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The Potential Applications of Artificial Intelligence (AI) in the Field of Education

Abstract
The article characterizes the possibilities of applying artificial intelligence technologies in society, which lead to a large-scale digital transformation. The author reveals the wide possibilities of applying artificial intelligence in all spheres and processes of human activity. The latest artificial intelligence tools that allow generating new content, creating new products, speeding up business transactions, and solving complex management issues are systematized. The possibilities of individual artificial intelligence tools for activating and updating the content of educational activities are revealed. The importance of realizing the possible challenges and threats associated with the spread of artificial intelligence technologies is emphasized.

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1 Introduction

Rapid digitalization and platformization in the modern world are leading to a comprehensive digital transformation, fundamental changes in all areas of social activity: economy, politics, education and science, medicine, etc. The spread of AI and IoT technologies not only speeds up all processes and transactions, but these tools transform the entire system of knowledge generation, dissemination, and use.

In the education system, the use of AI-based tools creates new opportunities. The main function of education is the transfer and assimilation of knowledge by students. These tools allow us to give new meaning to all stages of the knowledge transfer process.

The purpose of the article is to analyze and systematize the latest opportunities for using artificial intelligence tools in the education system.

Results. In general, the term "artificial intelligence" refers to computer systems that can perform tasks that are usually performed by human intelligence. These include language understanding, pattern recognition, decision-making, and data-driven learning. This field is developing very rapidly and focuses on creating smart machines and algorithms to solve complex problems, improve automation and decision-making in various applications.

Artificial intelligence (AI) can be used in many areas of human activity:

– in medicine: in diagnosing diseases, developing medicines, managing medical resources and predicting diseases;

– in finance: in predicting financial trends, calculating risks, optimizing portfolios and automating financial processes;

– in transport: for road sign recognition, automatic car control, route planning and calculating the most efficient transport connection;

– in energy: in predicting energy consumption, optimizing electricity distribution and managing the energy grid;

– in agriculture: to determine the need for irrigation and fertilization, forecast yields, and manage automated agricultural systems;

– in commerce: to personalize advertising offers, analyze customers and their behavior, and automate customer service processes.

The possibilities of applying AI technologies are virtually unlimited and are constantly expanding with the development of innovations.

The concept of Generative AI (GenAI) has emerged, a type of artificial intelligence that can create a variety of data, such as images, video, audio, text, and 3D models. It does this by learning patterns from existing data and then using this knowledge to create new and unique outputs. GenAI is able to create highly realistic and complex content that mimics human creativity, making it a valuable tool for solving complex problems in many industries, creating artwork, and even assisting in scientific research. (All Things Generative AI)

Generative AI programs such as ChatGPT, GitHub Copilot, Stable Diffusion, and others can perform many routine functions such as reorganizing and classifying data. But it's their ability to write text, compose music, and create digital art that has caught the attention of various users. Generative AI technologies are spreading at an incredible rate. ChatGPT was released in November 2022. Four months later, OpenAI released a new large language model, or LLM, called GPT-4 with significantly improved capabilities. Likewise, by May 2023, Anthropic's generative artificial intelligence, Claude, was able to process 100,000 tokens of text, which equates to roughly 75,000 words per minute-the length of an average novel-compared to roughly 9,000 tokens when it was introduced in March 2023. And in May 2023, Google announced several new features based on generative artificial intelligence, including Search Generative Experience and a new LLM called PaLM 2 that will power its Bard chatbot, among other Google products. (The economic potential of generative AI)

The most well-known and widespread AI tools are the following:

Chatbots and Virtual Assistants: Chatbots such as Siri and virtual assistants such as Alexa use AI to understand and respond to queries in natural language, providing information and performing tasks such as setting reminders or controlling smart home devices.

Recommendation Systems: Platforms such as Netflix and Amazon use AI to analyze user preferences and behavior to recommend movies, products, and content tailored to individual tastes.

Image Recognition: AI is used in image recognition applications such as face recognition to unlock smartphones or identify people in photos. It is also used for medical image analysis and in self-driving cars to recognize and react to objects on the road.

