EVOLUTION, FUNCTIONS, AND SHORTCOMINGS OF ARTIFICIAL INTELLIGENCE: A STUDY OF CHAT GPT, DEEPSEEK, AND RELATED MODELS

Dr Rita Parihar[1], Diksha Bhatia[2]

[1,2]HP university Dept for Evening Studies Shimlas, India.

ABSTRACT

Artificial Intelligence (AI) is transforming the way humans interact with technology by enabling machines to mimic cognitive functions such as learning, reasoning, and problem-solving. AI encompasses various subfields, including machine learning, deep learning, natural language processing, and computer vision, which allow systems to analyze data, recognize patterns, and make autonomous decisions. The role of AI extends across multiple industries, enhancing efficiency, accuracy, and automation in fields such as healthcare, finance, education, transportation, and cyber security. However, AI also presents challenges, including ethical concerns, data privacy issues, and the need for responsible AI governance. As AI continues to evolve, its role in driving innovation and societal progress remains critical, necessitating a balance between technological advancement and ethical considerations. This paper includes the evolution of Ai, role and its different models.

Artificial Intelligence (AI) has undergone remarkable evolution, transitioning from rule-based systems to sophisticated deep-learning models like ChatGPT and DeepSeek. These models have revolutionized natural language processing (NLP) with their ability to understand and generate human-like text. However, they also present various limitations. This paper explores the evolution of AI, the functions of modern conversational AI models, and their shortcomings, including ethical concerns and technical limitations.

Keywords- Artificial, Breakthrough, Reskilling, Upskilling, Chatbots, Hallucinations.

1. INTRODUCTION

The field of AI has significantly advanced over the past few decades. With the advent of deep learning and large-scale neural networks, models like ChatGPT and DeepSeek have demonstrated human-like conversational capabilities. This paper examines the historical progression of AI, the core functionalities of these models, and their associated limitations.

Evolution of AI

OpenAI was founded in December 2015 as an artificial intelligence research lab with the goal of developing safe and beneficial AI for humanity. Here's a brief timeline of its major milestones:

Founding ad Early Years (2015–2018)

- Founded by Elon Musk, Sam Altman, Greg Brockman, Ilya Sutskever, John Schulman, and others.
- Initially established as a nonprofit with $1 billion in funding pledged by investors like Musk, Altman, and Reid Hoffman.
- Focused on AI safety and ethical AI development.

Breakthroughs and Expansion (2018–2020)

- 2018: OpenAI introduced GPT-1, the first version of its Generative Pre-trained Transformer (GPT) model.
- 2019: Launched GPT-2, a more advanced AI capable of generating coherent and realistic text. OpenAI initially hesitated to release it due to concerns about misuse.
- Transitioned into a for-profit "capped" entity called OpenAI LP to attract more funding. Microsoft invested $1 billion to support OpenAI's computing needs.

Rise of AI Models (2020–2022)

- 2020: Released GPT-3, a revolutionary AI model with 175 billion parameters, widely adopted for chatbots, content creation, and coding.
- 2021: Introduced DALL·E, an AI model capable of generating images from text descriptions.
- Launched Codex, the AI behind GitHub Copilot, assisting developers in writing code.
- 2022: Released DALL·E 2, producing even more detailed and realistic AI-generated images.

- OpenAI's ChatGPT (based on GPT-3.5) launched in November 2022, quickly gaining millions of users for its human-like conversational abilities. (2023)
- 2023:
  - Released GPT-4, a more advanced and multimodal AI model capable of handling text and images.
  - Microsoft deepened its partnership with OpenAI, integrating its models into Bing AI and Azure OpenAI services.
  - Launched ChatGPT Plus, offering users access to GPT-4 for a subscription fee.
  - Introduced DALL·E 3, an improved AI image generator.

2024 and beyond: OpenAI continues improving AI models, exploring AGI (Artificial General Intelligence), and working on AI safety and ethical concerns. As of February 2025, artificial intelligence (AI) has seen significant advancements, particularly in the development of more efficient and capable models. A notable example is DeepSeek's R1 reasoning model, which has been developed at a fraction of the cost and with reduced energy consumption compared to previous models. This innovation democratizes AI development, enabling smaller firms to compete and potentially lowering costs and environmental impacts.

Early AI Systems

AI research began with symbolic AI, where systems followed explicitly programmed rules. Early systems such as ELIZA (1966) demonstrated rudimentary NLP capabilities but lacked true comprehension.

Machine Learning and Deep Learning Era

The shift from rule-based AI to machine learning introduced statistical approaches, allowing models to learn from data. The introduction of deep learning, particularly Transformer-based architectures like GPT (Generative Pre-trained Transformer), marked a significant breakthrough in NLP.

Modern AI Models: ChatGPT and DeepSeek

ChatGPT, developed by OpenAI, utilizes large-scale training on diverse text corpora to generate human-like responses. DeepSeek follows similar principles, employing deep-learning techniques for contextual understanding and response generation.

