virtual Reality

We know that virtual reality is about simulating the real world to such an extent that the user feels like they are inside it. Artificial intelligence strengthens the industry and enables the user to talk and interact with his computer in real time.

Pattern Recognition

This branch deals with the identification and categorization of patterns or structures contained in data (usually numerical). Classification and clustering algorithms are used to form these structures. He tries to draw some conclusion and give them some value. It is usually applied in the commercial and financial fields for price prediction, but recently it has also been used in medical sciences, biotechnology and robotics [2].

Computer Vision

It is a field of artificial intelligence as well as machine vision that has to do with finding technologies that allow computers to recognize and process information contained in images or videos. They are trying to create systems that "see" the world like humans. These systems can help with production processes, quality control, data organization, etc. [2].

Robotics

Artificial intelligence is also helping the robotics industry quite a bit. It augments existing industry technologies with advanced machine learning algorithms to create intelligent and autonomous robots. Now robots can learn from their surroundings and adapt to it as well as to future situations. Below we will analyze some additional definitions and capabilities of robotics.

Visual Perception

By using vision, even artificial vision, the robot can interact with the space around it. It understands the environment, the objects and even the people that are there. Little by little, scientists are trying to develop robots to such a level that it will allow them to perceive even differences, such as in the shape, size of objects, colors. They will be able to be programmed to focus only on objects of interest, ignoring the rest of the world. Next stage is memory input, being able to remember things they have seen and recognize them quickly.

Tactility

Known as artificial touch, it can be used in various industries such as food production and surgery. Robots are able to perceive the shape, material and position of objects in space. With the texture they can "understand" what force they need to exert to keep an object stable and without injuring/breaking it.

Dexterity

Dexterity allows robots to handle different objects and react appropriately to different situations. At present, dexterity is a piece that needs further study. Their performance is very good in monitored and supervised areas. But when they find themselves in places for which

they were not designed, the result is sad. Today the effort is being made to improve their motor skills.

Locomotion

Locomotion is about methods of movement that robots use to be able to move from place to place. These methods can be moving with wheels, with 2 or more legs, and even a combination of the previous ones. Robots that use legs try to imitate human and animal movements. The end result is that the robots can decide for themselves which method of movement to use in the situation they find themselves in.

Navigation

Navigation is the ability for the robot to understand its position and orientation within a space and what is the route it should take to reach the desired destination. That is, he must calculate his current position and its distance from the final one. In addition to moving to the final destination, it must be able to avoid obstacles that it can detect in front of it.

Intelligent Agents

With the development of artificial intelligence, intelligent agents can better perceive their environment and the signals they receive from it. Their autonomous decisions are much better and at times can even be improved through learning. Their main goal is to maximize some performance with respect to the environment around them. Recently, their most widespread applications are automated assistants and autonomously driven vehicles [1].

Learning Systems

Learning systems or otherwise Machine Learning provides the possibility of learning in computers without them being strictly programmed. The goal is to build algorithms that take various data as input and can make predictions based on them. They also make it easier for researchers, engineers and analysts to make reliable decisions and identify correlations through learning and trending data.

Fuzzy Logic

Fuzzy Logic is the branch that deals with the study and mathematization of the structure of natural language using T.N. (Artificial Intelligence). They start from binary logic and expand it by introducing ambiguity and uncertainty so that it approaches our natural language, but keeping the principles of binary logic.

Genetic Algorithms

Genetic algorithms also use Artificial Intelligence to consider multi-parameter problems. In the given problems it is difficult to find values for the parameters using any analytical method. The purpose is for these values to make the system respond in the most desirable way to its demands.

Neural Networks

A neural network is a system that consists of processing units that are interconnected. These units are computing nodes which together form a network. Each such node receives some input from another node or generally from its environment, performs some calculation and produces some output. This output can be the result of some nodes reaching each other or fed to the next one. The most basic feature of neural networks is their ability to learn. Once the network is trained, it can efficiently and quickly produce a solution to a particular problem. The ultimate goal is for the network to be able to produce correct results for inputs it has not been trained with.

Artificial Intelligence in Everyday Life

Every day we come into contact with systems and applications that use artificial intelligence. A simple example is mobile phones - smartphones. These devices collect information about how the user uses their device on a daily basis in order to provide a personalized experience.

Most mobile phones provide virtual assistants. These assistants can relieve the user of repetitive processes, answer questions, and even suggest things themselves that benefit users. In general, they facilitate and make the user's interaction with his device more pleasant. All this is possible because of artificial intelligence.

