



Unveiling The Impact Of Chatgpt: From Genesis To Transformational Influence

Sanjaikanth E Vadakkethil Somanathan Pillai^{1*}, P Vishnu Kumar², Mary Joseph³, Santiago Otero-Potosi⁴, Alvaro Vargas-Chavarrea⁵, Dr. Ragupathi Ramasamy⁶

¹School of Electrical Engineering and Computer Science, University of North Dakota, Grand Forks, USA

²Assistant Professor, Department of ECE, G Pullaiah College of Engineering and Technology, Kurnool, Andhra Pradesh

³Assistant Professor, Department of IT, St. Joseph's Institute of Technology, Chennai

⁴Professor, Department of Investigation, Instituto Superior Tecnológico Liceo Aduanero, Ibarra, Ecuador

⁵Professor, Department of Investigation, Instituto Superior Tecnológico Liceo Aduanero, Ibarra, Ecuador

⁶Associate Professor of English, NPR College of Engineering and Technology, Natham Dindigul, Tamil Nadu, India

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ARTICLE INFO**ABSTRACT**

ChatGPT stands as a groundbreaking technology harnessing advanced artificial intelligence methodologies to produce human-like text responses when presented with prompts or inputs. Its utilization spans a myriad of domains, ranging from natural language processing and customer service to content creation. This comprehensive investigation delves into the genesis of ChatGPT, elucidating its underlying mechanisms and operational dynamics. Through a thorough examination of its functionality, this study scrutinizes the intricacies of ChatGPT, shedding light on both its strengths and weaknesses. It meticulously evaluates the advantages it offers, juxtaposed with the limitations it poses, while also delving into its distinctive features. Furthermore, this analysis extends its purview to explore the profound impact of ChatGPT across an array of fields. From academia to cybersecurity, customer support to software development, this study meticulously dissects the transformative influence of ChatGPT. It unravels the intricate ways in which this technology has reshaped job landscapes and information technology paradigms. Moreover, it contemplates the burgeoning potential of ChatGPT for researchers and scholars, envisaging novel applications that propel the boundaries of knowledge dissemination and exploration. In essence, this exploration serves as a comprehensive roadmap, illuminating the multifaceted impact of ChatGPT and paving the way for a deeper understanding of its implications across diverse spheres of human endeavour.

I. Introduction:

Have you ever encountered a chatbot that conversed with you so seamlessly that it felt almost human-like? Or perhaps you've marvelled at the accuracy of a language translation tool, effortlessly deciphering complex sentences and phrases. If so, you've likely witnessed the transformative power of ChatGPT – a groundbreaking technology reshaping the landscape of human-machine interaction. Developed by OpenAI, ChatGPT epitomizes a language model that leverages sophisticated artificial intelligence techniques to craft natural language responses based on given prompts or inputs. The ripple effects of ChatGPT's emergence have reverberated across diverse domains, spanning from the realms of natural language processing to customer service and content creation. In this comprehensive exploration of ChatGPT, we embark on a journey to unravel its origins, operational mechanisms, and far-reaching impact on various fields of study. Join us as we navigate through the captivating realm of ChatGPT, uncovering the profound ways in which it's reshaping our daily interactions and communication paradigms. At its core, ChatGPT operates through a sophisticated deep neural network architecture, comprising multiple layers of transformers. These transformers are meticulously engineered to process sequential data, such as natural language text, and adeptly generate coherent and human-like responses. The model's training process entails feeding it with extensive textual data, allowing it to discern intricate patterns and relationships within language structures. Through iterative learning, ChatGPT continuously refines its capabilities, growing more adept as it assimilates additional data.