Functions of ChatGPT and DeepSeek

1. Natural Language Understanding (NLU)

These models can process and interpret human language, enabling applications in chatbots, virtual assistants, and automated text generation.

2. Text Generation

They generate coherent and contextually relevant text, useful for content creation, summarization, and dialogue systems.

3. Code Assistance

Models like ChatGPT assist in programming by suggesting code snippets, debugging, and explaining complex algorithms.

4. Language Translation

While not as specialized as dedicated translation models, ChatGPT and DeepSeek offer multilingual support and translation capabilities.

5. Personalized Assistance

They provide personalized recommendations, educational support, and tutoring in various AI has a wide range of benefits across different industries and aspects of life. AI is transforming the economy in multiple ways, affecting industries, labor markets, productivity, and overall economic growth. Here are some key areas where AI is making an impact:

1. Economic Growth & Productivity

- AI-driven automation increases efficiency in industries like manufacturing, logistics, and services.
- Predictive analytics helps businesses optimize operations and reduce waste.
- AI enables innovation by facilitating new business models, products, and services.

2. Labor Market & Employment

- AI automates repetitive tasks, reducing demand for certain low-skill jobs.
- It creates new job opportunities in AI development, data science, and AI ethics.
- The demand for reskilling and upskilling workers is increasing as AI changes job requirements.

3. Financial Sector

- AI is used in algorithmic trading, fraud detection, and risk assessment.
- Chatbots and AI-driven customer service improve banking and financial experiences.
- Personalized financial advice and robo-advisors help consumers make better investment decisions.

4. Business & Industry Transformation

- AI-driven supply chain management enhances logistics and reduces inefficiencies.
- Personalized marketing powered by AI improves customer engagement and sales.
- AI-powered chatbots and virtual assistants streamline customer service.

5. Government & Economic Policy

- AI helps governments analyze economic trends and make data-driven policies.
- It assists in tax fraud detection and enhances regulatory oversight.
- Smart infrastructure and urban planning benefit from AI-driven data insights.

6. Challenges & Risks

- Job displacement due to automation and the need for workforce reskilling.
- Bias in AI decision-making, which can impact hiring, lending, and law enforcement.
- Market concentration, as large tech companies dominate AI research and applications.
- Data privacy concerns, with AI relying heavily on personal data for decision-making.

7. The Future of AI in the Economy

- AI is expected to contribute trillions to global GDP in the coming decades.
- Governments and businesses need to balance AI adoption with ethical considerations and regulations.

The focus on AI-human colAI is transforming the economy in multiple ways, affecting industries, labor markets, productivity, and overall economic growth. Here are some key areas where AI is making an impact:

1. Economic Growth & Productivity

- AI-driven automation increases efficiency in industries like manufacturing, logistics, and services.
- Predictive analytics helps businesses optimize operations and reduce waste.
- AI enables innovation by facilitating new business models, products, and services.

2. Labor Market & Employment

- AI automates repetitive tasks, reducing demand for certain low-skill jobs.
- It creates new job opportunities in AI development, data science, and AI ethics.
- The demand for reskilling and upskilling workers is increasing as AI changes job requirements.

3. Financial Sector

- AI is used in algorithmic trading, fraud detection, and risk assessment.
- Chatbots and AI-driven customer service improve banking and financial experiences.
- Personalized financial advice and robo-advisors help consumers make better investment decisions.

4. Business & Industry Transformation

- AI-driven supply chain management enhances logistics and reduces inefficiencies.
- Personalized marketing powered by AI improves customer engagement and sales.
- AI-powered chatbots and virtual assistants streamline customer service.

5. Government & Economic Policy

- AI helps governments analyze economic trends and make data-driven policies.
- It assists in tax fraud detection and enhances regulatory oversight.
- Smart infrastructure and urban planning benefit from AI-driven data insights.

6. Challenges & Risks

- Job displacement due to automation and the need for workforce reskilling.
- Bias in AI decision-making, which can impact hiring, lending, and law enforcement.
- Market concentration, as large tech companies dominate AI research and applications.
- Data privacy concerns, with AI relying heavily on personal data for decision-making.

7. The Future of AI in the Economy

- AI is expected to contribute trillions to global GDP in the coming decades.
- Governments and businesses need to balance AI adoption with ethical considerations and regulations.
- The focus on AI-human collaboration will shape future economic structures.
- laboration will shape future economic structures.

Key Advantages of AI:

Here are some of the key advantages

1. Increased Efficiency & Automation

- Automates repetitive tasks, saving time and effort.
- Improves productivity in industries like manufacturing, logistics, and customer service.
- Reduces human error in data processing and analysis.

2. Improved Decision-Making

- Analyzes large amounts of data quickly to provide insights.
- Enhances business strategies through predictive analytics.
- Assists in risk management and fraud detection.

3. Enhanced Personalization

- AI-driven recommendations in e-commerce, streaming, and social media.
- Personalized learning experiences in education.
- Tailored healthcare treatments based on patient data.