Navigation apps also use artificial intelligence. According to the data they have collected from other users they can suggest better and faster routes to our destination and also modify them, as for example in cases of traffic jams.

In the field of security and specifically in matters of identification there is the implantation of artificial intelligence systems. They run algorithms on the user's biometric features such as fingerprints, facial and eye features to successfully identify them. Such systems combined with the usual passwords we use every day lead to an increase in our security.

Let's not forget IoT (Internet of Things) devices and how users benefit from them. They can automatically regulate temperatures in a space, coordinate traffic on the streets, manage energy better, etc. Little by little we notice their appearance even in cars. Now there is the possibility of cars operating autonomously without direct interaction with the driver, predicting road behaviors, recognizing risks and even preventing them [2][3].

The Ethics of Artificial Intelligence

From the previous chapters we can see that artificial intelligence has applications in various technological fields, we encounter it on a daily basis and it helps us to solve many problems we face. Its development rates are quite fast and new applications are constantly appearing. Its upward trajectory certainly has to do with the abundance of data it can collect from the internet but also the computing power that humans now have. All of this has raised questions about the ethics of artificial intelligence. The truth is that artificial intelligence "is only as moral as its programmer". There should be transparency in the algorithms it uses so that its users understand why certain decisions are made. The data used should not be biased. This can lead to wrong conclusions and discrimination. Also, during data collection, personal data should be protected. It is unethical to use them without consent to train artificial intelligence systems.

Lately there has been an intense debate throughout the technology community and also in the EU regarding its ethics. Last year, the first regulatory framework for it was published. Several universities are integrating courses related to the ethics of artificial intelligence into their curriculum. We can conclude that the issue that has been created is quite critical and important. Engineering, legal and ethical sciences must work together to provide a solution and regulation that ensures the ethical development of artificial intelligence [1][4].

Artificial Intelligence in Education

Artificial intelligence as we have seen can offer many things to achieve modernization. The area that we haven't mentioned yet and can privilege quite a bit is education. Its inclusion in the pedagogical framework improves efficiency, productivity as well as ease of learning.

Experienced Learning Systems

Experiential Learning Systems are systems that target learning functions. They use a variety of computer technologies as well as cognitive learning theories to enable effective, meaningful and immediate personalized learning. The basic idea is to provide a high quality and grade education to the students. These systems are constantly being improved and have been created by combining artificial intelligence with cognitive psychology.

The main difference between experiential learning systems and computer-assisted learning programs is the way they manage knowledge. Computer-based tutoring programs use sets of questions with predetermined answers. whereas expert teaching systems have a real representation of knowledge and with skepticism can adapt to the different needs that a learner may have.

Such a system is quite complex and consists of different units:

1. Student Modeling Unity

It is the collection of relevant information about users related to their level of knowledge. This information can be data about a student's abilities as well as his concentration and is very important for achieving personalized learning.

2. Pedagogical Module

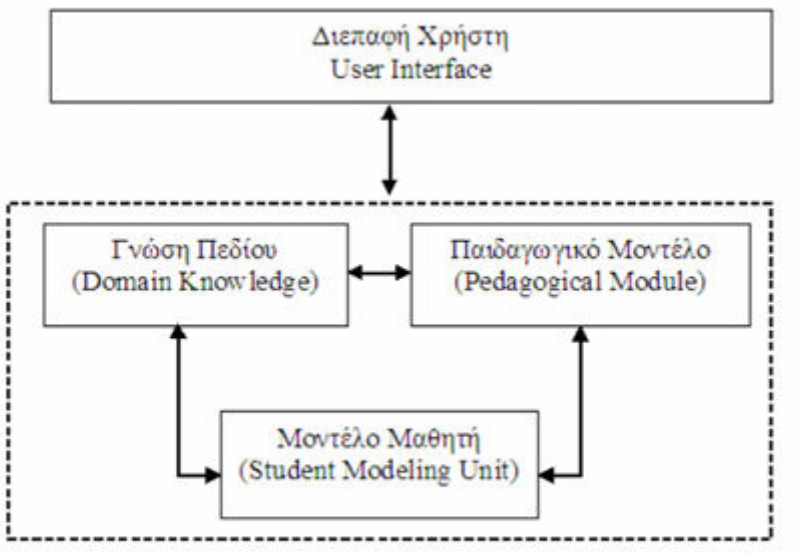
This unit is linked to the previous one and defines how the learning material will be presented to a student. It has to do with organizing the course based on the specifics of the user.

