Evolution of Artificial Intelligence in Different Technical and Non-Technical Fields: A Review

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Abstract

In present era, artificial intelligence (AI) continues to evolve at an unprecedented pace, profoundly impacting a wide array of industries and societal domains. Advancements in generative AI, such as large language models and multimodal systems, have led to more human-like interactions and creative outputs, enhancing fields from content creation to customer service. AI-driven automation is reshaping industries like healthcare, finance,manufacturing, Streamlining processes, improving efficiency, and enabling real-time decision-making. Ethical concerns surrounding AI, such as bias, privacy, and job displacement, are gaining increasing attention, prompting calls for regulation and transparent governance. Additionally, AI's role in addressing global challenges, such as climate change and healthcare inequality, is expanding, with researchers leveraging machine learning for predictive analytics, sustainable solutions, and medical diagnosis. As AI continues to advance, the balance between innovation, regulation, and societal impact remains a key focus for policymakers, technologists, and the global community.

KEYWORDS: Artificial intelligence, Machine Learning, Large language models, Multimodal Models, Open AI, Convolution Neural networks.

I.INTRODUCTION

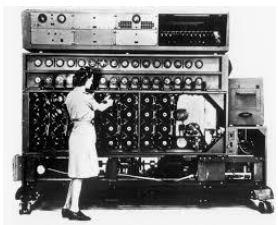
Artificial intelligence (AI) stands as one of the most transformative technologies of the modern era, revolutionizing how we live, work, and interact. AI has matured significantly, moving beyond its foundational stages into an era where machine learning, natural language processing, and advanced automation are integrated into everyday life and business operations. The capabilities of AI systems are expanding, with breakthroughs in generative AI, computer vision, robotics, and data analytics making headlines. These advancements are reshaping industries, from healthcare and finance to education and entertainment, creating new opportunities while also raising important ethical, legal, and societal challenges [1-4].

Why AI ?

AI (Artificial Intelligence) is becoming increasingly important because it has the potential to transform nearly every aspect of our lives. Here are some key reasons why AI is gaining such momentum: **Automation of Tasks**: AI can perform repetitive, time-consuming tasks quickly and accurately, freeing up humans to focus on more complex, creative, or strategic work. This increases productivity in many industries. [5,6] **Data Processing:** AI is excellent at analyzing vast amounts of data quickly. It can identify patterns, trends, and insights that humans might miss, helping in fields like healthcare, finance, marketing, and more**. Personalization**: AI allows for highly personalized experiences. For example, in online shopping, social media, or entertainment platforms, AI analyzes user behavior to recommend content or products tailored to individual preferences.**Enhancing Decision-Making**: AI can process large datasets to support better decision-making in business, healthcare, finance, and other sectors. Its predictive capabilities can forecast trends and outcomes based on data analysis .**Improving Healthcare**: In medicine, AI is helping with diagnostic tools, drug development, and personalized treatment plans. It can assist doctors by providing insights based on patient data, often leading to more accurate diagnoses and treatments [7-9]. **Innovation and Advancements**: AI is also driving innovation in areas like self-driving cars, robotics, natural language processing (like the chatbot you're interacting with!), and more. It's a key enabler of progress in numerous fields. **Global Challenges**: AI has the potential to address complex, large-scale global issues, such as climate change, by providing solutions like optimizing energy use, predicting natural disasters, and helping in resource management[10,11].

II.THE TIMELINE OF ARTIFICIAL INTELLIGENCE – FROM THE 1940 to 2025(beyond)

1. Enigma broken with AI (1942)



The Bombe Machine

This is first up our lane in the timeline of Artificial Intelligence. The Bombe machine, designed by Alan Turing during World War II, was certainly the turning point in cracking the German communications encoded by the Enigma machine. It helped in speeding up the decoding of messages. Hence, this allowed the allies to react and strategise within a few hours itself rather than waiting for days/weeks. His entire formula of breaking the code was with the observation that each German message contained a known piece of German plaintext at a known point in the message [12].

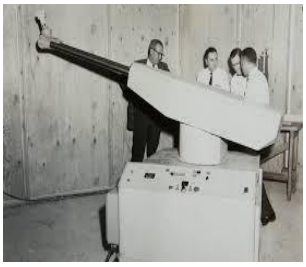
2. Test for machine intelligence by Alan Turing (1950)

Alan Turing, the world's most renowned computer scientist, and mathematician had posed yet another experiment to test for machine intelligence. The idea was to understand if the machine can think accordingly and make decisions as rationally and intelligently as a human being. In the test, an interrogator has to figure out which answer belongs to a human and which one to a machine. So, if the interrogator wouldn't be able to distinguish between the two, the machine would pass the test of being indistinguishable from a human being [13].

3.The father of AI – John McArthy (1955)

John McCarthy is the highlight of our history of Artificial Intelligence. He was an American Computer Scientist, coined the term Artificial Intelligence in his proposal for the Dartmouth Conference, the first-ever AI conference held in 1956. The objective was to design a machine that would be capable of thinking and reasoning like a human. He believed that this scientific breakthrough would unquestionably happen within 5-5000 years. Furthermore, he created the Lisp computer language in 1958, which became the standard AI programming language [14].

