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An Overview of Artificial Intelligence and its Impacts on Education, Human Cognitions and Business Environment

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Abstract: ***Artificial Intelligence (AI) refers to the development of computers and programs that perform tasks replicating human thinking, such as learning, problem-solving and reasoning. The evolution of Artificial Intelligence (AI) has transformed various aspects of society, including education, human cognition, and business. The use of AI-powered tools across various sectors has positive effects, enhancing performance and simplifying human resource operations. Despiteits numerous advantages, studies show that excessive reliance on AI systems raises ethical concerns, particularly regarding privacy and data security. There is no doubt that AI- powered machines are increasing productivity, saving time, and offering significant benefits to humans. However, overdependence on AImay graduallydiminish human creativity, memory, attention, and decision-making abilities, potentially leading to a more stressful life.In this work, we examine core technologies of Artificial Intelligence (AI), focusing on its applications and impacts in the education sector, human cognitive abilities and business environment.***
Keywords: Artificial Intelligence, Ethics, Creativity, Productivity.

I. INTRODUCTION

Artificial Intelligence (AI) is the science and engineering of creating intelligent machines, especially intelligent computer programs, that can think and learn like humans. Machine learning, affective computing, and artificial intelligence are collectively referred to as emotional artificial intelligence. AI is more powerful than any other invention of the century. AI is a vast technology used daily to make life easier. Its significance has been proven, particularly during the COVID-19 pandemic.

Artificial Intelligence (AI) plays a crucial role today, offering efficient solutions across diverse fields like healthcare, entertainment, finance, education and business. It enhances our daily lives by making tasks quicker and more convenient. Despite its benefits, machine learning and AI have also introduced challenges of security and privacy. Hubner (2021), highlighted in his work, that AI systems are heavily reliant on data availability. Without data, they are ineffective, and the risk of data misuse becomes major concern. Similarly, Samtani et al., (2021) and Mengidis et al., (2019), addressed vulnerabilities in AI systems. They emphasized that advancement in hardware and software have led to AI becoming more integrated with cybersecurity. As a result, security risks have increased, underscoring the importance of implementing policies mitigate these threats. Also, Weyerer and Langer (2019), claimed that, as AI systems collect and use wide data for making predictions and identify patterns, which increases a chance of bias and discrimination.

II. CORE TECHNOLOGIES AND INNOVATIONS OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a multidisciplinary field that enables machines to simulate human intelligence. It focuses on creating intelligent machines capable of performing tasks which maximize chances of success. AI has emerged as transformative technology. As AI has boomed in last few years, it has become common in everyday life. AI has undergone significant transformations since its inception.From rule-based systems to machine learning and deep learning, the key technologies and innovations of AI are discussed:

1) Rule Based Systems (RBS): Here machines were programmed to follow a set of rules to take action or decisions.

The main five elements of **RBS** are

a) The Knowledge Base: Hereevery rule has IF…THEN…. Structure. For every condition there will be an action defined.
b) The Database: It is simply a collection of facts.
c) The Inference Engine: This is for expert systems. It connects the facts keep in database with rules specified inknowledge base.

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d) Explanation Facilities: It questions the expert system and expert system must be able to defend its logic, recommendations, analysis and conclusions.
e) User Interface: This interface helps real users to interact with the expert systemto find a better solution to an issue.

RBS are commonly used in automation system to control and monitor complex processes. They require regular updates and refinement of rules for better working. Example of RBS: Medical Diagnosis, Fraud Detection, Quality control, Decision Support System.

2) *Machine Learning:* According to Arthur Samuel in 1950, Machine learning is the field of study that gives computer the ability to learn without explicitly being programmed.Machine Learning takes the approach of letting computers learn to program themselves through experience.

a) Functions of Machine Learning System

- Descriptive: It uses data to explain.
- Predictive: It uses data to predict.
- Prescriptive**:** It uses data to make suggestion about action.