3. Domain Knowledge

Domain knowledge is also directly related to the student's model. Specifically it has to do with the educational material itself and not the way it will be presented to the students as we developed in the previous unit. The content of the training material itself is adjusted based on the user's preferences.

4. User Interface

The part of the system that has direct interaction with the user. The way in which it will be designed and implemented is very important to the satisfaction of the end user/student [5][6].



Σχήμα 4 Η δομή ενός Έμπειρου Διδακτικού Συστήματος

An example of an expert teaching system is the APLUSIX software. Its goal is to learn and practice algebraic writing and solving mathematical equations. It is used in parallel with the regular educational mode to provide an interactive environment for elementary and middle school students to make it more enjoyable for them to practice and improve their mathematical skills.

Aplusix Web

This software is easily accessible because it can be loaded onto mobile devices, which allows students to use it in different places and not just at school.

The teachers are given the opportunity to design mathematical problems that have to do with equations, inequalities, etc. and give them to the students to solve. In addition, they can easily post additional theoretical material using hyperlinks. The ability to communicate with the teacher is just as possible as using e-mail.

The end result is that students become more confident when they have to deal with mathematical problems [5][6].

Automated Evaluation Systems

Automated Assessment Systems have emerged in recent years and are one of the most promising applications of artificial intelligence in education. These systems have been created to automate the time-consuming process of evaluating, reading and grading papers. They provide tools to teachers which serve to reduce their workload as well as increase their productivity. Students are also satisfied because they can get their grades and appropriate feedback instantly.

In the beginning, these tools simply output the final grade of the paper without any additional information or comment. They can now make inferences about the style and quality of the student's writing and provide examples that students could follow to achieve an even better result. They can also distinguish between linguistic and non-linguistic characters such as mathematical formulas and extract metrics such as the number of words, lines and errors.

Such systems are often used by very large providers of open online courses such as EdX, Coursera, etc. So they can very quickly check the writings of thousands of students in a short period of time. In addition to these providers, such systems are also used in several universities.

There are people who do not agree with the use of such systems, because they believe that the results they produce are often wrong. The truth is that their use in more critical essays cannot replace the quality of feedback and critical assessment provided by a teacher [5][6].

Facial Recognition Systems

Recently Face Recognition Systems are used in various social fields. One field in which their appearance has been shown is the school environment. The aim is to enhance the safety of the students as well as the teacher, monitoring the facial expressions of the students and recognizing which student is present and which is absent in the school environment.

Monitoring the students' facial expressions aims to analyze the degree of understanding they show during their teaching in the classroom. From the expression we can understand several things, such as satisfaction, disappointment, surprise, etc. This information can be useful for teachers to evaluate the quality of the teaching they provide and if it needs changes.

With these systems we can get to the point of identifying in real time which students cannot understand the subject being taught to them and for the immediate intervention of the teacher. In other words, we could say that these systems collect all the emotional situations displayed by students in school [5][6].

Early Warning Systems

These systems have appeared in the last ten years. Their main goal is to identify students who are at risk of dropping out of school. They use probability and statistical models to track various indicators. These indicators can be the absences that a student has, the total marks that he gets, the credits. When these indicators reach or fall below a certain threshold, the system flags the student for appropriate intervention.

These systems have been enhanced with artificial intelligence so that the models they use become even more accurate [5][6].

Chatbot

It is software that interacts with the user in a natural way such as text and voice about a specific topic that concerns him. It is a kind of digital assistant that can answer questions and offer information on a specific topic. The use of ChatBots has increased in areas such as marketing, customer service, but is slowly appearing in the education sector as well.

They can very easily provide information related to assessments, assignment deadlines, email addresses, finding learning materials, scheduling meetings. It has been observed that ChatBots offer a more pleasant and effective learning experience and at the same time greatly reduce the administrative workload of teachers.

The first ChatBots that were created followed simple programming rules using if-else structures. Nowadays, however, artificial intelligence is also used with the use of machine learning and natural language.

Some of the most well-known ChatBots are Siri, Alexa, Cortana, etc. Their job is to facilitate the user in carrying out daily activities. In other words we could call them as virtual assistants [5][6].

FAQ Chatbots

These Chatbots initially started to be used in businesses so that the customer could ask questions to a virtual representative to get information about a product. In the part of education, questions related to how to evaluate a course, teaching hours, teaching rooms are quite common. The goal of this Chatbox is to anticipate such questions and provide an immediate and efficient response.

