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A. Kavalenka[1], **A. Belkin**[2]
[1] *School of Business of BSU*, *Minsk*, *Belarus*, *oleg.kavalenka@gmail.com*
[2] *Moscow*, *Russia*, *alexey@belkin.digital*

THE FUTURE OF AI AND ITS POTENTIAL TO SHAPE THE ECONOMY, EDUCATION, AND BUSINESS IN THE COMING YEARS

Artificial intelligence (*AI*) *has the potential to transform the economy*, *education*, *and business in significant ways. AI can automate routine tasks and improve decision-making*, *leading to cost savings and new business opportunities. It can also personalize learning experiences for students and assist teachers in grading assignments. In business*, *AI can provide 24/7 customer support and optimize operations through predictive analytics. While the technology is expected to continue playing an increasingly important role*, *potential risks such as job displacement and bias must also be carefully considered and managed.*

Keywords: *artificial intelligence*, *economy*, *business*, *education*

О. А. Коваленко[1], **А. Белкин**[2]
[1] *Институт бизнеса БГУ*, *Минск*, *Беларусь*, *oleg.kavalenka@gmail.com*
[2] *Москва*, *Россия*, *alexey@belkin.digital*

БУДУЩЕЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА И ЕГО ПОТЕНЦИАЛ ДЛЯ ФОРМИРОВАНИЯ ЭКОНОМИКИ, ОБРАЗОВАНИЯ И БИЗНЕСА В БЛИЖАЙШИЕ ГОДЫ

Искусственный интеллект (*ИИ*) *обладает потенциалом для существенного преобразования экономики*, *образования и бизнеса. ИИ может автоматизировать рутинные задачи и улучшить процесс принятия решений*, *что приводит к экономии средств и новым возможностям для бизнеса. ИИ также может персонализировать процесс обучения для учащихся и помочь учителям в оценке заданий. В бизнесе искусственный интеллект может обеспечивать круглосуточную поддержку клиентов и оптимизировать операции с помощью прогнозной аналитики. И хотя технологии ИИ будут продолжать играть все более важную роль*, *потенциальные риски*, *такие как уменьшение рабочих мест*, *также необходимо учитывать.*

Ключевые слова: *искусственный интеллект*, *экономика*, *бизнес*, *образование*

Artificial intelligence (AI) is one of the top IT trends [1] and a rapidly growing field that is revolutionizing various aspects of society. This paper will explore the effective integration of AI in economy, education, science and business and how it can lead to improved outcomes. In 2019, Jack Ma and Elon Musk met at the World Artificial Intelligence Conference in Shanghai to discuss their differing opinions on the future of AI. During their one-on-one session, they debated the potential risks and benefits of AI and sized up the odds of an AI takeover [2]. While Elon Musk has been vocal about his concerns regarding the potential dangers of AI, Jack Ma holds a different opinion and believes that AI will bring more opportunities than threats [3]. Despite their differing views, they both agreed that AI is a powerful tool that can be used to improve people's lives and solve some of the world's most pressing problems [2].

Challenges. There are several potential challenges and risks associated with the use of AI. *Job Displacement:* The increasing use of AI and automation in industries such as manufacturing and transportation could lead to significant job displacement, particularly for workers in low-skill jobs [4].

Bias and Discrimination: AI models can reflect the biases and prejudices of their creators, leading to discriminatory outcomes in areas such as hiring, lending, and criminal justice [4]. *Ethics.* There are also concerns about the ethical implications of using AI, such as privacy violations and the potential for AI to be used for malicious purposes [4]. *Unintended Consequences:* AI systems can have unintended consequences and may make decisions that are harmful to humans, particularly if they are not designed with safety and ethical considerations in mind. *Cybersecurity Risks:* The increasing use of AI and connected devices could lead to new cybersecurity risks, particularly if these systems are not properly secured [5]. *Autonomous Weapons:* The development of autonomous weapons, such as drones and robots, could pose a significant risk to human safety and security if they are not properly regulated and controlled.

Artificial General Intelligence. There are varying opinions on the timeline for the rapid evolution of AI and Artificial General Intelligence (AGI). Some experts believe that AGI will occur before 2060 [6]. However, AGI is not yet here, and it is still a gradual march towards it [7]. OpenAI believes that a gradual transition to a world with AGI is better than a sudden one [8].