Basically, Machine Learning starts from data whether it is in number, photo or text.

b) Subcategories Of Machine Learning

- Supervised: It is the most common type used. These models are trained with labeled data set. It learns and grows more accurate with time.
- Unsupervised: It looks for a pattern in unlabeled data. Example: From online sales data, identify different types of clients.
- Reinforcement: It trains machine through trial and error. It can be used in playing games and telling when it took the right decisions to help it learn over time.

3) Natural Language Processing (NLP): AI powered NLP has enabled machines to understand and generate human language. In NLP, a machine capture human speech as audio processes the stacked conversation, connect the speech into text and then generate a response which is converted back into audio for human interaction. NLP has a wide application such as language translation application like Google Translator, smart assistant like Siri, Alexa. NLP employs algorithms to identify and extract the rules of natural languages; transforming unstructured human language data into a structured format that computer can process and understand.

4) *Neural Networks:* Neural network is a machine learning model inspired by the structure andfunction of a human brain. Every Neural Network consists of layer of nodes or artificial neurons.

- An Input layers
- One or More hidden layers
- An Output Layer

All are interconnected and has associated weights & threshold. If output is above threshold value, datawill be sent to the next layer of networks. Neural Network relies on training data to learn and improve. Task in speech recognition or image recognition can take minutes instead of hours through Neural Network.Example: Google Search Algorithm.

5) Computer Vision: Computer vision is a field of AI that enables computer to interpret and understand visual information from images and videos. Open CV and Pillow (Python) Libraries enable image and video processing, object detection and segmentation CV has wide range of application from facial recognition to medical imaging diagnosis. Examples: Healthcare, Autonomous Vehicles, Security.

6) Robotics and Automation: AI powered automation is used to get the task done by machines which improve productivity and are cost effective and more efficient. Automation helps in preventing fraud especially in online financial transactions by using CAPTCHA technology to verify user authentication. Process automation is designed to handle high volume repetitive tasks like motion planning, control system and sensor integration. It is a combination of ML, CV, NLP and many others.

7) Machine Vision: In Machine Vision, a machine captures visual information then converts the image into digital data using analog to digital conversion and processes it through digital signal processing before feeding the results into a computer. Key aspects of machinery include sensitivity the machine ability to perceive impulses and data feed and resolution, which determines how accurately it can predict details.

III. OPPORTUNITIES AND CHALLENGES OF AI IN EDUCATION SECTOR

According to studies by Nemorin et al., (2022), Ade-Ibijola et al., (2022), and Nakitore and Otike (2022), now a days technologies are widely applied in education. These include plagiarism detection, tools for maintaining exam integrity, chatbots assisting with enrollment and retention, learning management systems, and advanced online decision- making platforms. Such innovations have significantly simplified the learning process.

Many researchers, including Sayed et al., (2021), have highlighted that while AI plays a crucial role in education, its benefits are not guaranteed. AI can positively influence learning, but its use also raises ethical concerns. Like other technologies, AI present certain challenges in education and learning. The education sector faces various ethical concerns when implementing AI, including issues related to privacy, data access and student records. Additionally, data hacking and manipulation pose threats to personal privacy, potentially infringing on students' rights and amplifying concerns related to race, age, gender, income inequality, and social status. Moreover, the growing dependence of AI technology among educators and students is gradually reducing their willingness to complete tasks independently, which in turn affects their motivation. Research also indicates that excessive use of AI in education can weaken human decision- making skills over time.

According to Vanlangen (2021), while online education offers benefits, the traditional classroom environment should remain a priority. Face-to-face interactions between teachers and students play a significant role in character development, civic engagement, and enhances their ability to make independent decisions. Likewise, Taddeo et al., (2019), suggested that as AI usage in education grows, security risks will also increase. Similarly, Bartoletti (2019), Saura et al., (2022) and Bartneck et al., (2021), supported this view, emphasizing that over reliance on AI in education raises significant concerns regarding user security and privacy. Studies suggests that despite the various benefits of AI in education, it also present significant challenges.