The biggest advantage of such kinds of Chatboxes is their constant availability. Anyone at any time can ask it something and get an answer. In a class where there is a large number of students, which leads to difficulty in communication between teacher and student, we are given the solution of the personalized approach.

If teachers notice that a question is being asked quite often by students, they can easily consider a different way of formulating a satisfactory answer.

In order to integrate this type of Chatbox in a school/institution, the database it uses must always be up-to-date. Also, students should be informed about the possibilities and functions it can offer them [5][6].

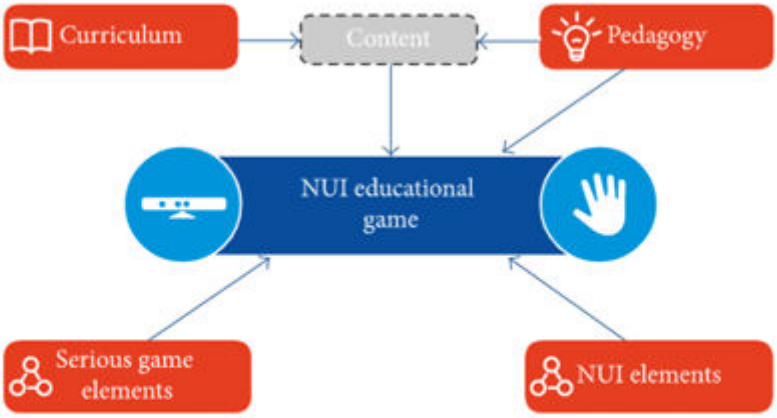
Short Response Quiz Chatbox

Short Response Quiz Chatbot is another type of Chatbot that is used to create and run short quizzes/tests. The answers given should be justified and then there will be personalized feedback. The personalization and the calculation of the degree of understanding are the important advantages that these Chatbots provide us.

Their creation is quite difficult and time-consuming. Like the previous Chatbots we mentioned they need a constantly updated database. Beyond that, their design is quite complex [5][6].

Physical User Interface in Education

Physical User Interface has recently taken the lead in human computer interaction. It is used in different fields as well as in the field of education. Educational games have been designed that use this technology and have managed to boost even a small amount of student performance in their classrooms. They do not use the traditional way of human interaction with the computer which is by using the mouse and keyboard but by sight, speech and movement. Such interfaces even have the ability to recognize faces and expressions, voices, fingerprints, emotions and even the intentions of their users [5][6].



Σχήμα 5 Μοντέλο Εκπαιδευτικών Παιχνιδιών NUI

These games work like this. Students enter a virtual world and with their bodies can physically interact with the learning material. The goal is for students to have a fun and personalized education. They target various subjects such as math, physics and even special education.

A well-known example of such a game is Kids Magic Learning. This game used the Kinect sensor. The aim of the game was to practice memory, coordination and mathematics [5][6].

Kinect in the classroom | Jumpido: Educational games for Kinect

References

[1] (Vassilios Tzorgzis, 2022): Artificial Intelligence and its Utilization for the benefit of technology and man
https://polynoe.lib.uniwa.gr/xmlui/bitstream/handle/11400/1765/Tzortzis_99.pdf?sequence=3&isAllowed=y

[2] (Europarl.Europa.EU, 2021) : What is artificial intelligence and how is it used?
https://www.europarl.europa.eu/topics/el/article/20200827STO85804/ti-einai-i-techniti-noimosuni-kai-pos-chrisimopoieitai

[3] (Eugene Rudenko, 2024) : Artificial Intelligence in Mobile Apps
https://nix-united.com/blog/mobile-artificial-intelligence-when-apps-get-smarter/

[4] (Michail Paraskevas, ?): Artificial Intelligence in Education
https://eclass.uth.gr/modules/document/file.php/PRE_P_112/%CE%95%CE%BA%CF%80%CE%B1%CE%B9%CE%B4%CE%B5%CF%85%CF%84%CE%B9%CE%BA%CF%8C%20%CF%85%CE%BB%CE%B9%CE%BA%CF%8C%20%CE%B4%CE%B9%CE%B4%CE%AC%CF%83%CE%BA%CE%BF%CE%BD%CF%84%CE%B1%20%CE%A0%CE%B1%CF%81%CE%B1%CF%83%CE%BA%CE%B5%CF%85%CE%AC%20%CE%9C%CE%B9%CF%87% CE%B1%CE%AE%CE%BB/01%20-%20%CE%94%CE%B9%CE%B1%CE%BB%CE%AD%CE%BE%CE%B5%CE%B9%CF%82/%CE%95_%CE%A4%CE%B5%CF%87%CE%BD%CE%B7%CF%84%CE%AE_%CE%9D%CE%BF%CE%B7%CE%BC%CE%BF%CF%83%CF%8D%CE%BD%CE%B7_%CF%83%CF%84%CE%B7%CE%BD_%CE%95%CE%BA%CF%80%CE%B1%CE%AF%CE%B4%CE%B5%CF%85%CF%83%CE%B7.pdf