Upon completion of its training phase, ChatGPT can undergo fine-tuning tailored to specific applications or tasks, be it language translation or content generation. The modus operandi of ChatGPT unfolds through a series of meticulously orchestrated steps. The user initiates the interaction by inputting a prompt or query into the system. Subsequently, the model processes this input, leveraging its nuanced understanding of language nuances and associations to craft a coherent response. This response is then seamlessly delivered back to the user, fostering a fluid conversational flow. Crucially, the efficacy of ChatGPT is continuously honed through reinforcement learning, wherein it assimilates feedback from human interactions to refine and enhance its conversational prowess. Thus, ChatGPT represents a remarkable fusion of cutting-edge technology and human ingenuity, heralding a new era of interaction between humans and machines.

1. Supervised Fine-Tuning (SFT) Model:

The Supervised Fine-Tuning model operates on a supervised learning approach, utilizing demonstration data to train and refine its capabilities. Through the accumulation of demonstration data, the model learns to mimic desired behaviours or outputs, thereby enhancing its performance over time. This method involves providing the model with labelled examples or demonstrations, allowing it to iteratively adjust its parameters to better align with the provided data.

2. Reward Model (RM):

The Reward Model serves as a critical component in the reinforcement learning framework. It evaluates the outputs generated by the Supervised Fine-Tuning (SFT) model and assigns points or rewards based on the desirability of these outputs from the perspective of users or predefined criteria. The Reward Model essentially acts as a feedback mechanism, guiding the learning process by incentivizing the generation of outputs that align with desired objectives or user preferences.

3. SFT Model via Proximal Policy Optimization (PPO):

In this approach, the Supervised Fine-Tuning (SFT) model undergoes further refinement through reinforcement learning techniques, specifically via Proximal Policy Optimization (PPO). Through this method, the SFT Policy is fine-tuned iteratively by allowing it to optimize its outputs based on the guidance provided by the Reward Model (RM). PPO, as a fine-tuned variant of reinforcement learning algorithms, facilitates the optimization of policies in a stable and efficient manner, ensuring that the SFT model continually improves its performance over successive iterations.

II. Literature work:

This literature review delves into the extensive body of research surrounding ChatGPT, a pioneering conversational AI model developed by OpenAI. By synthesizing findings from diverse studies, it aims to provide a comprehensive understanding of ChatGPT's capabilities, limitations, and potential applications across various domains.

i. Attention Mechanism:

The attention mechanism serves as a pivotal component within neural networks, imbuing models with the ability to selectively focus on particular aspects of input data when making predictions (Niu et al., 2021). By dynamically allocating resources to relevant features, attention mechanisms enhance the model's capacity to discern salient information, thereby improving prediction accuracy and robustness.

ii. Chatbot:

A chatbot represents a sophisticated computer program meticulously crafted to emulate human-like conversation, predominantly in online settings (King, 2022). These AI-powered agents engage users in interactive dialogues, catering to a diverse array of queries and tasks, ranging from customer support inquiries to entertainment and beyond.

iii. Generative Model:

In the realm of machine learning, generative models stand apart by their ability to produce new data instances, rather than solely classifying or predicting based on existing input data (Pavlik, 2023). Leveraging probabilistic frameworks, generative models exhibit remarkable versatility, generating data samples that closely adhere to the underlying distribution of the training data.

iv. Generative Pre-Trained Transformer (GPT):

The Generative Pre-Trained Transformer, or GPT, epitomizes a groundbreaking machine learning model adept at comprehending and generating human-like language through a synthesis of unsupervised and supervised learning techniques (Radford et al., 2018). GPT's prowess lies in its capacity to encapsulate the nuances of human language, enabling it to generate coherent and contextually relevant text across a diverse array of domains and topics.

v. Multimodal Neurons:

Multimodal neurons represent a pivotal innovation within artificial neural networks, possessing the capability to comprehend and interpret diverse modalities or representations of data, such as images, text, and speech (Goh et al., 2021). By assimilating information from multiple sources, multimodal neurons facilitate holistic understanding and inference across disparate data types, fostering enhanced performance in multimodal tasks.

vi. Language Model:

A language model constitutes a cornerstone within the realm of artificial intelligence, trained to generate text that exhibits characteristics akin to human language (MacNeil et al., 2022). These models leverage vast datasets to discern underlying linguistic patterns and structures, facilitating the generation of contextually appropriate and grammatically sound text.

vii. Natural Language Processing (NLP):

Natural Language Processing (NLP) embodies a burgeoning field within artificial intelligence, dedicated to the development of algorithms that analyze and interpret human language, encompassing both textual and spoken forms (Manning & Schütze, 1999). NLP techniques enable machines to extract meaning, infer sentiment, and derive actionable insights from unstructured textual data, thereby facilitating a broad spectrum of applications spanning from sentiment analysis to machine translation.

viii. Neural Network:

A neural network stands as a foundational architecture within the realm of machine learning, comprising interconnected processing nodes that collectively learn to perform specific tasks through iterative adjustment of connection strengths (Bishop, 1994). These versatile models excel in pattern recognition and data processing tasks, underpinning advancements across diverse domains, including image classification, speech recognition, and natural language understanding.

ix. Supervised Fine-Tuning:

Supervised fine-tuning represents a potent machine learning technique wherein a pre-trained model undergoes further refinement on a smaller, labelled dataset, thereby honing its performance on specific tasks (Lee et al., 2018). By leveraging labelled examples to fine-tune model parameters, supervised fine-tuning enables the adaptation of pre-trained models to novel domains or tasks, enhancing their efficacy and generalization capabilities.

x. Transfer Learning:

Transfer learning epitomizes a powerful capability exhibited by tools like ChatGPT, wherein knowledge acquired from one task is leveraged to enhance performance on another, closely related task (Pan & Yang, 2010). By capitalizing on insights gleaned from prior experiences, transfer learning facilitates the efficient adaptation of learned knowledge across diverse domains, thereby expediting learning and improving overall performance.

xi. Unsupervised Pre-Training:

Unsupervised pre-training emerges as a foundational machine learning technique, wherein a model is trained on a sizable dataset devoid of labelled examples, enabling it to discern underlying structures and patterns inherent in the data (Lee et al., 2018). Freed from the constraints of labelled data, unsupervised pre-training empowers models to autonomously uncover salient features and representations, laying a robust foundation for subsequent supervised learning tasks. This approach engenders versatility and adaptability, facilitating the acquisition of nuanced insights from unstructured data sources.

III. Features of Chat GPT:

Features of ChatGPT encompass a rich array of capabilities that distinguish it as a cutting-edge technology in the domain of natural language processing and artificial intelligence. These features include:

1. Natural Language Understanding: ChatGPT demonstrates a remarkable ability to comprehend and interpret human language in its diverse forms, encompassing colloquialisms, idiomatic expressions, and contextual nuances.
2. Contextual Responsiveness: Leveraging sophisticated algorithms, ChatGPT exhibits a contextual understanding of conversations, enabling it to generate responses that are relevant and coherent within the given context.
3. Adaptability: ChatGPT can adapt its responses based on the input provided, allowing for dynamic interactions tailored to specific user queries or prompts.
4. Multimodal Integration: Integrating diverse modalities such as text, images, and audio, ChatGPT expands its scope beyond textual interactions, facilitating richer and more engaging conversational experiences.
5. Personalization: Through continuous learning and fine-tuning, ChatGPT can adapt its responses to individual user preferences and conversational styles, fostering personalized interactions.

6. Scalability: ChatGPT's architecture is designed for scalability, allowing it to handle varying volumes of interactions across different platforms and applications with ease.
7. Versatility: From customer support to content creation, ChatGPT demonstrates versatility in its application, catering to a wide range of use cases across different industries and domains.
8. Ethical Considerations: ChatGPT incorporates mechanisms to ensure ethical and responsible usage, including safeguards against generating harmful or inappropriate content.
9. Continuous Improvement: Through ongoing training and refinement, ChatGPT evolves over time, enhancing its performance and capabilities in response to user feedback and new data.
10. Integration with External Systems: ChatGPT can seamlessly integrate with external systems and APIs, enabling interoperability with existing software infrastructure and workflows.