IV. IMPACT OF AI ON HUMAN COGNITION

Artificial Intelligence (AI) is profoundly reshaping the ways human think, learn, and process information, bringing both opportunities and challenges. Its impact can be seen across various fields, enhancing efficiency, decision- making, and convenience, while also raising ethical and social consideration. Jones (2014), found that AI has redefined almost every aspect of human life and social interaction. However, its expanding role in daily life is diminishing human control, which, in turn, restricts independent thinking abilities. Krakawer (2016), claimed that although AI has enhanced living standards and simplified life, it has also contributed to increased impatience and dependency. The continuous advancement and widespread adoption of AI may result in stress, declining professional skills, and growing reliance on automation. Ahmed (2019), explained that AI supports decision-making in organizations, yet its extensive use is controlling the human biological processors, as individuals rely more on AI rather than critical thinking. Similarly, Ghosh et al.,(2019), found that over- reliance on AI weakens mental abilities and creativity in problem- solving. As AI becomes integral to various tasks, professionals- including employers, employees, educators, and worker- gradually lose their decision- making ability. AI-driven automation is tasking numerous responsibilities, making human workers increasingly reliant on technology and, consequently, diminishing their skills. Thus, while AI offers numerous benefits, it also significantly impacts human decision- making capabilities, attention, memory, creatives, and skills. To maximize its benefits while minimizing risk, society must adopt responsible AI development, implement ethical guidelines, and ensure that AI complements rather than replaces humans' skills.

V. OPPORTUNITIES AND CHALLENGES OF AI IN BUSINESS

Artificial Intelligence (AI) is transforming the business landscape by improving efficiency, enhancing decision- making, and unlocking new opportunities. One of its significant transformation is in customer service, where it enables faster and more personalized interactions. While business is rapidly adopting AI and machine learning without fully assessing the potential risks. Although AI implementation enhances productivity and accelerates results, it also presents challenges. AI powered systems minimize human errors, operate 24/7 and analyze vast amounts of complex data. However, despite these advantages, there drawback is the high cost of development and deployment. Furthermore, AI lacks emotional intelligence and creativity, which can lead to biased outcomes and contribute to inequality. Unlike humans, AI does not learn from experiences naturally; instead, it requires expensive and intricate programming for continuous improvement.

Additionally, widespread AI adopting in industries threatens jobs availability, as it automates repetitive tasks that were once performed by human workers. The rapid evolution and use of AI also bring ethical concerns, particularly regarding data privacy and security. Thus, while AI offers immense benefits, business must weigh its advantages against its challenges and ensure its responsible applications.