[5] (Ioannis Desyllas, 2022): Artificial intelligence as an innovation strategy in the educational process
https://dione.lib.unipi.gr/xmlui/bitstream/handle/unipi/14961/Desyllas_21028.pdf?sequence=1&isAllowed=y

[6] (Nikoletta Samara, 2021): Artificial intelligence and its applications in education
https://dione.lib.unipi.gr/xmlui/bitstream/handle/unipi/14067/Samara_17043.pdf?sequence=3&isAllowed=y

2. Using artificial intelligence to personalize education and adaptive learning

Artificial intelligence (AI) has the potential to revolutionize the educational process through personalization and adaptive learning. Key uses of artificial intelligence include:

Personalized Teaching

Intelligent AI systems can analyze student performance data and adapt teaching content and activities to each student's needs and capabilities, providing targeted feedback and additional resources [4].

Evaluation

Through personalized teaching, artificial intelligence can identify students' weaknesses and strengths in real time, allowing teachers to have a more direct and effective assessment. For example, in a test, instead of students waiting for some time for the results to be posted, thanks to intelligent artificial intelligence systems, they see the results directly upon completion of the test [1][4].

People with Special Needs

Through intelligent artificial intelligence systems, people with special needs are not excluded from education, as artificial intelligence has adapted its technologies to provide learning even to those people who find it difficult to adapt. For example, there are technologies that translate the teacher's voice from the microphone into text, so a person with a hearing problem can read what the teacher says in the lecture and be as interactive and productive as the rest of the students [1][4].

In summary, personalized instruction enhances the effectiveness of learning and improves student progress with the immediacy of assessment through personalized exercises.

Data Analysis

Through data analysis, AI can identify learning patterns and difficulties students may be experiencing, allowing educators to intervene early with appropriate instructional strategies.

Machine Learning and Deep Learning models have important applications in education, contributing to the personalization of the learning experience and the more efficient management of educational resources.

Machine Learning

It is a field of artificial intelligence that allows systems to learn and improve from experience without being explicitly programmed. It is used to create adaptive learning platforms, analyze student progress and predict their learning needs.

Deep Learning

It is an important field of machine learning based on neural networks with many layers. It is used to develop advanced tools that can recognize and analyze voice and images, as well as to personalize learning experiences through big data analysis.

In education, data analytics technologies help monitor student performance and provide real-time feedback, allowing educators to tailor instructional materials to student needs.

Content Creation

AI can create educational materials that are tailored to the needs of students, such as customized knowledge quizzes, interactive lessons, and educational games that enhance active learning and keep students engaged in the course [3].

Custom Knowledge Quizzes

Artificial intelligence can create quizzes that adapt to each student's knowledge level. Depending on the student's answers, the AI can adjust the difficulty of the questions and provide real-time feedback. This helps students identify their weaknesses and focus on specific areas that need improvement.

Interactive Lessons

Interactive lessons generated by artificial intelligence can include customized learning paths that take into account each student's pace and learning style. AI can analyze student

progress and adjust course content accordingly, ensuring the student stays engaged and fully understands the material.

Educational Games

Artificial intelligence can create educational games that incorporate elements of fun into the educational process. These games enhance active learning and keep students engaged in the lesson. Through games, students can learn new concepts, practice skills and improve their critical thinking.

Customized Learning Programs

By analyzing student performance data, AI can design customized learning programs that meet each student's needs. These programs can include a combination of interactive lessons, videos, exercises and games, ensuring a well-rounded learning experience.

Collaborative Learning Platforms

Artificial intelligence can be integrated into collaborative learning platforms, allowing students to collaborate on projects and exchange ideas with peers from different geographic regions. AI can help group students based on their interests and knowledge levels, enhancing collaboration and knowledge sharing.