4. Better Healthcare & Medical Advancements

- AI-powered diagnostics help detect diseases early.
- Drug discovery and medical research acceleration.
- Robot-assisted surgeries for precision and reduced recovery time.

5. Improved Customer Experience

- AI chatbots provide 24/7 customer support.
- Virtual assistants like Siri, Alexa, and Google Assistant help with daily tasks.
- Sentiment analysis helps businesses understand customer needs.

6. Enhanced Cybersecurity

- AI detects and prevents cyber threats in real time.
- Fraud detection in banking and financial transactions.
- Automated security updates and monitoring.

7. Smarter Transportation & Logistics

- Self-driving cars and AI-powered traffic management.
- Route optimization for delivery services.

- Predictive maintenance for vehicles and machinery.

8. Environmental Benefits

- AI helps optimize energy consumption and reduce waste.
- Climate modeling and disaster prediction.
- Smart agriculture for better crop yields and resource management.

9. Creativity & Innovation

- AI assists in music, art, and content creation.
- Generates new ideas and designs in architecture and engineering.
- AI-powered coding assistants improve software development.

10. Accessibility & Inclusion

- AI-powered speech-to-text and text-to-speech tools help disabled individuals.
- Real-time language translation breaks communication barriers.
- Smart prosthetics and assistive technologies improve mobility and independence.

Shortcomings of AI Models

1. Bias and Ethical Concerns

AI models inherit biases from training data, leading to biased outputs. Ethical concerns regarding misinformation, data privacy, and fairness remain critical issues.

2. Lack of True Understanding

Despite their linguistic capabilities, these models do not possess true comprehension or reasoning ability. Their responses are based on pattern recognition rather than genuine understanding.

3. Computational Costs

Training and deploying large-scale AI models require immense computational resources, making them expensive and environmentally impactful.

4. Hallucination and Inaccuracies

AI models sometimes generate factually incorrect or misleading information, posing risks in critical applications like medicine and law.

5. Dependence on Training Data

The performance of AI models is constrained by the quality and diversity of their training data. They may struggle with novel or niche topics outside their training scope. The future of AI is shaping up to be revolutionary, impacting nearly every aspect of life. Here are some key trends and predictions:

1. AI in Everyday Life

- AI assistants will become more human-like, understanding emotions and context better.
- AI-generated content (text, images, videos) will blur the line between human and machine creativity.
- Smart home and IoT devices will get more autonomous and predictive.

2. AI and Work

- Automation will replace repetitive jobs, but new AI-related roles will emerge.
- AI-powered decision-making will be common in business, finance, healthcare, and law.
- AI will boost productivity, but ethical concerns around bias and job displacement will need addressing.

3. AI in Healthcare

- AI will assist in early disease detection, personalized medicine, and drug discovery.
- Robotic surgeries and AI-powered diagnostics will improve precision and accessibility.
- Mental health chatbots and AI therapy tools will become mainstream.

4. AI and Creativity

- AI will generate realistic music, art, and writing, challenging traditional creative industries.
- AI co-pilots will assist authors, filmmakers, and designers.
- Ethical questions about AI-created content and ownership will rise.

5. AGI and Super intelligence

- Advanced AI models might develop General Intelligence (AGI), capable of reasoning like humans.
- Governments and researchers will debate AI safety and regulations to prevent risks.
- AI ethics and responsible AI will be crucial to preventing unintended consequences.

6. AI and Society

- AI will play a big role in education, personal tutoring, and skill development.
- AI surveillance and privacy issues will need strong regulations.
- Deepfakes and misinformation risks will require AI-driven fact-checking solutions.

2. CONCLUSION

AI has made remarkable strides, with models like ChatGPT and DeepSeek redefining NLP applications. However, limitations such as bias, lack of true comprehension, and high computational costs highlight the need for continued research and ethical considerations. Future advancements should focus on improving reasoning capabilities, reducing biases, and enhancing efficiency to ensure responsible AI development.

3. REFERENCES

Books

[1] Russell, S., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.

[2] Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning.* MIT Press.

[3] Mitchell, M. (2019). *Artificial Intelligence: A Guide for Thinking Humans.* Farrar, Straus and Giroux.

Academic Papers

[1] LeCun, Y., Bengio, Y., & Hinton, G. (2015). *Deep learning. Nature, 521*(7553), 436-444.

[2] Silver, D., et al. (2016). *Mastering the game of Go with deep neural networks and tree search. Nature, 529*(7587), 484-489.

[3] Bostrom, N. (2014). *Superintelligence: Paths, Dangers, Strategies.* Oxford University Press.

Online Resources & Journals

[1] Google Scholar Association for the Advancement of Artificial Intelligence (AAAI) arXiv.org AI Section

[2] MIT Technology Review – AI Section

- OpenAI. (2023). ChatGPT Model Overview. Retrieved from [OpenAI website]
- DeepSeek AI. (2023). Model Capabilities and Applications. Retrieved from [DeepSeek website]
- Bengio, Y., Lecun, Y., & Hinton, G. (2015). Deep Learning. Nature, 521, 436-444.