4. The industrial robot – Unimate (1961)

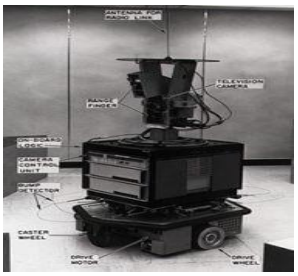


Unimate became the first industrial robot created by George Devol. She was used on a General Motors Assembly line to transport die castings and weld these parts on autobodies. The workers had to be extremely cautious while performing this activity. Else, it could lead to poisoning or losing a limb. Unimate known for its heavy robotic arm weighed 4000 pounds. Several replicas were made after Unimate's success and various industrial robots were introduced [16]**.**

5. The first chatbot – Eliza (1964)

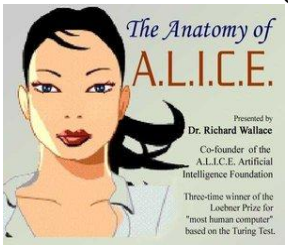
The next invention marks a huge discovery amongst the timeline of Artificial Intelligence, as the market for it is still thrivin. Eliza – the first-ever chatbot was invented in the 1960s by Joseph Wiezenbaum at the Artificial Intelligence Laboratory at MIT. Eliza is a psychotherapeutic robot that gives pre-fed responses to the users. Such that, they feel they are talking to someone who understands their problems. Here, the main idea is that the individual would converse more and get the notion that he/she is indeed talking to a psychiatrist. Of course, with continuous development, we are now surrounded by many chatbot providers such as drift, conversica, intercom, etc [17,18].

6. Shakey – the robot (1969)



Next lined-up in this timeline of Artificial Intelligence is Shakey. Shakey is chiefly titled as the first general-purpose mobile robot. It was able to reason with its own actions. According to the plaque displayed in IEEE, Shakey "could perceive its surroundings, infer implicit facts from explicit ones, create plans, recover from errors in plan execution, and communicate using ordinary English." The robot had a television monitor and whiskers to detect when it came close to any object. Interestingly, the robot itself would plan the route it would take so that it could carefully manoeuvre around obstacles. Shakey "communicated" with the project team with a teletype and a CRT display. Also, the team would judge how Shakey reacted to pranks [15].

7. The chatbot ALICE (1995)



A.L.I.C.E, composed by Richard Wallace, was released worldwide on November 3rd, 1995. Although Joseph Weizenbaum's ELIZA heavily inspired the bot, there were major tweaks to the bot that made her a genuinely exceptional. It is strengthened by NLP (Natural Language Processing), a major program that converses with humans by applying algorithmic pattern-matching rules that enables the conversation to flow more naturally. Over the years, ALICE has won many awards and accolades, such as the Loebner Prize in three consecutive years (2000, 2001 and 2004). Additionally, ALICE has inspired the 2013 movie by Spike Jonze called Her. The movie represents a relationship between a human and an artificially intelligent bot called Samantha [17].

8. Man vs Machine – DeepBlue beats chess legend (1997).

This was indeed a game-changer in the timeline of Artificial Intelligence. DeepBlue was a chess-playing computer developed by IBM. It was the ultimate battle of Man Vs Machine, to figure out who outsmarts whom. Kasparov, the reigning chess legend, was challenged to beat the machine – DeepBlue. Everyone glued to the game was left aghast that DeepBlue could beat the chess champion – Garry Kasparov. This left people wondering about how machines could easily outsmart humans in a variety

9. The Emotionally equipped robot – Kismet (1998).

Kismet (*meaning: fate*) was one of the first robots able to equally demonstrate social and emotional interactions with humans. It had a cartoonish face and always had the ability to engage with people and make them smile. The entire code to run and develop kismet took the developers about 2.5 years.The motor outputs include vocalisations, facial expressions, and motor capabilities to adjust the gaze direction of the eyes and the adjustment of the head. Therefore, it portrayed a variety of emotions such as disgust, surprise, sadness, keen interest, calmness and infuriated.

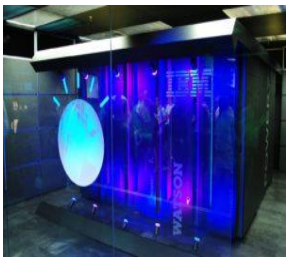
10. The Vaccum Cleaning robot – Roomba (2002).

AI soon absorbed the sponge of cleaning as well. With the introduction of Roomba, cleaning at home became much more efficient. The vacuum can trap 99% of allergens with the vacuum's High-Efficiency Filter. So, once it finishes cleaning, you have to empty the wastebasket, and you're good to go. The device has a suite of sensors to avoid smashing with the furniture, fall down the stairs and so on. Not only that, but the vacuum integrates with Amazon's Alexa and Google's Assistant—so you can have the floors cleaned only using your voice and your preferred digital assistant [18].

11. Voice recognition feature on the iPhone and Siri (2008).

In 2011, Siri was introduced as a virtual assistant and is specifically enabled to use voice queries and a natural language user interface to answer questions, make recommendations, and perform virtual actions as requested by the user. Lastly, Siri comprises a conversational interface, personal context awareness, and service delegation. The user response to Siri has consistently been so positive that it has become a key feature on all Apple devices. A user can ask Siri to call, send a message, or perform other actions with the iPhone, Macbook, and Smart Watch apps. With the rise of voice assistants like Siri, users can now search for and order various pharmaceutical products through simple voice commands [20].