Personalized Feedback

Through the use of technologies such as natural language processing, artificial intelligence can provide personalized feedback to students. This includes explaining mistakes, providing examples and suggestions for further study, helping students to improve their performance and gain a deeper understanding of the learning material.

The use of artificial intelligence in education opens new horizons for the personalization of learning by making the educational process more efficient and adapted to the needs of students. Teachers can leverage these tools to enhance their teaching work and provide a more complete and engaging educational experience.

Adaptive Learning

Adaptive learning algorithms allow students to progress at their own pace by receiving personalized exercises and feedback, which enhances their autonomy and self-confidence [1].

Adaptive learning is an educational approach that uses artificial intelligence technologies and algorithms to adapt educational material to the needs, abilities and learning pace of each student. This method has proven to be highly effective in improving the learning experience and student performance. Some important elements of adaptive learning are as follows:

Personalization of Learning

Adaptive learning algorithms analyze student performance and interactions with the learning material. Based on this data, they adjust the content, exercises and course structure to meet the unique needs of each student. This means that students can progress at their own pace and focus on the areas where they need more practice.

Real Time Feedback

One of the biggest challenges in traditional education is the lack of immediate feedback. Adaptive learning algorithms solve this problem by providing real-time feedback. Students can instantly see if their answers are right or wrong and get explanations and additional information to improve their understanding.

Development of Autonomy and Self-Confidence

Adaptive learning enhances student autonomy by allowing them to control the pace and course of their learning. This freedom helps them develop confidence in their abilities, as they see that they can progress and achieve their goals based on their own efforts.

Data and Analysis

Adaptive learning algorithms use large data sets to analyze student performance and behaviors. This analysis allows teachers to have a clear picture of each student's progress, identify weaknesses and adjust their teaching methods accordingly.

Personalized Learning

Students do not learn in the same way or at the same pace. Adaptive learning algorithms create personalized learning that is designed to meet the needs and interests of each student. This leads to a more efficient and enriched learning experience.

Incorporating a Variety of Educational Resources

Adaptive learning uses different types of learning resources, such as videos, interactive simulations, texts, and exercises, to ensure that students have access to material that suits their learning style. This variety helps maintain student interest and engagement.

Continuous Improvement and Adaptation

Adaptive learning algorithms are not static. Instead, they are constantly learning and improving as they receive new data from student interactions. This means that the quality and accuracy of their suggestions and adjustments improves over time.

Adaptive learning is changing the landscape of education, making it more flexible, efficient and tailored to the needs of students. This approach enhances the learning experience and helps students achieve their educational goals with greater confidence and autonomy.

The application of artificial intelligence in education promises a more efficient and personalized learning experience, adapted to the needs of each student [5].

References

[1] (Georgia Vlamaki, 2024): Artificial Intelligence in Education
https://welcome.etwinning.gr/archives/349

[2] (Vassilios Tzortzis, 2022): Artificial Intelligence and its Utilization for the benefit of technology and man
https://polynoe.lib.uniwa.gr/xmlui/bitstream/handle/11400/1765/Tzortzis_99.pdf?sequence=3&isAllowed=y

[3] (Māiri Tsaousidou, 2024): Artificial Intelligence Applications for Education
https://blogs.sch.gr/mtsaousid/2024/02/14/efarmoges-technitis-noimosynis-gia-tin-ekpaideysi/

[4] (Angelos Alexopoulos, 2023) : Artificial intelligence in education: Perspectives and challenges
https://www.alfavita.gr/ekpaideysi/421718_i-tehniti-noimosyni-stin-ekpaideysi-prooptikes-kai-prokliseis

[5] (Lykavitos.gr, 2023): The role of Artificial Intelligence in Education
https://www.lykavitos.gr/news/planet/texniti-noimosyni-stin-ekpaideysi

3. Analysis of problems that can be solved using artificial intelligence in the educational field

Artificial intelligence offers many solutions to the problems facing the education sector, helping to improve the quality and effectiveness of teaching.

Problems can be solved by using artificial intelligence in the educational field such as:

Personalized Learning

Artificial Intelligence can adapt educational materials to the needs of each student, providing a personalized learning experience based on their performance and interests [1].

Also, artificial intelligence has the potential to customize the student experience in the education space. By analyzing performance data and student interests, AI systems can create customized educational programs. This includes selecting appropriate learning materials, adjusting the difficulty of exercises and providing appropriate feedback. Thus, each student learns at their own pace, which increases learning engagement and effectiveness.