The features collectively contribute to its effectiveness and utility across various contexts, empowering users to engage in natural and meaningful interactions with AI-powered conversational agents.

IV. Limitations of Chat GPT:

While ChatGPT represents a significant advancement in natural language processing and conversational AI, it is not without its limitations. Some of these limitations include:

1. Inability to Generate Original Content: While proficient at generating coherent text based on provided prompts, ChatGPT lacks true creativity and may struggle to produce genuinely original or innovative content.
2. Limited Knowledge Base: ChatGPT's knowledge is confined to the data it has been trained on, which may result in inaccuracies or gaps in information, particularly in rapidly evolving or specialized domains.
3. Prone to Generating Inaccurate or Misleading Information: Due to its reliance on statistical patterns in training data, ChatGPT may inadvertently generate inaccurate or misleading information, especially in complex or ambiguous contexts.
4. Difficulty in Handling Complex Conversations: ChatGPT may struggle to maintain coherence and context in lengthy or multi-turn conversations, leading to disjointed interactions or misunderstandings.
5. Vulnerability to Adversarial Attacks: Like other machine learning models, ChatGPT is susceptible to adversarial attacks, where intentional manipulation of input can lead to unexpected or undesirable outputs.
6. Limited Understanding of Emotional Context: While ChatGPT can recognize and generate text expressing emotions, its understanding of emotional context may be limited, resulting in responses that lack empathy or fail to appropriately address emotional cues.
7. Resource Intensive: Training and deploying ChatGPT models can be computationally expensive and resource-intensive, making it challenging for some organizations or individuals to utilize the technology effectively.
8. Ethical and Privacy Concerns: The widespread deployment of conversational AI raises concerns related to privacy, data security, and ethical considerations surrounding the collection and use of user data for training and optimization purposes.

Several alternatives to ChatGPT exist, each offering unique features and capabilities. Some notable alternatives include:

There's a plethora of alternatives to ChatGPT available for natural language processing and automated conversation tasks. Notably, due to Microsoft's significant investments in ChatGPT, numerous companies, including Google, have stepped up with their AI-based chatbots. Take Google's Bard, for instance—a remarkable AI chatbot crafted to enhance the search engine experience. Leveraging the LaMDA language model, akin to ChatGPT 3.5, Bard operates akin to ChatGPT, proficiently generating user-friendly responses across diverse topics. It transforms the Google search engine into an interactive virtual assistant, providing insightful and engaging interactions. These chatbots exemplify various design methods, showcasing the richness of approaches within the AI chatbot landscape. Explore below some of the fascinating design approaches and types of chatbots that have emerged.

V. Other Approaches and Types of Chatbots:

- a. BERT (Bidirectional Encoder Representations from Transformers): Developed by Google, BERT is a pre-trained natural language processing model based on the transformer architecture. It is designed to understand context and bidirectional relationships within text, making it effective for a wide range of language understanding tasks.
- b. GPT-3 (Generative Pre-trained Transformer 3): Like ChatGPT, GPT-3 is a powerful language generation model developed by OpenAI. It offers even larger scale and capabilities, with up to 175 billion parameters, enabling it to generate highly coherent and contextually relevant text across various domains.
- c. XLNet: XLNet is another transformer-based language model developed by Google AI. It leverages permutations of input sequences during training, enabling it to capture bidirectional context more effectively than previous models. XLNet has shown strong performance on a variety of natural language processing tasks.