Language Models. AI language models are systems that can understand and generate text, and they are changing the landscape of AI (Fig. 1) [9]. Language models are general-purpose text interfaces that can be applied across a vast expanse of scenarios, from summarizing articles to engaging in long conversations [10]. Large language models (LLMs) are among the biggest models in terms of parameter count, and they are trained on enormous amounts of text data, sometimes at the petabyte scale [11; 12]. These models are usually very large deep-neural-networks, which are trained by going through billions to hundreds of billions of parameters [13]. Language models are a probability distribution over words or word sequences, and they can be used for tasks such as question answering, document summarization, text generation, sentence completion, and more [12; 14]. Large language models are expected to define artificial intelligence in the future [13]. For example, GPT-4 (see Fig. 1) is a new language model from OpenAI that is claimed to be top-performing in its class and more creative than its predecessor, GPT-3 [15]. OpenAI is working with a number of companies and sectors, including technology, education, business services, manufacturing, finance, and more [16–17] (Fig. 2). OpenAI's main financiers are Microsoft, the Reid Hoffman Foundation, and Khosla Ventures [18].

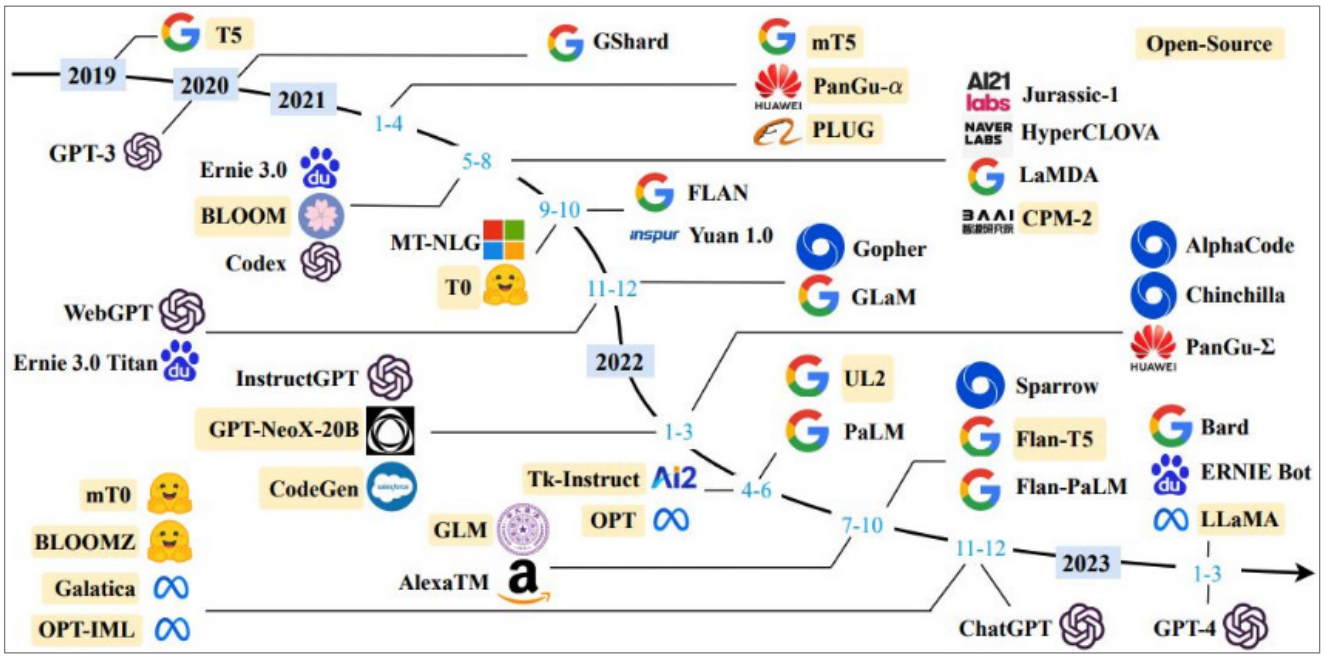

Fig. 1. A timeline of existing large language models (having a size larger than 10 B) in recent years (open-source LLMs are marked in yellow color)