Evaluation and Feedback

Artificial intelligence can automate the student assessment process, providing immediate feedback and highlighting areas that need improvement [3].

Automating the assessment process through artificial intelligence reduces teacher workload and speeds up the feedback process. AI systems can grade quizzes and exercises, recognize mistakes, and provide instant feedback to students. This allows students to better understand their weaknesses and improve quickly.

Teacher Support

Teachers can use AI systems to prepare teaching materials and design lessons more effectively, saving time and improving the quality of teaching [4].

Artificial intelligence can help educators prepare teaching materials, plan lessons, and develop instructional strategies. Using data analysis, AI can provide insights into student preferences and performance, helping educators adjust their teaching methods. This saves time and improves the quality of teaching.

Learning Details

AI can analyze student performance data to identify trends and patterns, helping schools make better decisions about curriculum and teaching methods [5].

AI can analyze student performance data to identify trends and patterns. This information can be used by schools to improve their curriculum and teaching methods. This way teachers and administrators can make informed decisions that improve the overall educational experience

Support for Students with Special Needs

Artificial intelligence can develop customized tools and applications for students with special needs, facilitating their access to education [2].

Artificial intelligence can develop customized tools and applications for students with special needs. For example, speech recognition and natural language processing technologies can help students with dyslexia or other learning disabilities. AI systems can also tailor educational content to fit the unique needs of these learners, making it easier for them to access education.

Virtual Assistants and Tutors

Virtual assistants and tutors can provide support to students whenever needed by answering questions and providing guidance. These virtual assistants can operate 24/7, offering continuous assistance and encouraging self-learning.

Recognition of Emotion

Artificial intelligence can recognize students' emotions by analyzing their voice, facial expression or interactions with the digital environment. This technology can help teachers when students are stressed, bored or struggling, allowing appropriate support to be provided.

The integration of artificial intelligence into education offers a variety of possibilities to improve the learning and teaching experience. Applied correctly, AI can help create a more adaptive, efficient and equitable education system.

References

[1] (Wikipedia, 2019) : Problem solving (artificial intelligence)
https://en.wikipedia.org/wiki/%CE%95%CF%80%CE%AF%CE%BB%CF%85%CF%83%CE%B7_%CF%80%CF%81%CE%BF%CE%B2%CE%BB%CE%B7%CE%BC%CE%AC%CF%84%CF%89%CE%BD_(%CF%84%CE%B5%CF%87%CE%BD%CE%B7%CF%84%CE%AE_%CE%BD%CE%BF%CE%B7%CE%BC%CE%BF%CF %83%CF%8D%CE%BD%CE%B7)

[2] (Internetsafety.pi.ac.cy, 2022) : Use of Artificial Intelligence and data in teaching
https://internetsafety.pi.ac.cy/artificial-intelligence-and-data-in-teaching-and-learning/

[3] (Sotiris Douklias, 2023): Artificial intelligence and the future of education
https://www.linkedin.com/pulse/%CE%B7-%CF%84%CE%B5%CF%87%CE%BD%CE%B7%CF%84%CE%AE-%CE%BD%CE%BF%CE%B7%CE%BC%CE%BF%CF%83%CF%8D%CE%BD%CE%B7-%CE%BA%CE%B1%CE%B9-%CF%84%CE%BF-%CE%BC%CE%AD%CE%BB%CE%BB%CE%BF%CE%BD-%CF%84%CE%B7%CF%82-%CE%B5%CE%BA%CF%80%CE%B1%CE%AF%CE%B4%CE%B5%CF%85%CF%83%CE% B7%CF%82-%CF%83%CF%84%CE%B7-douklias

[4] (Māiri Tsaousidou, 2024): Artificial Intelligence Applications for Education
https://blogs.sch.gr/mtsaousid/2024/02/14/efarmoges-technitis-noimosynis-gia-tin-ekpaideysi/

[5] (Angelos Alexopoulos, 2023) : Artificial intelligence in education: Perspectives and challenges
https://www.alfavita.gr/ekpaideysi/421718_i-tehniti-noimosyni-stin-ekpaideysi-prooptikes-kai-prokliseis

[6] (Lykavitos.gr, 2023): The role of Artificial Intelligence in Education
https://www.lykavitos.gr/news/planet/texniti-noimosyni-stin-ekpaideysi

4. Applications of artificial intelligence at different levels of education

Artificial intelligence has been introduced at various levels of education with multiple applications that enhance the learning process and administrative functions.