12. The Q/A computer system – IBM Watson (2011).



The famous quiz show Jeopardy resulted in the development of Watson! Watson is a question-answering computer system capable of answering questions posed in natural language. Watson helps you predict and shape future outcomes, automate complex processes, and optimise your employees' time.In recent years, Watson's calibre has evolved from just being a question-answering computer system to a powerful machine learning asset to its company that can also 'see,' 'hear', 'read,' 'talk,' 'taste,' 'interpret,' 'learn,' and 'recommend.' Watson competed against champions Brad Rutter and Ken Jennings in 2011 and won the first-place prize of $1 million on the show

13. Alexa (2014)

Next up, in the history of AI is Alexa. Alexa is a virtual assistant Artificial Intelligence system, developed by Amazon. Alexa is available on smartwatches, car monitors, speakers, TV, and various other platforms. Whenever a person says "Alexa", the device conversely activates and performs the command. After that, it filters human voice from a room filled with commotion.Alexa can play music, provide information, deliver news and sports scores, tell the weather condition, and control your smart home. It even enables Prime members to make lists and order products from Amazon [19].

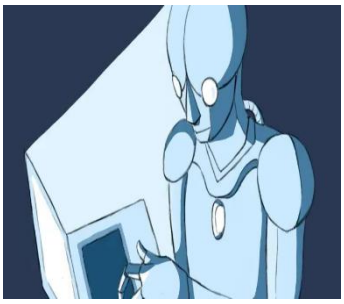
14. The first robot citizen – Sophia (2016).

Hansen Robotics created Sophia, a humanoid robot with the help of Artificial Intelligence. Sophia can imitate humans' facial expressions, language, speech skills, and opinions on pre-defined topics, and is evidently designed so that she can get smarter over time. Sophia, activated in February 2016, and introduced to the world later that same year. Thereafter, she became a Saudi Arabian citizen, making her the first robot to achieve a country's citizenship. Additionally, she was named the first Innovative Champion by the United Nations Development Programme. Actress Audrey Hepburn, Egyptian Queen Nefertiti, and the wife of Sophia's inventor are the inspiration behind Sophia's appearance [21].

15. The first AI music composer – Amper (2017).

Amper became the first artificially intelligent musician, producer and composer to create and put out an album. Additionally, Amper brings solutions to musicians by helping them express themselves through original music. Amper's technology is built using a combination of music theory and AI innovation. Amper marks the many one-of-a-kind collaborations between humans and technology. For example, Amper was particularly created on account of a partnership between musicians and engineers. Identically, t he song "Break-Free' marks the first collaboration between an actual human musician and AI. Together, Amper and the singer Taryn Southern also co-produced the music album called "I AM AI"[22,23].

16. The revolutionary tool for automated conversations – gpt-3 (2020).



GPT-3, short for Generative Pre-trained Transformer, was introduced to the world earlier in May 2020, and it is truly transforming automation.It is undoubtedly a revolutionary tool used for automated conversations, such as responding to any text that a person types into the computer with a new piece of text that is contextually appropriate. It requires a few input texts to develop the sophisticated and accurate machine-generated text. The subtle tweaks and nuances of languages are far too complex for machines to comprehend. Therefore, it becomes a task for them to generate texts that are easily readable by humans. However, GPT-3 is based on natural language (NLP), deep learning, and Open AI, enabling it to create sentence patterns, not just human language text. It can also produce text summaries and perhaps even program code automatically [24].

17.The Present Standing of AI (As of 2024)

Artificial Intelligence has undeniably become a reliable tool in the workforce. It is incorporated in search engine algorithms, customer support chatbots, analysing and processing big data, and simplifying complex processes.Moreover, AI has also merged an alliance with Cyber Security. As it learns more about the attacks and vulnerabilities that occur over time, it becomes more potent in launching preventive measures against a cyber attack [24].

18.**2025 and beyond**

Corporate spending on generative AI is expected to surpass $1 trillion in the coming years. Bloomberg predicts that GenAI products "could add about $280 billion in new software revenue driven by specialized assistants, new infrastructure products and copilots that accelerate coding."

By 2026, Gartner reported, organizations that "operationalize AI transparency, trust and security will see their AI models achieve a 50% improvement in terms of adoption, business goals and user acceptance." Yet Gartner analyst Rita Sallam revealed at July's Data and Analytics Summit that corporate executives are "impatient to see returns on GenAI investments … [and] organizations are struggling to prove and realize value." As a result, the research firm predicted that at least 30% of GenAI projects will be abandoned by the end of 2025 because of "poor data quality, inadequate risk controls, escalating costs or unclear business value [25]."

III. BASIC AI ARCHITECTURE DIAGRAM (CONCEPTUAL)

The basic architecture of an AI system typically involves several key layers or components that work together to process data, learn patterns, and make decisions.

Data Layer (Data Sources) ↓
Data Processing Layer (Preprocessing, Feature Engineering) ↓
Model Layer (AI Algorithms, Training) ↓
Inference Layer (Prediction/Decision Making) ↓
Output Layer (Actions or Results) ↔ (Optional) **Feedback Loop** (Continuous Learning) ↔ (Optional) **Human Interface Layer** (User Interaction)

FIGURE 1 The basic architecture of an AI system typically involves several key layers or components.