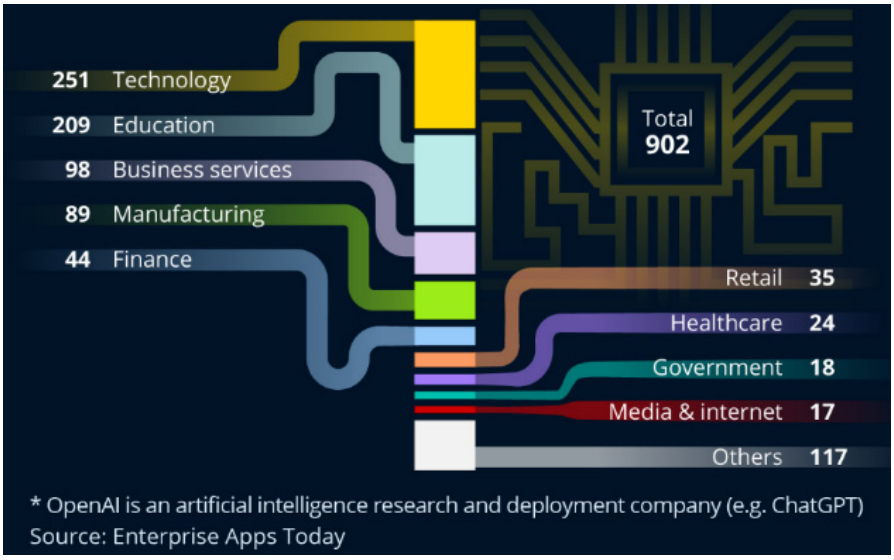

Fig. 2. Number of companies and sectors that are working with OpenAI

Foundation models represent a paradigm shift for the world of artificial intelligence, and they are the next frontier in AI [19]. A model trained on a large amount of unlabeled data can be adapted to many applications as these are typically large-scale models with over billions of parameters that can generate output in the form of text, image, code, or other [20]. Foundation models refer to models trained on large volumes of unlabeled data that can be adapted to new downstream tasks [21]. The value in foundation models can theoretically extend into any domain, including healthcare, finance, and the arts [22].

Modern foundation models are designed to be multimodal and multitasking. Multimodal foundation models are a natural way of fusing all the relevant information about a domain and adapting to tasks that require multiple modalities, such as healthcare [23]. These models are also capable of performing tasks that are very different from each other, thanks to techniques in task-transfer and multi-task AI models [24]. Large language models (LLMs) have evolved into foundation models and now multi-modal models, with GPT-4 being described as a multi-modal model [25]. The foundation model is a transformer pretrained jointly on unpaired multimodal data, which can be fine-tuned for various downstream tasks [26].

Reinforcement learning plays a significant role in AI (Fig. 3) as a feedback-based training mechanism for machine learning models [27]. It is a learning method that directs unsupervised machine learning through rewards and penalties, allowing the agent to learn to avoid negative outcomes and seek positive ones. Reinforcement learning is designed to maximize the rewards earned by the agents while they accomplish a specific task, making it beneficial for a wide range of applications [28]. It is a subfield of machine learning and artificial intelligence processes that establish learning techniques to train agents to perform specific tasks [29]. Reinforcement learning has been applied in various real-life applications, such as robotics, gaming, finance, and healthcare [30].

Education. AI in education refers to the use of artificial intelligence technologies to enhance learning, assist teachers, and streamline administrative tasks. AI is currently being used to manage entire schools, powering student records systems, transportation, IT, maintenance, scheduling, and more [31]. AI can drive efficiency, personalization, and streamline admin tasks to allow teachers the time and freedom to provide understanding and adaptability [32]. AI can help fill needs gaps in learning and teaching and allow schools and teachers to do more than ever before [33]. AI systems (like ChatGPT – Fig. 4) can help students learn better and faster when paired with high-quality learning materials and instruction [33; 34]. To truly take advantage of what AI has to offer, educators need to get smarter about how they teach and change what they are educating people for [34].