Natural Language Processing (NLP): Artificial intelligence language models such as GPT-3.5 can generate human-like text, answer questions, or even translate languages. NLP is also used in sentiment analysis to understand public opinion on social media.

Autonomous Vehicles: Self-driving cars rely on artificial intelligence to perceive their environment, make decisions, and navigate safely without human intervention. They use sensors, cameras, and machine learning algorithms.

Medical Diagnosis: AI is used to help medical professionals diagnose diseases and conditions, analyze medical images such as X-rays and MRIs, and predict patient outcomes.

Fraud Detection: Financial institutions use AI to detect fraudulent transactions by analyzing customer behavior patterns and transaction data.

Gaming: AI is used in video games to create intelligent non-player characters (NPCs) and opponents. These NPCs can adapt to the player's actions and create an interesting gaming experience.

Language Translation: AI-based translation tools, such as Google Translate, use machine learning to provide real-time translation between languages.

Robotic Process Automation (RPA): Businesses are automating repetitive tasks with software robots that can perform data entry, form filling, and other rule-based operations, increasing efficiency.

The proliferation of various AI tools is revolutionizing functional processes (regardless of application), such as:

– search, retrieval and analysis of information;

– content creation, which is extremely relevant for many areas, such as marketing, public activities, education, science, etc;

– market communication – automation of certain operations and customer interaction;

– management of technological, logistics, and production processes.

AI tools are widely used in marketing, helping to create advertising content, improve customer interaction, plan and forecast sales. Content is the main driving force of marketing, and its preparation, message automation, and customer interaction are important success factors. AI marketing tools can help with this by optimizing the content creation process. It can automate messages or improve engagement across various social media marketing platforms.

Artificial intelligence (AI) also has great potential for change in the education sector, creating new opportunities for learning and development. The possibilities of using AI in education are also diverse:

1. Personalized learning: AI can adapt learning to the needs and individual abilities of students. It can analyze students' responses, identify their strengths and weaknesses, and offer personalized tasks and materials.

2. Virtual assistants: AI can function as virtual assistants that help learners solve problems, answer questions, and provide explanations. They can be available at any time and help learners at all stages of learning.

3. Data analysis and efficiency: AI can analyze large amounts of learning data, recognize trends, and look for ways to improve. AI tools can help teachers and educational institutions understand how students are learning and suggest improvements in the learning process.

4. Interaction with students: AI can interact with learners through chatbots or voice interfaces, answering questions, stimulating dialog, and providing additional explanations.

5. Online learning: AI can develop interactive courses and platforms for distance learning. It can provide access to high-quality materials and resources for students anywhere and anytime. The development of AI in education is the trend of the future, but there are also questions about ethics, privacy, and risks associated with its use. Therefore, it is important to develop adequate policies and regulations for the use of AI to ensure maximum efficiency and safety in education.

A neural network is a computational model inspired by the structure and functioning of the human brain. It consists of interconnected nodes (neurons) organized into layers to process and learn from data. Neural networks are used in machine learning and artificial intelligence to solve complex tasks, such as pattern recognition, image analysis, and natural language processing, by adjusting the strength of connections (weights) between neurons during training to create predictions or classifications. They are a fundamental component of deep learning, a subfield of artificial intelligence known for its ability to solve complex problems.

GPT-3.5/4.5 (Generative Pre-trained Transformer): GPT – is a state-of-the-art language model developed by OpenAI. It is known for its ability to generate coherent and contextually relevant text similar to human speech. It is widely used in natural language processing tasks such as text generation, translation, and question answering.

ResNet (Residual Neural Network): ResNet – is a deep convolutional neural network architecture that is particularly effective for image classification tasks. The use of residual connections allows training very deep networks, which leads to increased accuracy.

BERT (Bidirectional Encoder Representations from Transformers): BERT is a transformational model developed by Google. It is designed to understand the context of words in a sentence, which makes it very effective for various NLP tasks, including sentiment analysis, text classification, and question answering.