1. Data Layer

Data Sources: Raw data is collected from various sources like sensors, databases, user inputs, or the internet. This could include text, images, audio, video, or structured data.Data Collection: AI systems need large amounts of data to function effectively, and this data is typically collected continuously or from specific datasets.

Data Storage: Data is stored in a form that's easy to access, such as in databases, data lakes, or cloud storage systems.

2. Data Processing Layer

Preprocessing: Raw data is cleaned, transformed, and normalized to remove noise and errors, making it more suitable for analysis.For example: Converting text into tokens (NLP), resizing images (Computer Vision), or encoding categorical variables (structured data).Feature Engineering: Identifying key features from the data that will be most useful for training the AI model.

3. Model Layer

AI Algorithms/Models: This is where the actual AI engine resides. It includes the models that analyze the processed data to find patterns and make predictions or classifications. Types of models can vary based on the task:Machine Learning Models: Regression, decision trees, SVMs, etc.Deep Learning Models: Neural networks, CNNs (Convolutional Neural Networks), RNNs (Recurrent Neural Networks), etc.Reinforcement Learning Models: Used for decision-making in dynamic environments (e.g., game-playing AIs).Training: The model is trained using data (often labeled), where the system learns patterns and relationships. The model parameters are adjusted based on feedback during this phase (typically through backpropagation in neural networks).

4. Inference/Execution Layer:

Inference Engine: After training, the model can be used to make predictions on new, unseen data. This is where the AI system executes its learned knowledge.For example, a self-driving car's AI might predict the next action to take based on real-time sensor data.

5. Output Layer

Decision-Making/Action: After inference, the AI system generates its output, which could be a classification, a prediction, a recommendation, or a physical action.Example: An AI in a medical diagnosis system might output a prediction about a patient's health status.

6. Feedback Layer (Optional but Common in Machine Learning)

Continuous Learning: Many AI systems have a feedback loop where their performance is monitored, and the model is fine-tuned or retrained based on new data or corrections to improve future predictions. Example: A recommendation engine may update its model based on new user preferences.

7. Human Interface Layer (Optional)

User Interaction: This is the layer that allows humans to interact with the AI system, whether it's through a chatbot, dashboard, or other interface. It can also include visualization tools to make the AI's decisions or predictions more understandable to users [26,27].

V a. Large Language Models (LLMs)

Typical diagram of a Large Language Model (LLM) like GPT would look:Diagram:

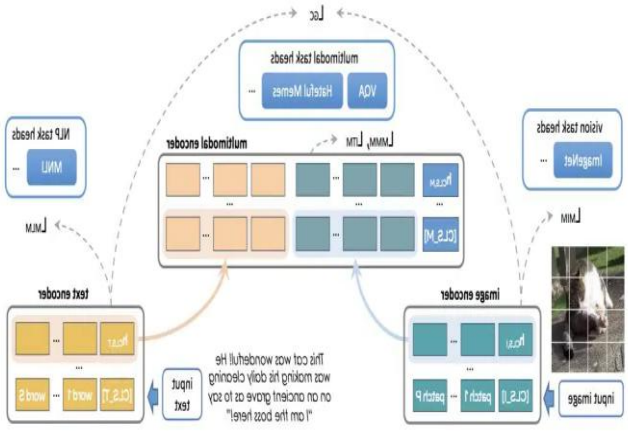
```
Input Text ---> [Tokenization] ---> [Embedding Layer]
--->
```

V
[Transformer Block 1] ---> [Transformer Block 2] ---> ... ---> [Transformer Block N]
V
[Output Layer] ---> Predicted Text or Task Output (e.g., next word, translation)

FIGURE 2

Input Layer:The model receives an input text sequence. For example, a sentence or a paragraph.This input is tokenized into smaller units (tokens), often words or subwords.Embedding Layer:The tokens are converted into dense vectors (embeddings) that represent their semantic meaning.Transformer Blocks:The core of the model is made up of multiple Transformer layers. Each block consists of:Self-attention Mechanism: Allows the model to focus on different parts of the input text when making predictions.Feed-forward Neural Networks: After attention, the model passes the data through fully connected layers for further transformation.Stack of Transformer Layers:Multiple transformer layers are stacked on top of each other. The more layers, the larger the model (hence "Large").Each transformer layer refines the understanding of the input text by building upon previous layers.OutputLayer:The final output layer generates predictions based on the processed input, which could be a text continuation, translation, or other tasks, depending on the training.The output could be a probability distribution over the vocabulary, representing which word is most likely next in the sequence.Fine-Tuning (Optional):Sometimes, after pre-training, the model undergoes fine-tuning on specific tasks or datasets to improve performance for a given application (like question answering, summarization, etc.).GPT-4 (and successors): These models, developed by OpenAI, are capable of understanding and generating highly coherent and contextually accurate text. They are used for a wide range of tasks such as text generation, translation, summarization, and conversational agents.Anthropic's Claude: A series of models that emphasize alignment, safety, and ethical use of AI, Claude is designed to be more controllable and user-friendly for conversational AI applications.Google'sPaLM: The Pathways Language Model (PaLM) is an advanced model by Google that scales to multiple tasks without the need for task-specific training. It's used for understanding and generating text as well as performing complex reasoning.