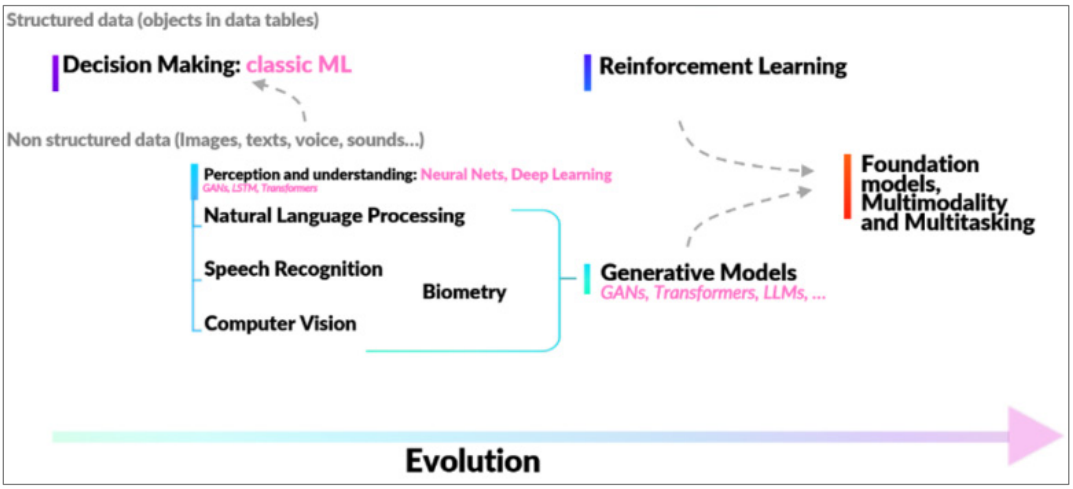

Fig. 3. The key AI technologies within AI evolution

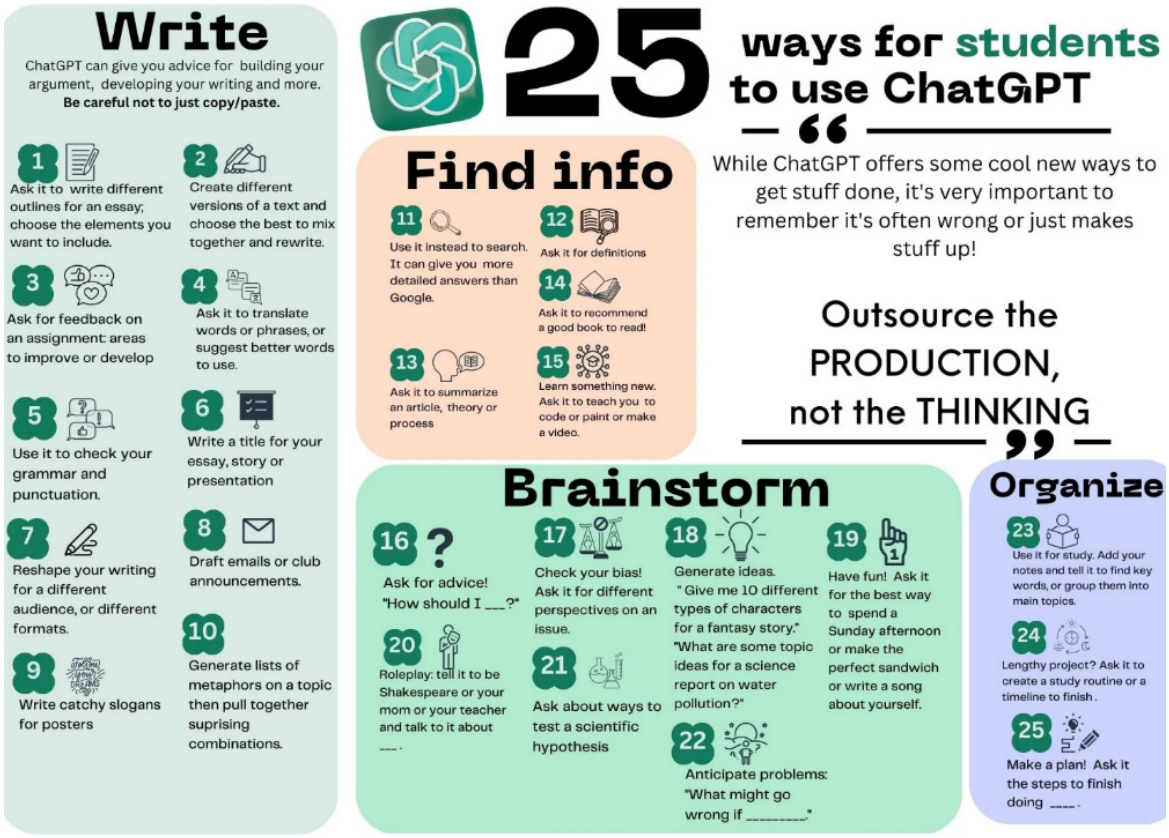

Fig. 4. Different ways for students to use ChatGPT

Science. Training AI on large volumes of arXiv, SSRN, ChemRxiv, SocArXiv, bioRxiv, engrXiv, and psyarXiv data could potentially provide new scientific insights and lead to breakthroughs in modern science and other fields. These platforms host preprints and other scholarly articles in various fields, including physics, chemistry, biology, engineering, and psychology. By analyzing these large datasets, AI can identify patterns, relationships, and insights that may not be immediately apparent to human researchers. This can lead to new discoveries, hypotheses, and research directions that can advance scientific knowledge and understanding. However, it is important to note that AI is not a substitute for human expertise and judgment, and it should be used in conjunction with other research methods and approaches to ensure the accuracy and validity of its findings.