YOLO (You Only Look Once): YOLO is an object detection neural network that can quickly and accurately detect and locate objects in images or video footage. It is used in applications such as autonomous driving, video surveillance, and real-time object tracking.

AlphaZero: AlphaZero – is a neural network-based artificial intelligence developed by DeepMind that can play board games such as chess, shogi, and go at a superhuman level. It learns by playing on its own and has achieved significant success in these games, outperforming human champions.

A generative neural network is a type of artificial neural network designed to create new instances of data that resemble a given data set. Unlike discriminative networks, which classify or make decisions, generative networks focus on learning and creating data, such as images, text, or other types of information. These networks use techniques such as variational autoencoders (VAEs), generative adversarial networks (GANs), and autoregressive models to create data samples that exhibit similar statistical patterns and characteristics to the original data set. Generative neural networks are used in image synthesis, text generation, data augmentation, and creative tasks to create realistic and novel content (Figure 1).

Generative Adversarial Networks (GANs): GANs remain one of the most popular generative models. They continue to evolve and are used in a variety of areas, including image generation, text-to-picture synthesis, and style transfer (What are GANs).

Variational Autoencoders (VAEs): VAEs are widely used for generative tasks. They are used to generate images, smooth data, and create latent spaces for structured data representation.

Transformers (e.g., GPT-3.5/4.5): Transformer models, such as GPT-3.5/4.5, have gained immense popularity due to their natural language generation capabilities. They are used for text generation, translation, and numerous NLP tasks.

DALL-E: OpenAI's DALL-E model combines text and images to generate new images from text descriptions. It is known for its ability to produce creative and conceptually diverse visual content.

StyleGAN and StyleGAN2: These are types of GANs specially designed for high-quality image synthesis and style rendering. They are used to create realistic faces, works of art, and new visual content.

A Large Language Model is a type of artificial intelligence system designed to understand and generate human speech. It is built on large neural networks, often containing tens of billions of parameters, which allows it to process and generate text that appears coherent and contextually relevant. These models are capable of performing a wide range of natural language processing tasks, such as text generation, translation, question answering, and sentiment analysis. Their size and complexity make them capable of capturing complex speech patterns, making them valuable tools in a variety of applications, from chatbots and virtual assistants

to content generation and data analytics. (What are large language models)

GPT-3.5/4.5 (Generative Pre-trained Transformer): Developed by OpenAI, GPT is one of the largest language models with 175 billion parameters. It is known for its excellent language generation capabilities and wide range of applications in natural language processing.

BERT (Bidirectional Encoder Representations from Transformers): BERT, developed by Google, has 340 million parameters. It is designed to understand the context of words in a sentence and is used for tasks such as text classification and sentiment analysis.

T5 (Text-to-Text Transfer Transformer): T5, also from Google, is designed to convert all NLP tasks to text-to-text format. It has 11 billion parameters and is versatile for a variety of language-related tasks.

XLNet: XLNet – Another large language model with 3 40 million parameters that aims to capture the dependencies between all words in a sequence, making it useful for a wide range of NLP applications.

RoBERTa: Developed by Facebook AI, RoBERTa has 125 million parameters and is an improved version of BERT. It is designed to understand the context of words in a sentence and is used for tasks such as text classification and speech understanding.

GPT (Generative Pre-trained Transformer) is an advanced class of large language models in the field of natural language processing (NLP). Developed by OpenAI, GPT is based on the Transformer architecture, a neural network model known for its effectiveness in processing sequential data such as text. (ChatGPT).

What makes GPT special is its ability to generate text that resembles human speech. It is "pre-trained" by providing it with a huge amount of text from the Internet, which allows it to learn the structure, grammar, and context of human language. Once pre-trained, the GPT can be "fine-tuned" for specific NLP tasks, making it incredibly versatile. It can perform a wide range of tasks, including text generation, translation, summarization, question answering, and sentiment analysis.

One of the distinctive features of GPT is its autoregressive nature, meaning that it generates text one word at a time, taking into account the context of the words it has already generated. This allows it to create coherent and contextually relevant text. GPT models have become known for their ability to understand and generate human speech, making them invaluable tools in a variety of applications, from chatbots and virtual assistants to content generation and speech recognition tasks.