V.Multimodal Models



OpenAI's GPT-4 Multimodal: This model goes beyond text generation and includes the ability to process both text and images, making it useful for tasks such as image captioning, visual question answering, and cross-modal understanding.DeepMind's Flamingo: Another multimodal model that can handle both vision and language tasks, Flamingo excels in interpreting images and responding in natural language without the need for specialized training on each visual concept.Vision Transformers (ViTs):This architecture has emerged as a powerful alternative to convolutional neural networks (CNNs) for image recognition tasks. ViTs excel in processing images with long-range dependencies, making them particularly useful in fields like medical imaging, autonomous vehicles, and facial recognition.Meta's DINO: A self-supervised learning

FIG-3 SHOWS MULTIMODEL MODEL

model designed for visual representation learning, DINO is capable of understanding complex visual concepts without relying on labeled datasets.Reinforcement Learning Models:DeepMind'sAlphaCode: Built on reinforcement learning, AlphaCode has been a major breakthrough in coding generation. It can solve competitive programming problems by learning from vast amounts of programming data, demonstrating significant advancements in AI-powered software development.OpenAI's Dota 2 Bots: Leveraging reinforcement learning, OpenAI's bots were trained to play the video game Dota 2 at a competitive level. These bots continue to evolve, demonstrating AI's potential in strategic thinking and decision-making.5. Generative Adversarial Networks (GANs):StyleGAN 3: StyleGAN has been a leading architecture for generating highly realistic images, and its latest iteration, StyleGAN 3, improves upon its predecessors by minimizing visual artifacts and producing even more realistic, high-quality synthetic images.Runway's Stable Diffusion: A popular open-source text-to-image generator, Stable Diffusion allows users to create detailed, high-quality images based on text descriptions. It is widely used in art, design, and creative industries [26-28].

IV .TRANSFORMATIVE TECHNOLOGIES

In 2024, several transformative technologies are at the core of artificial intelligence, enabling its rapid evolution and widespread impact across various sectors. Key technologies include:Machine learning is a branch of artificial intelligence (AI) that enables computers to learn from data and improve over time without being explicitly programmed. Instead of following a fixed set of rules, machine learning algorithms identify patterns and make predictions or decisions based on the data they are given.**Supervised Learning**: The algorithm is trained on labeled data (data with known outcomes). It learns the relationship between the input data and the desired output, so it can make predictions on new, unseen data. For example, predicting house prices based on features like size, location, etc.**Unsupervised Learning**: The algorithm is given data without labeled outcomes and must find hidden patterns or structures within it. A common example is clustering, where the algorithm groups similar data points together.**Reinforcement Learning**: The algorithm learns by interacting with its environment and receiving feedback (rewards or penalties). It aims to maximize the cumulative reward over time by making decisions that lead to better outcomes. A good example is training an AI to play a game.**Semi-supervised and Self-supervised Learning**: These are hybrid approaches where the model learns from both labeled and unlabeled data or tries to predict parts of the data that are missing [29].

Generative AI: With the rise of powerful models like Generative Pre-trained Transformer **(**GPT-4) beyond, generative AI has become one of the most influential technologies. It can produce text, images, audio, and video content with high fidelity, facilitating advancements in content creation, marketing, and creative industries. This technology is also being used to generate synthetic data for training other AI models.**Large Language Models (LLMs)**: These models, such as GPT-4, continue to evolve, enabling more natural, context-aware interactions between humans and machines. They are pivotal in natural language processing (NLP), driving applications in customer service, language translation, and personalized communication.**Deep Learning**: Deep neural networks continue to push the boundaries of AI, improving the accuracy of tasks such as speech recognition, computer vision, and decision-making. Deep learning has significantly enhanced capabilities in areas like medical imaging, autonomous driving, and facial recognition.**Computer Vision**: Advancements in computer vision, powered by deep learning and convolutional neural networks (CNNs), have led to breakthroughs in image recognition, object detection, and visual data interpretation. This technology is pivotal in sectors such as healthcare (for diagnostics), security (for surveillance), and retail (for customer behaviour analysis).**Reinforcement Learning**: Reinforcement Learning (RL) is a branch of machine learning focused on making decisions to maximize cumulative rewards in a given situation In RL, an agent learns to achieve a goal in an uncertain, potentially complex environment by performing actions and receiving feedback through rewards or penalties.**Federated Learning**: A privacy-preserving machine learning technique, federated learning allows AI models to be trained across decentralized devices without needing to share sensitive data. This technology is essential for improving privacy and security in AI systems, particularly in healthcare and financial applications.**Edge AI**: As AI is deployed on edge devices like smartphones, sensors, and IoT devices, edge AI reduces the need for cloud-based computation, enabling faster decision-making and lower latency. It's crucial for real-time applications such as autonomous vehicles, smart cities, and wearable health devices.