It has been implemented at all levels of education, from primary and secondary to tertiary education, with the aim of improving both the learning process and administrative functions.

Indicative applications of artificial intelligence appearing in education by level are as follows:

Primary Education

Personalized Learning

Platforms like DreamBox and Knewton offer personalized learning programs that adapt to each student's needs, enhancing learning through exercises and content that match their performance and preferences.

Interactive Educational Games

Games like Spot the Difference and other educational software use artificial intelligence to create fun and educational experiences that improve children's observation, concentration and problem-solving skills.

Secondary Education

Suggestion Systems

Platforms like Coursera and Khan Academy use artificial intelligence to recommend educational videos, articles and resources to students based on their performance and interests, helping them enhance their learning.

Evaluation and Scoring

Systems like Gradescope use artificial intelligence to automate the grading of assignments and exams, providing objective feedback and reducing teacher workload.

Higher Education

Personalized Consulting Services

Systems like IBM Watson Education help students choose courses and careers based on their performance and interests, providing personalized advice and guidance.

Research and Data Analysis

Data analysis tools that use artificial intelligence, such as Google AI and Microsoft Azure Machine Learning, help researchers analyze large data sets and spot patterns and trends.

Administrative Functions

Management of Study Programs

Systems like Brightspace and Blackboard use artificial intelligence to analyze student performance and help educational institutions adjust and improve curricula.

Enrollment and Admissions Support

Systems like AdmitHub use artificial intelligence to automate and streamline the admissions and admissions process by helping institutions evaluate student applications and predict student success.

Support for Students with Special Needs

Speech Recognition Technologies

Tools like Dragon NaturallySpeaking help students with dyslexia or other learning disabilities turn their speech into text, making education easier to access.

Interactive Applications

Apps like Proloquo2Go help students with autism develop social skills and communicate effectively.

Artificial intelligence is transforming education by offering personalized learning experiences, improving administrative functions and providing support for students with special needs. By incorporating these technologies, education systems become more efficient, flexible and equitable, offering better learning opportunities for all students

References

[1] (Misthou Stavroula, Paliouras Aristidis, Irini Papadopetraki, Kyriakos Dimitris, Amanatidis Nikolas, 2021) : Introduction of Artificial Intelligence in Primary and Secondary Education
researchgate.net - Introduction of Artificial Intelligence in Primary ...

[2] (Seitos Dimitris, 2024) : Application of artificial intelligence in the creation of game 'Find the differences'. An analysis of technological development in entertainment and education
polynoe.lib.uniwa.gr - Application of artificial intelligence in the creation of ...

[3] (Theresia Giakoumatou, 2021) : Artificial intelligence in education
slideshare.net - Artificial intelligence in education | PPT

[4] (Tsousidou Mary, 2024) : Applications of Artificial Intelligence for education
blogs.sch.gr - Applications of Artificial Intelligence for education

[5] (Grigoris Milopoulos, 2023) : Artificial Intelligence (AI) in School Education: There is no AI without …HI
startupper.gr - Artificial Intelligence (AI) in School Education: No ...

Epilogue

Artificial intelligence has begun to transform the education sector in ways that the human community could not have imagined. The potential of artificial intelligence to individualize education, adaptive learning and optimize administrative functions is invaluable. From providing personalized learning experiences and automating assessment, to supporting teachers and analyzing performance data, artificial intelligence is opening new avenues for improving the quality of education.

However, the application of artificial intelligence in education brings with it challenges that must be addressed. Issues such as data privacy, the ethical use of technology, and the need for ongoing training of teachers and students in the use of new technologies are issues that require careful management.

In summary, artificial intelligence offers a unique opportunity to redefine the way we learn and teach. With the right approach and the cooperation of all involved, this technology can help create an educational environment that promotes learning, innovation and student development, offering better opportunities for the future.

With the further development and integration of artificial intelligence in education, we can hope for a more fair, adaptive and efficient education system that will meet the needs of all students, regardless of their peculiarities and abilities.

References

[1] (Savvas Hatzichristofis, 2023) : Adaptive Learning and Artificial Intelligence: Revolution in Education with Artificial Intelligence

https://speaknews.gr/2023/10/13/prosarmostiki-mathisi-kai-techniti-noimosyni-epanastasi-stin-ekpaideysi-me-tin-techniti-noimosyni/

[2] (Georgia Vlamaki, ?) : Artificial intelligence in education: Meeting technology with knowledge

https://welcome.etwinning.gr/archives/349

E-LEARNING

Thank you for your attention