Prompt – Refers to the initial input or instruction given to the language model to generate a specific response or text. The prompt sets the context or indicates the desired output of the model. It can be a sentence, a paragraph, or even a single word, depending on the task or interaction you want to perform with the model.

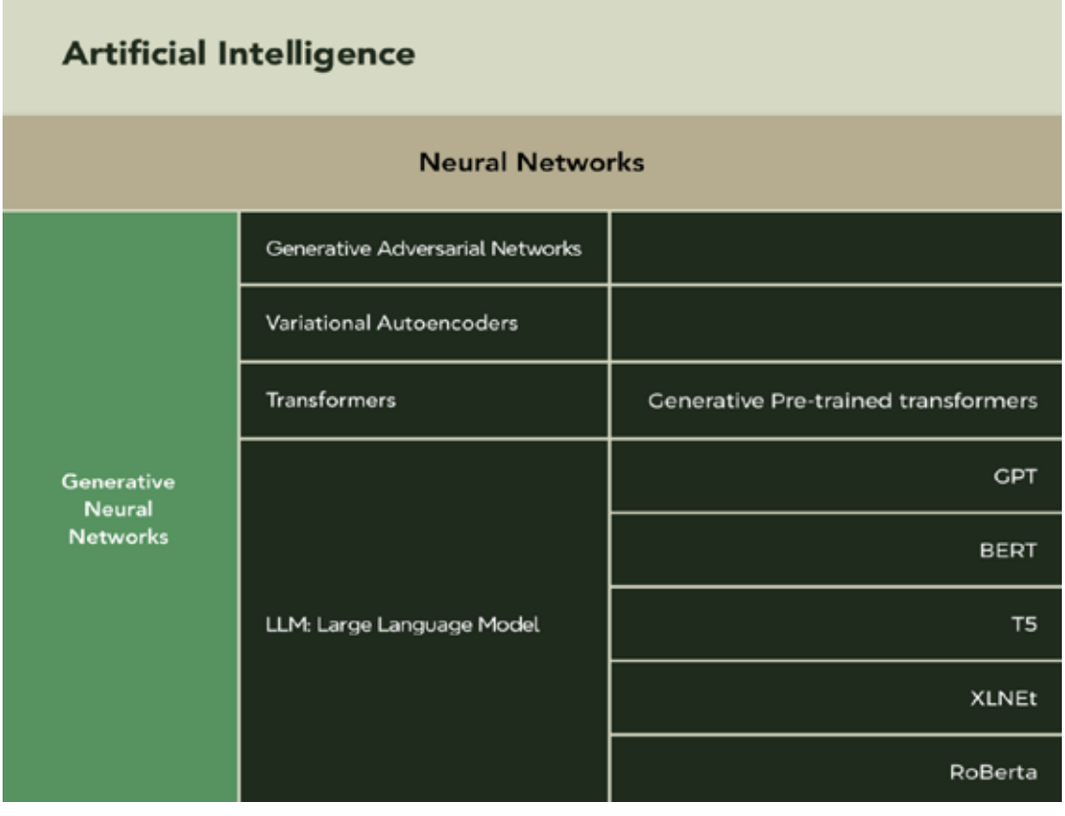

FIGURE 1 Instruments of Artificial Intelligence

Artificial intelligence (AI) offers many opportunities to improve learning at different levels and in different contexts. The possibilities are vast, and they are constantly evolving and diversifying as new tools and applications emerge. The benefits and opportunities of AI include:

Personalized learning: AI can analyze data about the learning needs and abilities of each student and create individualized learning programs that meet their needs and level of knowledge.

Adaptive learning platforms: AI systems can develop learning platforms that adapt to the needs of each learner, providing additional explanations or tasks to strengthen weak areas.

Assessment and reporting: AI can automate the process of grading students' work, analyze their results, and provide detailed reports to teachers and parents.

Virtual assistants: Artificial intelligence can serve as virtual assistants for teachers to help with classroom management, preparation of lesson materials, and other aspects of the learning process.