Explainable AI (XAI): With AI systems becoming more complex, there is an increasing focus on explainability and transparency. XAI seeks to make AI decisions understandable to humans, which is essential for industries like healthcare, finance, and law, where trust and accountability are critical.
Quantum Computing: Though still in early stages, quantum computing promises to exponentially increase computational power, unlocking new potentials for AI, particularly in optimization, complex modeling, and drug discovery. It is expected to dramatically accelerate AI research in the coming years.
AI-Driven Automation and Robotics: AI technologies are powering the next generation of robotics, leading to more autonomous machines capable of performing complex tasks across industries. In manufacturing, logistics, and healthcare, AI-driven robots are transforming workflows and enhancing efficiency.

V.The difference between AI in 2023 and 2024:

1. Model Size and Performance2023 AI: In 2023, large language models like GPT-4 were widely used, and models continued to grow in size, reaching billions of parameters. These models exhibited impressive language understanding and generation capabilities but were still limited in certain areas like reasoning, memory, and fine-tuned applications.**2024 AI**: In 2024, AI models are expected to be even more optimized and powerful, with improvements in both model architecture and training methods. We're likely to see even larger models or models that are more efficient, potentially improving accuracy, speed, and the ability to handle more complex tasks (e.g., better memory, multi-modal capabilities, advanced reasoning, and contextual understanding [28].

2. Multi-Modal AI2023 AI: In 2023, we saw more developments in multi-modal AI, like GPT-4's ability to understand and generate text and images. AI models could handle tasks like image captioning, visual question answering, and even text-to-image generation.**2024 AI**: By 2024, multi-modal AI is expected to reach a more integrated level, where models can seamlessly combine not only text and images but also videos, sounds, and other types of data (e.g., 3D simulations, augmented reality). These systems will be more adept at understanding complex scenarios that involve multiple data types simultaneously, making them more versatile in real-world applications like robotics, healthcare, and entertainment.

3. Specialized AI Models2023 AI: In 2023, AI models were still somewhat general-purpose, though there were specialized models for certain tasks, such as image generation (DALL·E), medical diagnostics, and robotics.[2]**2024 AI**: The trend of creating more domain-specific models will likely continue, but in 2024, specialized models might go further, exhibiting deeper expertise in niche fields like quantum computing, climate modeling, and specialized health diagnostics. There could be more fine-tuned models for different industries that outperform general-purpose models for specific tasks.

4. AI Ethics and Regulation2023 AI: In 2023, the discussion around AI ethics, fairness, and regulation became more urgent. Many tech companies and governments began pushing for clearer guidelines and rules on things like transparency, accountability, and bias in AI systems.**2024 AI**: By 2024, we're likely to see the introduction of more formal regulations and ethical frameworks around AI deployment. This could include government-mandated transparency for how models work, rules about data privacy, and methods for reducing bias and discrimination in AI systems. We might also see the growth of "AI governance" frameworks to ensure responsible development and deployment.

5. AI in Business and Everyday Life2023 AI: In 2023, AI made significant inroads in fields like customer service (chatbots), content creation (AI-generated art and text), business automation, and healthcare (diagnosis support).**2024 AI**: By 2024, AI integration in everyday life will be even more widespread and subtle. AI systems will become more autonomous and embedded in devices, improving everything from personalized recommendations (shopping, entertainment) to enhancing productivity tools (writing assistants, coding helpers). Additionally, we could see AI playing a key role in personalized healthcare, mental health support, and advanced automation (e.g., self-driving cars becoming more viable [24].

6. AI Efficiency and Sustainability2023 AI: AI models, especially large ones like GPT-4, were energy-intensive to train and operate. Efforts were being made to improve efficiency, but the energy and environmental impact of training these models remained a topic of concern.**2024 AI**: In 2024, we can expect more innovations in energy-efficient AI models, perhaps driven by advances in hardware (like quantum computing or specialized AI chips) and algorithm optimization. More companies and research labs will likely adopt "green AI" practices, seeking to minimize the environmental impact of training large models and ensuring AI systems are energy-efficient without sacrificing performance [25].

7. Integration of AI with Emerging Technologies2023 AI: AI in 2023 was already being integrated with emerging technologies like blockchain, edge computing, and the Internet of Things (IoT) to drive smarter, decentralized systems.**2024 AI**: By 2024, these integrations will deepen. For example, AI could enhance decentralized finance (DeFi) systems by automating risk analysis or providing more advanced predictions for investments. Edge AI could become more common, with smart devices processing data locally, making real-time decisions without relying on cloud computing.

8. Improved Human-AI Interaction2023 AI: In 2023, user interfaces like chatbots, voice assistants, and AI-enhanced tools were becoming more conversational and capable of understanding human nuances.**2024 AI**: AI is expected to be even more natural and intuitive in 2024, thanks to improvements in understanding context, emotions, and social cues. These advancements could lead to more seamless human-AI collaboration, where AI systems are able to provide personalized suggestions and offer proactive assistance in a more human-like manner [29].

9. AI and Creativity2023 AI: AI-generated art, music, and writing were becoming more impressive, with models like DALL·E, MidJourney, and GPT-3 being able to create high-quality creative content.**2024 AI**: Expect even more sophisticated AI in creative fields. In 2024, AI might co-create with humans in real-time, bringing ideas to life faster, suggesting improvements, and even evolving the creative process. AI could be more integrated into professional industries like filmmaking, game design, and product development, where its ability to generate novel ideas can accelerate innovation [30].