- d. T5 (Text-to-Text Transfer Transformer): Developed by Google Research, T5 is a versatile language model that frames all NLP tasks as text-to-text transformations. It achieves state-of-the-art results on various benchmarks by fine-tuning the same model architecture across different tasks.
- e. RoBERTa (Robustly optimized BERT approach): RoBERTa is a modified version of BERT developed by Facebook AI. It addresses some of BERT's limitations by training on larger datasets for longer periods, resulting in improved performance on downstream tasks.
- f. Transformer-XL: Developed by researchers at Google AI, Transformer-XL is designed to handle longer context windows by incorporating segment-level recurrence mechanisms. It achieves better performance on tasks requiring longer context understanding compared to standard transformers.
- g. T-NLG (Text-to-Text Natural Language Generation): T-NLG is a versatile language model developed by Microsoft Research. Similar to T5, it frames all NLP tasks as text-to-text transformations, enabling it to achieve impressive performance on various language generation tasks.

These alternatives offer diverse approaches to natural language processing and generation, catering to different use cases and preferences. Depending on specific requirements, developers and researchers may choose the most suitable model based on factors such as performance, scalability, and ease of use.

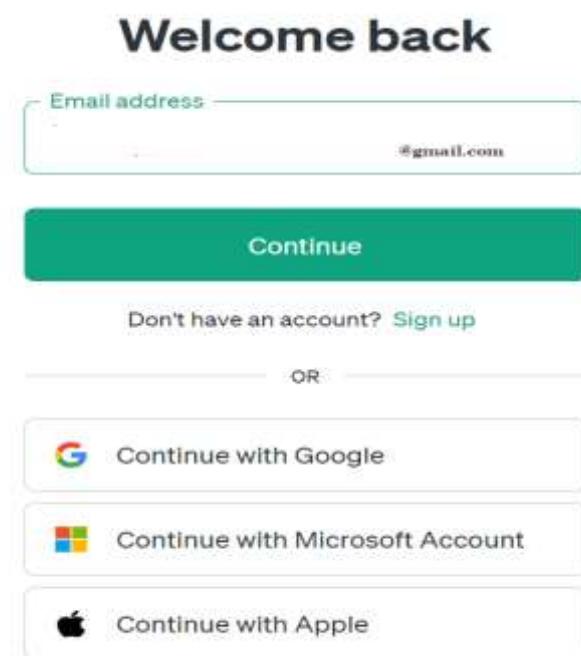
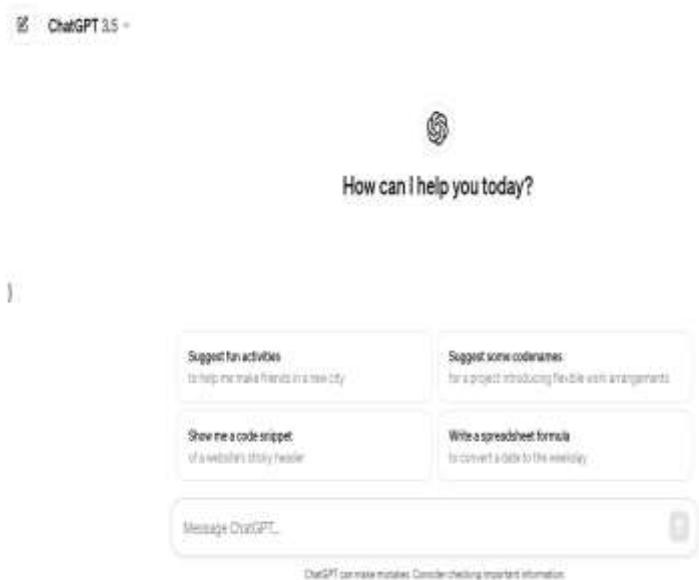
VI. Use of Chat GPT in steps:

1. Access the Platform: First, you need to access the platform or interface where ChatGPT is available. This could be through a web application, API (Application Programming Interface), or integrated into another software tool.
2. Choose Input Method: Depending on the platform, you may have different options for inputting text. This could include typing directly into a text box, uploading a document, or sending a message through a chat interface.
3. Input Prompt: Formulate your input prompt or question. This is the text that you want ChatGPT to respond to or generate a continuation for. Make sure your prompt is clear and specific to get the desired response.
4. Submit Prompt: Once you have formulated your input prompt, submit it to ChatGPT through the provided interface. This could involve clicking a "submit" button or pressing "enter" if using a chat interface.
5. Wait for Response: ChatGPT will process your input prompt and generate a response based on its understanding of the input and its trained knowledge. This may take a few seconds to a minute, depending on the complexity of the prompt and the server's processing speed.
6. Review Response: Once ChatGPT generates a response, review it to ensure it meets your expectations and requirements. If the response is satisfactory, you can proceed to use it as needed. If not, you may refine your input prompt and submit it again for a revised response.
7. Iterate as Needed: Depending on the complexity of the task and the quality of the responses, you may need to iterate by refining your input prompts and reviewing multiple responses until you obtain the desired outcome.
8. End Session: Once you have completed your interaction with ChatGPT, you can end the session or close the interface. Make sure to save any relevant information or responses if needed for future reference.

Overall, using ChatGPT involves formulating clear input prompts, submitting them through the provided interface, reviewing generated responses, and iterating as needed to achieve the desired outcome.

Step 1:

The screenshot shows the ChatGPT landing page. At the top left is the ChatGPT logo (a green circle with a white brain-like icon). Next to it is the URL <https://chat.openai.com>. To the right of the URL are three small dots. Below the URL is the word "ChatGPT" in a large, blue, sans-serif font. Underneath "ChatGPT", there is a short, light-gray text: "ChatGPT is a free-to-use AI system. Use it for engaging conversations, gain insights, automate tasks, and witness the future of AI, all in one place." Below this text are two prominent blue buttons: "Log in" on the left and "Get started" on the right. Both buttons have a slight shadow effect. Below each button is a very small, faint gray text: "ChatGPT is a free-to-use AI system. Use it for engaging ..." under "Log in" and "ChatGPT is a free-to-use AI system. Use it for engaging ..." under "Get started".

Step 2:**Step 3:****Step 4:**

Step 5:

VII. Exploring Future Frontiers: Research Avenues for Field-Based ChatGPT & it's Impact:

This refers to potential areas of exploration and development within the context of applying ChatGPT or similar conversational AI models in specific fields or industries. This could encompass various domains such as healthcare, finance, education, customer service, and more.

- Industry-specific ChatGPT Models:** Developing specialized versions of ChatGPT trained on domain-specific data to better understand and respond to queries within a particular industry. For instance, a healthcare-specific ChatGPT could be trained on medical literature and terminology to assist medical professionals or patients.
- Task-oriented ChatGPT:** Expanding ChatGPT's capabilities to handle task-specific conversations, such as helping users' complete forms, make reservations, or provide personalized recommendations based on user preferences.
- Ethical Considerations:** Investigating the ethical implications of deploying ChatGPT in various fields, including issues related to bias, privacy, and accountability. Research could focus on developing frameworks and guidelines for responsible AI deployment.
- Multimodal Conversational AI:** Integrating ChatGPT with other modalities such as images, videos, or audio inputs to enable more immersive and context-aware interactions. This could involve research into multimodal fusion techniques and improving the model's understanding of non-textual inputs.
- Transfer Learning:** Exploring techniques for transferring knowledge from pre-trained ChatGPT models to specific field-based applications with limited data. This could involve domain adaptation methods to fine-tune the model on task-specific data while retaining the general knowledge acquired during pre-training.
- Evaluation Metrics:** Developing new evaluation metrics and benchmarks tailored to assess the performance of field-based ChatGPT models in real-world scenarios. This could involve designing standardized test sets and evaluation protocols to measure aspects such as task completion rates, user satisfaction, and conversational quality.
- Human-AI Collaboration:** Investigating how ChatGPT can be effectively integrated into human workflows to augment rather than replace human decision-making processes. This could involve designing interfaces and interaction paradigms that facilitate seamless collaboration between humans and AI systems.