History of the World. Training AI on large volumes of historical and archaeological data could potentially help to reconstruct the past of human civilization. By analyzing artifacts, historical

documents, and other sources of information, AI could potentially identify patterns and connections that would be difficult for human researchers to identify on their own. For example, AI could be trained to identify similarities and differences between artifacts from different time periods and cultures, helping to shed light on how different civilizations developed and interacted with one another. Similarly, AI could be used to analyze historical documents and identify patterns in language and writing style that could help to reveal information about the society in which they were written.

Medicine. The future of AI in medicine is promising and shows that AI has the potential to improve healthcare delivery. AI can help doctors make more accurate diagnoses, identify potential health risks, and provide personalized treatment plans tailored to the individual's needs and preferences. AI is being used in a wide range of medical applications, including diagnosis, treatment planning, and health monitoring. AI can add value by either automating or augmenting the work of clinicians and staff, and many repetitive tasks will become fully automated. AI can also help health professionals perform better at their jobs by providing them with insights and recommendations based on large datasets. AI can be used to analyze large volumes of medical data, identify patterns and relationships, and generate new hypotheses and research directions. AI can also be used to develop personalized treatment plans and assist in diagnosis [35; 36]. Despite the potential drawbacks, AI has the potential to transform the future of medical diagnosis and improve the quality of care for patients [37; 38].

Economy. While AI has the potential to improve economic forecasting and decision-making, it is important to note that AI is not a substitute for human expertise and judgment, and it should be used in conjunction with other research methods and approaches to ensure the accuracy and validity of its findings. The impact of ChatGPT and GPT-4 on the workplace isn't just a theoretical one, and it is important to consider the potential risks and benefits of using AI in the economy. The good news is that we can decide how we choose to use ChatGPT and GPT-4 and other large language models, and effective AI regulation is essential to ensure that AI is used in a responsible and ethical manner [15; 39].

Business. GPT-4 has the potential to change the business landscape in many ways [39]. Let's take a closer look at how it can impact different aspects of business operations. *Customer Service and Interactions.* One of the key areas where GPT-4 can have a significant impact is customer service. Businesses can use this technology to provide real-time customer service through virtual assistants. These virtual assistants can be integrated into websites and mobile apps, providing customers with instant answers to their queries. This not only saves time and money for businesses, but also provides customers with an improved experience as they receive quick and accurate answers to their questions. *Content Creation and Management.* GPT-4 can also change the way businesses create and manage content. With its ability to understand and generate human-like text, businesses can use this technology to automate the creation of content for their websites and social media platforms. This can free up time for businesses to focus on other tasks, while still providing customers with high-quality and consistent content. Additionally, businesses can use GPT-4 to analyze and manage their existing content, providing insights into what works best for their customers and what needs improvement. *Sales and Marketing.* Another area where GPT-4 can have a major impact is in sales and marketing. This technology can be used to automate the process of lead generation and qualification. By analyzing customer data and interactions, GPT-4 can identify potential customers and provide businesses with insights into how they can effectively target and engage with them. Furthermore, businesses can use GPT-4 to automate their email marketing campaigns, allowing them to send personalized and relevant messages to their customers. *Business Process Automation.* GPT-4 can also be used to automate various business processes, such as invoicing, payroll, and financial reporting. This technology can process large amounts of data and provide businesses with real-time insights into their financial performance. By automating these processes, businesses can reduce the risk of errors and increase efficiency, freeing up time and resources to focus on other areas of their business. *Talent Recruitment.* Finally, GPT-4 can change the way businesses recruit and hire talent. This technology can be used to

automate the process of reviewing resumes and conducting initial interviews. GPT-4 can analyze candidate data and provide businesses with insights into the candidate's skills and experience, allowing them to make more informed hiring decisions. Additionally, businesses can use GPT-4 to conduct virtual interviews, saving time and money while still providing candidates with a comprehensive and engaging interview experience [39].

Conclusion. AI and AGI have the potential to revolutionize the way businesses operate. With its advanced language generation capabilities, GPT-4 can automate tasks such as writing reports, creating presentations, and even composing emails, freeing up time for employees to focus on more high-level tasks. Additionally, GPT-4 can provide real-time insights and predictions, enabling companies to make more informed decisions and stay ahead of the competition. As the technology continues to evolve, it will become increasingly integrated into various industries, leading to more efficient and effective business operations. The arrival of this AI technology marks a new era in the business world, and companies must be prepared to embrace the change to stay relevant. AI and AGI will change business forever.

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