Expanding access to learning: AI can help create online courses and interactive learning resources that make learning more accessible and effective for a wider range of people.

Predicting success: AI can analyze student performance data and predict their future success, helping schools and universities develop support strategies for students.

The use of AI in education can significantly increase the efficiency and accessibility of education by helping to develop pupils' or students' competencies and improve their academic performance.

As mentioned above, Artificial Intelligence (AI) has many potential benefits that can be found in many areas of human activity. However, there are also certain risks and threats, especially when it comes to education. These challenges and threats include the following:

Inequality of access to education: The introduction of AI into the educational process may widen the gap between those who have access to high-tech tools and those who do not. This may lead to increased social inequality in education.

Loss of jobs: Automation of some functions in education by AI may lead to job losses for teachers and lecturers.

Data privacy and security: The use of AI in education can pose threats to the privacy and security of student and teacher data, especially when AI collects large amounts of personal information.

Automated decisions and biases: AI systems can execute decisions based on algorithms that contain biases or misconceptions, which can lead to incorrect or misunderstandings and malicious actions. The emergence of the concept of bias refers to systematic deviations in perception, thinking, and decision-making that can arise for a variety of reasons, such as personal beliefs, cultural influences, social factors, or even technological limitations. Biases can be intentional or unintentional, but either way they can affect decision-making and information perception. They can arise from unintentional or incorrect choices of data, analysis algorithms, or even from insufficient representation of the original data. For example, if a machine learning algorithm uses only a limited amount of data or takes into account only certain aspects of a problem, it may make biases in its predictions or recommendations.

Biases can have serious consequences, especially when it comes to artificial intelligence systems that are used in making important decisions, such as selecting job candidates, determining credit worthiness, or imposing punishment. It is therefore important to be aware of and consider possible biases in the development and use of AI systems, and to take steps to avoid and mitigate them.

Superficiality and loss of deep understanding: Too much reliance on AI can lead to a loss of deeper understanding and critical thinking among students, as they may become too dependent on automated solutions.

Alienation from learning: The use of AI may alienate students or learners from the learning process, as they may become less engaged in the learning environment due to the large amount of time spent on gadgets and interacting with technology.

These threats show that it is important to be cautious and careful about implementing AI in the educational process. The advantages of AI are undoubted, including: encyclopedic knowledge; structured knowledge; communication and dialogue; self-learning; customization; connectivity to other services and the Internet of Things, etc. At the same time, there is also a clear need to develop ethical and legal rules to ensure security, privacy, and equality of access.

Conclusions. Modern digital technologies create extraordinary opportunities for solving many problems in all spheres of human life. Artificial intelligence tools are becoming increasingly diverse. They allow solving not only complex issues using big data and large amounts of information, but also create new opportunities in the process of generating new content, in the process of learning and assimilation of knowledge, in medicine, city management, security, acceleration of business transactions and many other areas.

The use of artificial intelligence technologies in education has enormous potential given the variety of tools that can accelerate the processes of collecting large amounts of information, systematizing and analyzing it, assimilating and producing new knowledge. At the same time, understanding all the benefits and opportunities of artificial intelligence should also be accompanied by an awareness of all the possible threats and challenges posed by the latest technologies

to humanity. Real progress in social development includes not only the rapid spread of technology, but also the realization of human development, green development, and sustainable development goals. This is possible only on the basis of universal values and environmental protection.

10 NEURAL NETWORKS THAT CAN SOLVE 95% OF PROBLEMS

✅ **ChatGPT** – text generator

✅ **Midjourney, Kandinsky, DALL-E** – illustration creation services

✅ **Looka** – master of branding and brand identity (corporate style)

✅ **Invideo** – AI video creator and primarily Reels

✅ **24ai** – is a service for marketplaces

✅ **Tome** – is a service for creating presentations

✅ **Vidyo ai** – creates short ones from a large video. And it's extremely meaningful. Ideal for creating Reels, Shorts, clips

✅ **Imagine soundscapes** – will create an audio sequence for your content. He will select a voiceover for either a strict presentation or a travel video.

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