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Is ChatGPT Leading Generative AI? What is Beyond Expectations?

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Abstract

Generative AI has the potential to change the way we do things, and chatbot is one of the most popular implementation areas. Even though companies like Google and Meta had chatbots, ChatGPT became popular as it was publicly available. Although ChatGPT is still in the early stages of its development, it attracted the attention of people and capital groups. It has taken the public interest; people from different fields, ages, and education levels started using ChatGPT. There have been many trials with ChatGPT. It is possible to see wide range of news and social media posts about it on the Internet. The study aims to shed light on what is happening by the studies in the literature and give insight on the user expectations of ChatGPT and Generative AI. The technical and structural fundamentals of ChatGPT and its competitors (Google's Bard AI, Claude, Meta's Wit.ai and Tencent's HunyuanAide) are described. We try to shed light on who will win the race by sharing the early-stage due diligence and current situation analysis for all these points. Preprint papers and published articles are examined. We also used ChatGPT in editing the content of the available resources. Even with the presence of the wrong answers, Generative AI and its large language models are promising.

Keywords: ChatGPT, GPT4, Generative AI, Artificial Intelligence, LLM

1. INTRODUCTION

As humanity started to use Artificial intelligence (AI) in many areas, companies lead a new paradigm called Generative AI. Generative AI is focusing on creating new and unique content with the trained data. This content can be literature, images, music, video and etc. The written text can even be an academic paper or a film scenario. Possible usage areas are endless.

Chatbot is one of the implementation areas of generative AI. Chatbots have always been in focus as humanity had the question of "Can computers think?" [1]. Companies such as Google, Meta, DeepMind, and OpenAI are working on developing chatbots. ChatGPT gained popularity as the OpenAI company made its language models and user interfaces publicly available. Even though these environments are still evolving, their reliability is widely discussed in social networks and also gained the attention of academic studies.

This study aims to answer the following research questions; Is ChatGPT leading generative AI? What are the main competitors? Are these solutions satisfying people's expectations? In this paper, we present an overview of the technology, give a literature survey, an early-stage due

diligence and current situation analysis to address these research questions and discuss the challenges.

In the next section, fundamentals are given. In Section 3, the method is described. Then the literature review is given in Section 4. In section 5, discussion and evaluation are presented. The conclusion and future works are given in the last section.

2. FUNDAMENTALS

This section covers the main topics that form the basis of the used technologies; Natural Language Processing (NLP), tokens, Language Models (LMs), Large Language Models (LLMs), Generative Adversarial Network (GAN) and Generative AI.

2.1. NLP

Natural Language Processing is one of the important research areas of computer science. The ultimate goal to achieve with NLP is to create a computer system that can understand and respond to human speech or written text. NLP combines many technologies, algorithms, and models. In particular, it can use computational linguistics, machine learning, deep learning models, and artificial intelligence applications. While translating from one language to another,

it can generate answers or process commands according to the information supplied. Although what can be done with NLP is very diverse, we can list some of its basic applications as speech-to-text, part-of-speech tagging, word sense disambiguation, coreference resolution, sentiment analysis, and natural language generation [2].

Even though it takes many years for people to learn natural languages, and it is difficult to fully master the entire language; NLP can achieve this with significant success. There are still challenges with idioms, proverbs, spelling mistakes, and expression disorders.

2.2. Tokens, Language Models (LMs) & Large Language Models (LLMs)

We need to model languages to make the computer understand the human languages to use in speech recognition, machine translation, natural language generation, information retrieval and related applications. “A language model assigns a probability to a piece of unseen text, based on some training data” [3]. The studies on it had started with studies on probabilistic models of language generation [4].

A token is an instance of a string of characters that has been compiled into a meaningful semantic processing unit. Each document (text) is formed of several tokens. Unigram models use several one-state finite automata. In this approach, it is assumed that the probability of the tokens in a sequence are independent. n-gram (Q-gram) models are based on a continuous sequence of n pieces from a text.

Large-scale language models can be applied to machine translation as in [5]. Increasing the amount of training data to up to 2 trillion tokens was demonstrated experimentally; a 5-gram language model and 300 billion n-grams were produced. New architectures are being experimented that can scale up to 530 billion parameters [6] and more.