VI. FUTURE SCOPE Artificial Intelligence (AI) has experienced remarkable advancements over the past few decades, leading to significant improvements across various sectors. Here's an overview of the key developments:1. Natural Language Processing (NLP):Language Understanding and Generation: AI systems have achieved unprecedented accuracy in understanding and generating human language. This progress is evident in sophisticated chatbots, language translation services, and voice-activated assistants,Generative Models: Models like OpenAI's GPT series and Google's BERT have revolutionized text generation, enabling applications from content creation to code generation.2. Machine Learning and Deep Learning:Reinforcement Learning: Advancements in reinforcement learning have led to AI systems excelling in complex tasks such as game playing, robotics, and autonomous systems. Generative Adversarial Networks (GANs): Introduced in 2014, GANs have enabled the creation of realistic images, videos, and audio, impacting fields like art, entertainment, and data augmentation. 3. Healthcare Innovations:Medical Diagnostics: AI has enhanced diagnostic accuracy, with systems now capable of interpreting medical images and patient data with high precision,Drug Discovery: AI accelerates the identification of potential drug compounds, streamlining the development of new medications.4. Robotics and Automation:Learning from Observation: Robots have developed the ability to learn tasks by observing human actions, reducing the need for explicit programming. Advanced Robotics: AI-driven robots are now capable of performing complex tasks in dynamic environments, from manufacturing to healthcare assistance.5. AI in Creative Industries:Art and Design: AI tools assist in creating art, music, and literature, offering new avenues for creative expression.Content Generation: AI models can generate realistic images, videos, and audio, impacting fields like art, entertainment, and data augmentation. 6. AI in Business and Finance:Predictive Analytics: AI analyzes large datasets to forecast trends, aiding in decision-making across various industries. Customer Service: AI-powered chatbots and virtual assistants enhance customer interactions, providing timely and personalized

responses.7.AIinTransportation:Autonomous Vehicles: AI enables self-driving cars to navigate complex environments, promising safer and more efficient transportation. Traffic Management: AI optimizes traffic flow and reduces congestion through intelligent traffic control systems.8. AI in Education:Personalized Learning: AI tailors educational content to individual learning styles and paces, enhancing student engagement and outcomes.Automated Grading: AI systems assist in evaluating assignments and providing feedback, streamlining administrative tasks for educators.9. AI in Security:Threat Detection: AI analyzes patterns to identify potential security threats, enhancing cybersecurity measures.Surveillance: AI-powered systems monitor and analyze surveillance footage, improving public safety.10. AI in Environmental Sustainability:ClimateModeling: AI improves the accuracy of climate models, aiding in the understanding and mitigation of climate change.Resource Management: AI optimizes the use of natural resources, promoting sustainable practices in agriculture and industry.These advancements highlight AI's transformative impact across diverse sectors, continually reshaping industries and daily life.

VII.CONCLUSION From 1940 to 2024, AI has undergone significant evolution. Initially, in the 1940s and 50s, AI was rooted in theoretical foundations, like Turing's work on computation and early neural network models. The 1960s and 70s saw the development of symbolic AI and rule-based systems, with early expert systems emerging in the 80s. The 1990s brought advances in machine learning algorithms, including decision trees and support vector machines. The 2000s marked the rise of deep learning, particularly with the advent of neural networks capable of processing large datasets. By the 2010s, AI achieved breakthroughs in natural language processing and computer vision, exemplified by models like GPT and AlphaGo. Today, AI is deeply integrated into industries such as healthcare, autonomous vehicles, and entertainment, with continued focus on making systems more ethical, transparent, and efficient. AI's capabilities now continue to expand into quantum computing and generative models, shaping the future of technology.

https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai

[1] B. Whitby, Artificial Intelligence: A Beginner's Guide. Oxford, U.K.: Oneworld, 2008.

[2]D. H. Hagos, R. Battle and D. B. Rawat "Recent Advances in Generative AI and Large Language Models: Current Status, Challenge Artificial Intelligence, vol. 5, no. 12, pp. 5873-5893, Dec. 2024, doi: 10.1109/TAI.2024.3444742.

[2] K. Flamm, Creating the Computer: Government, Industry, and High Technology. Washington, DC, USA: Brookings Institution Press, 1988.

[3] M. Campbell-Kelly, Computer, Student Economy Edition: A History of the Information Machine. Evanston, IL, USA: Routledge, 2018.

[4] M. M. L. Cairns "Computers in education: The impact on schools and classrooms," in Life Schools Classrooms. Singapore: Springer, 2017, pp. 603–617.

[5] B. Coppin, Artificial Intelligence Illuminated. Boston, MA, USA: Jones and Bartlett, 2004.

[6] B. Whitby, Artificial Intelligence: A Beginner's Guide. Oxford, U.K.: Oneworld, 2008.

[7] V. Devedžic, "Web intelligence and artificial intelligence in education," Educ. Technol. Soc., vol. 7, no. 4, pp. 29–39, 2004.

[8] M. J. Timms, "Letting artificial intelligence in education out of the box: Educational cobots and smart classrooms," Int. J. Artif. Intell. Edu., vol. 26, no. 2, pp. 701–712, Jan. 2016.