VI. CONCLUSION

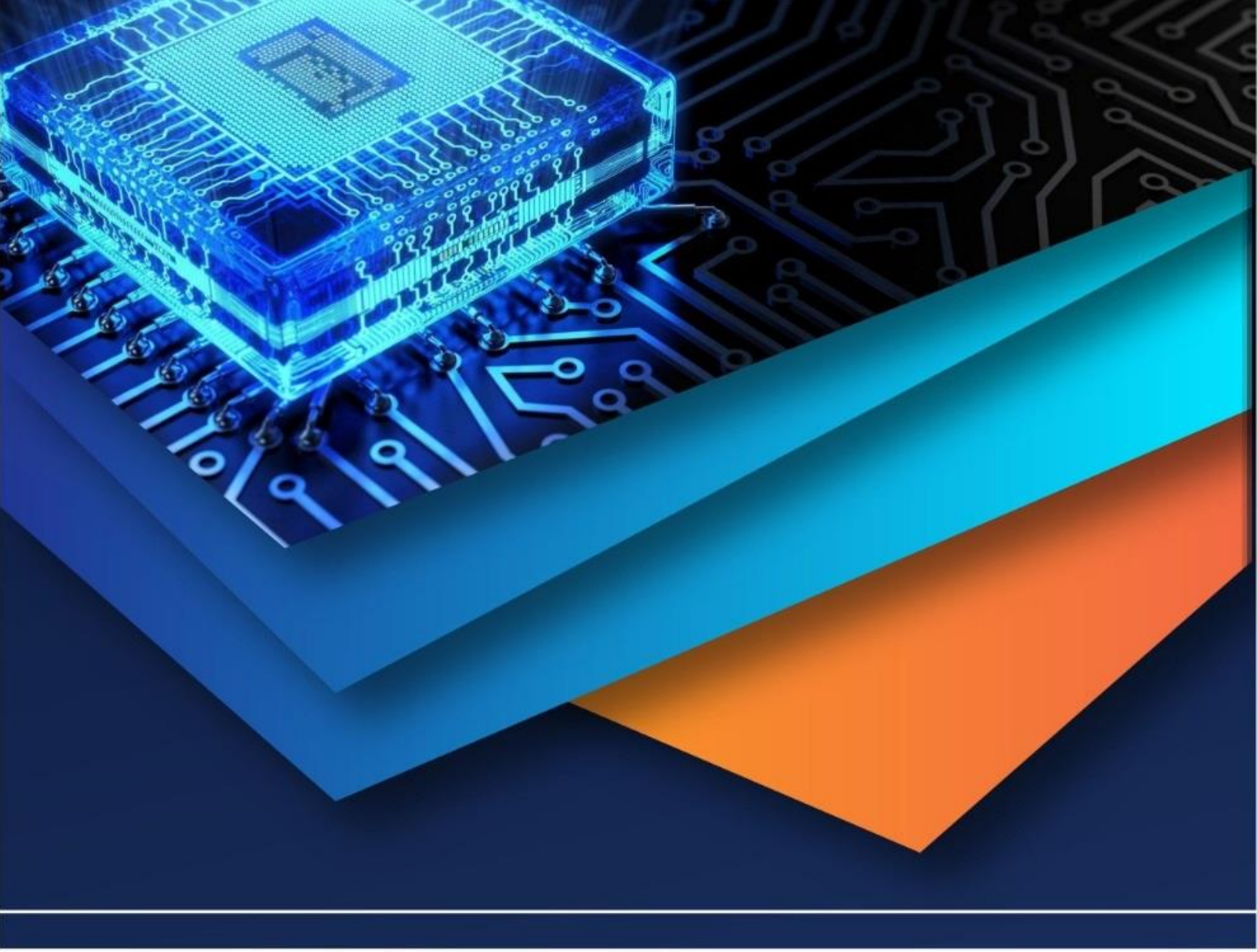
Artificial Intelligence (AI) has become an integral part of everyday life, influencing various sectors such as education, business, social interactions, healthcare, and workplaces. Despite its benefits, AI presents several challenges, with data security, privacy risks, loss of human decision- making, reduced creativity, and increasing human dependence being among the most significant concerns.

AI enhances productivity by assisting employees, students and educators in academic and administrative tasks, improving efficiency and decision- making. As AI adoption and dependency continue to grow, addressing its challenges become crucial. Proper training for educators and students is necessary to ensure data security and privacy. Businesses must also adopt strong cybersecurity measures, such as identity verification systems, multi-factor authentication, user activity monitoring, and encrypted data exchange protocols. Additionally, AI can contribute to cybersecurity by detecting fraud and preventing data breaches.

The advantages of AI include increased efficiency, time savings, bias reduction, and automation of repetitive tasks. However, its drawbacks- such as high implementation costs, job displacement, and a lack of emotional intelligence and creativity- must also be considered. While AI has the potential to revolutionize various aspects of life, from healthcare to education, it is essential to address its challenges and ethical concerns and responsible usage should be prioritized. By addressing its challenges, AI can be leveraged effectively to build a more inclusive and beneficial future for all.

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