2.3. Generative Adversarial Network (GAN)

GANs are one of the most successful advancements in artificial neural network classification, prediction, and problem-solving. It is also one of the most influential developments in machine learning in recent years. Ian Goodfellow and colleagues introduced the Generative Adversarial Network (GAN) in 2014 [7, 8].

As shown in Figure 1, a GAN is constructed from two neural networks: a discriminator and a generator. These two structures work in the constant connection between them. While the generator creates new instances, the discriminator attempts to distinguish them from the genuine cases in the training dataset. The two networks are trained together, with the discriminator seeking to detect generated instances more correctly and the generator attempting to generate samples that the discriminator cannot distinguish as distinct from real ones.

GANs can create new images that are almost indistinguishable from reality. The generator produces an

image, and the discriminator checks whether the produced image is real or fake. A pre-trained model is not used, education takes place in the process. The discriminator has real pictures. The generator creates a new image and sends it to the discriminator. Discriminator compares the new image with the real images and returns a response to the generator. According to the answer, the generator constantly updates and improves itself. This process continues in a loop, and eventually, the generator starts producing more realistic pictures [9].

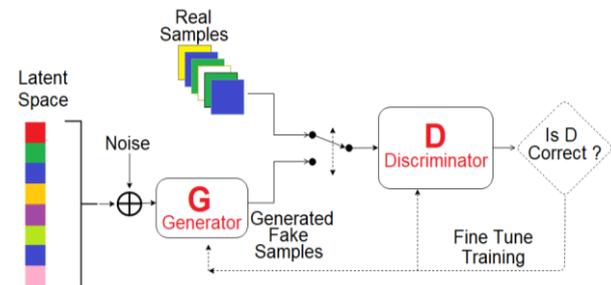


Figure 1. Generative adversarial network (GAN) model (adapted from [10])

2.4. Generative AI

Generative AI is an artificial intelligence field that concentrates on generating new and original information by machine learning on massive databases of experiences. There are several potential applications for generative AI, such as the generation of new pictures, text, and music. Also, it is used in computer vision, natural language processing, and speech recognition. As an example, generative models may be used to create realistic images for video games, simulations, and virtual reality, as well as novel chemical compounds for medicinal research.

This is performed by using a model that has been trained on a large dataset of examples and constructing new instances that are comparable to the training dataset. Natural language processing generative models may be used to produce new material that is equivalent to the style and substance of a specific author or subject. Among the most popular generative AI models are GANs, Variational Autoencoders (VAE), and Transformer-based models.

GAN is one of the most well-known models of generative AI. Another well-known generative AI technique is the VAE, a type of neural network that learns to create new instances by learning to compress and decompress input. After this model is trained on a collection of examples, a VAE learns to compress each example into a tiny, low-dimensional representation known as a latent code. The VAE can decompress a latent code to generate a new example that is analogous to those in the training dataset.

There are also other generative models, such as Transformer-based models (like GPT-2 and GPT-3), which use the attention mechanism to generate new text, pictures, and sounds that are remarkably similar to real-world instances. These models can generate high-quality, consistent text, images, and animation [11].

Table 1. Classification of the AI Tools [12, 13]