[9] H. Snyder, "Literature review as a research methodology: An overview and guidelines," J. Bus. Res., vol. 104, pp. 333–339, Nov. 2019.

[10] Y. Fang, P. Chen, G. Cai, F. C. M. Lau, S. C. Liew, and G. Han, "Outagelimit-approaching channel coding for future wireless communications: Root-protograph low-density parity-check codes," IEEE Veh. Technol. Mag., vol. 14, no. 2, pp. 85–93, Jun. 2019.

[11] M. Vaismoradi, H. Turunen, and T. Bondas, "Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study," Nursing Health Sci., vol. 15, no. 3, pp. 398–405, Mar. 2013.

[12]M. Chassignol, A. Khoroshavin, A. Klimova, and A. Bilyatdinova, "Artificial intelligence trends in education: A narrative overview," Procedia Comput. Sci., vol. 136, pp. 16–24, Jan. 2018.

[13] V. Rus, S. D'Mello, X. Hu, and A. Graesser, "Recent advances in conversational intelligent tutoring systems," AI Mag., vol. 34, no. 3, pp. 42–54, Sep. 2013.

[14] R. C. Sharma, P. Kawachi, and A Bozkurt, "The landscape of artificial intelligence in open, online and distance education: Promises and concerns," Asian J. Distance Educ., vol. 14, no. 2, pp. 1–2, 2019.

[15] S. Pokrivcakova, "Preparing teachers for the application of AI-powered technologies in foreign language education," J. Lang. Cultural Edu., vol. 7, no. 3, pp. 135–153, Dec. 2019.

[16] T. A. Mikropoulos and A. Natsis, ‘‘Educational virtual environments: A ten-year review of empirical research (1999–2009),’’ Comput. Edu., vol. 56, no. 3, pp. 769–780, Apr. 2011.

[17] (2019). United Nations Education Scientific and Cultural Organization (UNESCO). How Can Artificial Intelligence Enhance Education? [Online]. Available: https://en.unesco.org/news/how-can-artificialintelligence-enhance-education

[18] S. A. Wartman and C. D. Combs, ‘‘Medical education must move from the information age to the age of artificial intelligence,’’ Acad. Med., vol. 93, no. 8, pp. 1107–1109, Aug. 2018.

[19] H. T. Kahraman, S. Sagiroglu, and I. Colak, ‘‘Development of adaptive and intelligent Web-based educational systems,’’ in Proc. 4th Int. Conf. Appl. Inf. Commun. Technol., Oct. 2010, pp. 1–5.

[20] R. Peredo, A. Canales, A. Menchaca, and I. Peredo, ‘‘Intelligent Webbased education system for adaptive learning,’’ Expert Syst. Appl., vol. 38, no. 12, pp. 14690–14702, Nov. 2011.

[21] P. Phobun and V. J. , ‘‘Adaptive intelligent tutoring systems for e-learning systems,’’ Procedia-Social Behav. Sci., vol. 2, no. 2, pp. 4064–4069, 2010.

[22] I. Roll and R. Wylie, ‘‘Evolution and revolution in artificial intelligence in education,’’ Int. J. Artif. Intell. Edu., vol. 26, no. 2, pp. 582–599, Feb. 2016.

[23] Surjandy, W. Suparta, A. Trisetyarso, C. H. Kang, and B. S. Abbas, ‘‘Warding off the plagiarism with the applications (Case study at Bina Nusantara university student and faculty member),’’ in Proc. Int. Conf. Inf. Commun. Technol. (ICOIACT), Mar. 2018, pp. 511–514.

[24] H. Sutton, ‘‘Minimize online cheating through proctoring, consequences,’’ Recruiting Retaining Adult Learners, vol. 21, no. 5, pp. 1–5, Jan. 2019.

[25] D. Crowe, M. LaPierre, and M. Kebritchi, ‘‘Knowledge based artificial augmentation intelligence technology: Next step in academic instructional tools for distance learning,’’ TechTrends, vol. 61, no. 5, pp. 494–506, Jul. 2017.

[26] R. F. Murphy, ‘‘Artificial intelligence applications to support K–1 2 teachers and teaching,’’ RAND Corp., Santa Monica, CA, USA, Tech. Rep. PE135, 2019, doi: 10.7249/PE315.

[27] S. Kiesler, R. E. Kraut, K. R. Koedinger, V. Aleven, and B. M. Mclaren, ‘‘Gamification in education: What, how, why bother,’’ Academic exchange quarterly, vol. 15, no. 2, pp. 1–5, 2011.

[28] N. T. Le, S. Strickroth, S. Gross, and N. Pinkwart, ‘‘A review of AIsupported tutoring approaches for learning programming,’’ in Advanced Computational Methods for Knowledge Engineering. Heidelberg, Germany: Springer, 2013.

[29] M. Saerbeck, T. Schut, C. Bartneck, and M. D. Janse, ‘‘Expressive robots in education: Varying the degree of social supportive behavior of a robotic tutor,’’ in Proc. 28th Int. Conf. Hum. Factors Comput. Syst. (CHI), 2010, pp. 1613–1622.

[30] W. U. Weiguo, ‘‘Research progress of humanoid robots for mobile operation and artificial intelligence,’’ J. Harbin Inst. Technol., vol. 47, no. 7, pp. 1–19, 2015.