Overall, exploring these and other research directions can help unlock the full potential of field-based ChatGPT applications and pave the way for more effective and responsible deployment in various domains. The impact of field-based ChatGPT applications extends across various sectors, promising transformative changes in how industries interact with customers, manage tasks, and process information. Specialized ChatGPT models tailored to specific fields, such as healthcare, finance, and customer service, offer unparalleled opportunities for efficiency and innovation. By leveraging domain-specific data and knowledge, these models can provide personalized assistance, streamline workflows, and enhance decision-making processes. Moreover, task-oriented ChatGPT systems enable seamless automation of routine tasks, freeing up valuable human resources to focus on more complex and strategic activities. Ethical considerations surrounding the deployment of ChatGPT in these contexts are paramount, prompting research into bias mitigation, privacy protection, and accountability mechanisms to ensure responsible AI usage. Additionally, the integration of multimodal capabilities allows for richer, more context-aware interactions, further enhancing user experiences. As field-based ChatGPT models continue to evolve and mature, their impact on industries is poised to be profound, driving innovation, improving efficiency, and ultimately reshaping the way organizations operate in the digital age.

The future of ChatGPT holds exciting possibilities, driven by advancements in natural language processing (NLP) and artificial intelligence (AI) technologies. As AI research progresses, ChatGPT is expected to evolve in several key areas.

- a. Enhanced Understanding and Generation: Future iterations of ChatGPT are likely to exhibit improved understanding of context, sentiment, and user intent, leading to more accurate and contextually relevant responses. This could involve advancements in techniques such as few-shot learning, meta-learning, and reinforcement learning to enable ChatGPT to adapt and learn from interactions in real-time.
- b. Multimodal Capabilities: Integrating ChatGPT with multimodal inputs, such as images, videos, and audio, will enable more immersive and interactive conversations. This could enhance the model's ability to comprehend and generate responses based on diverse types of information, making interactions more natural and intuitive.
- c. Personalization and Adaptation: ChatGPT may become more adept at personalizing interactions based on user preferences, past interactions, and contextual cues. This could involve leveraging user feedback mechanisms, user profiling, and reinforcement learning to tailor responses to individual users' needs and preferences.
- d. Domain-specific Specialization: Future versions of ChatGPT may be trained on domain-specific datasets to better serve particular industries or fields. This specialization could lead to more accurate and reliable responses in specialized domains such as healthcare, finance, legal, and technical support.
- e. Continual Learning and Upgrades: The upgrade process for ChatGPT will likely involve continual training on large and diverse datasets to keep pace with evolving language patterns, user expectations, and emerging domains. Incremental improvements and updates to the model architecture, training methodologies, and fine-tuning techniques will ensure that ChatGPT remains state-of-the-art and capable of handling a wide range of conversational tasks.
- f. Ethical and Responsible AI: As ChatGPT becomes more pervasive in society, there will be an increasing focus on ensuring ethical and responsible AI deployment. This includes addressing issues such as bias, fairness, transparency, privacy, and accountability through robust governance frameworks, regulatory guidelines, and industry best practices.

Overall, the future of ChatGPT holds tremendous potential to revolutionize how we interact with AI systems and leverage conversational AI technology to augment human capabilities across various domains and applications. Continued research and development efforts will play a crucial role in unlocking this potential and shaping the trajectory of ChatGPT in the years to come.

VIII. Conclusion:

In conclusion, ChatGPT stands as a transformative technology that has reshaped our interactions with both machines and fellow humans. Leveraging its robust natural language processing capabilities, ChatGPT excels in generating responses that closely mimic human speech, rendering it invaluable across diverse applications. While ChatGPT exhibits certain limitations, such as susceptibility to bias and a lack of emotional intelligence, these challenges can be addressed through meticulous training data selection and programming refinements. The impact of ChatGPT spans numerous fields, ranging from academia and cybersecurity to customer service and software development, where it has significantly enhanced productivity, efficiency, and user satisfaction. As we continue to explore its potential, the evolution of ChatGPT promises to yield even more remarkable advancements in the years ahead.

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