Classification	Tool Name and Web Page Address	Operation Mode
Text to Image (T2I)	DALL-E 2 (https://openai.com/product/dall-e-2)	Generation
	Stable Diffusion (https://stability.ai/)	Generation
	Craiyon (https://www.craiyon.com/)	Generation
	Jasper (https://www.jasper.ai)	Generation
	Imagen (https://imagen.research.google/)	Generation
	MidJourney (https://www.midjourney.com)	Generation
	NightCafe (https://nightcafe.studio/)	Generation
	GauGAN2 (https://gpt3demo.com/apps/gaugan2-by-nvidia)	Generation
	Wombo (https://www.w.ai/)	Generation
	Wonder (https://www.wonder-ai.com/)	Generation
	Pixray-test2image (https://pixray.gob.io/)	Generation
	Neural.love (https://neural.love/)	Classification, Generation, Transformation
	Text to Video (T2V)	Runway (https://runwayml.com/)
Fliki (https://fliki.ai/)		Generation
Synthesia (https://www.synthesia.io/)		Generation
MetaAI (https://ai.facebook.com/)		Generation
Google AI (https://ai.google/)		Generation
Text to Audio (T2A)	Phenaki (https://phenaki.video/)	Generation
	Play.ht (https://play.ht/)	Generation
	Murf.AI (https://murf.ai/)	Generation
	Resemble.AI (https://resemble.ai)	Generation
Text to Text (T2T)	WellSaid (https://wellsaidlabs.com/)	Generation
	Descript (https://www.descript.com/)	Classification, Generation, Transformation
	Simplified (https://simplified.com/)	Generation
	Jasper (https://www.jasper.ai)	Generation
	Frase (https://www.frase.io/)	Transformation
	EleutherAI (https://www.eleuther.ai/)	Generation
	Requstory (https://requstory.com/)	Generation
	Grammarly (https://www.grammarly.com)	Transformation
	Copy.ai (https://www.copy.ai/)	Generation
	MarketMuse (https://www.marketmuse.com/)	Generation
	AO21labs (https://www.ai21.com/)	Transformation
	HubSpot (https://www.hubspot.com/)	Classification
	InterKit (https://app.inferkit.com)	Generation
	GooseAI (https://goose.ai/)	Generation
	ResearchAI (https://research-ai.io/)	Generation
	Writesonic (https://writesonic.com/)	Generation
	Co:here (https://cohere.ai/)	Classification
	CHIBI (https://chibi.ai/)	Generation
	Ideas AI (https://ideasai.com/)	Generation
	Copysmith (https://copysmith.ai/)	Generation
	Flowrite (https://www.flowrite.com/)	Generation
	NICHESS\$ (https://nichess.com/)	Generation
	Sudowrite (https://www.sudowrite.com/)	Generation
	Ideasbyai (http://ideasbyai.com/)	Generation
	Text.cortex (https://textcortex.com/)	Classification, Transformation
	OpenAI GPT3 (https://openai.com/blog/chatgpt)	Generation
	AISEO Blog Idea Generator (https://aiseo.ai/templates/blog-idea-generator.html)	Generation
	Rytr AI https://rytr.me/	Generation
	PepperType AI https://www.peppertype.ai/	Generation
Kafkai AI https://kafkai.com/en/	Generation	
Texta AI https://texta.ai/dark	Generation	
Anyword AI https://anyword.com/	Generation	
DeepL Write AI https://www.deepl.com/write	Generation	
Perplexity https://www.perplexity.ai/	Generation	
Elicit https://elicit.org/	Generation	
Text to Motion (T2M)	TREELnd. (https://www.tree.industries/)	Generation
	MDM: Human Motion Diffusion Model (https://guytevet.github.io/mdm-page/)	Generation
Text to Code (T2C)	Replit Generate code(https://docs.replit.com/power-ups/ghostwriter/generate-code)	Generation
	Github Copilot (https://github.com/features/copilot)	Generation
Text to NFT (T2N)	LensAI (https://lens-ai.com/)	Generation
Text to 3D (T2D)	DreamFusion (https://dreamfusion3d.github.io/)	Generation
	Clip-Mesh (https://www.nasir.lol/clipmesh)	Generation
	GET3D (https://nv-tlabs.github.io/GET3D/)	Generation
Audio to Text (A2T)	Descript (https://www.descript.com/tools/audio-text)	Classification, Generation, Transformation
	AssemblyAI (https://www.assemblyai.com/)	Transformation
	Whisper (OpenAI) (https://github.com/openai/whisper)	Transformation
Audio to Audio (A2A)	Elsa Speaks https://elsaspeak.com/en/	Classification, Generation
	AudioLM (https://google-research.github.io/seanet/audiolm/examples/)	Transformation
Brain to Text (B2T)	VOICEMOD (https://www.voicemod.net/)	Transformation
	Speech from brain (Meta AI) (https://ai.facebook.com/blog/ai-speech-brain-activity/)	Generation
Image to Text (I2T)	Non-invasive brain recordings (https://hal.science/hal-03808317/document)	Generation
	Neural.love (https://neural.love/)	Classification, Generation, Transformation
	GPT-2 x Image Captions (https://huggingface.co/nlpcnnect/vit-gpt2-image-captioning)	Transformation

The classification of some selected Generative AI tools is given in Table 1. Generative AI tools are grouped as Text to Image (T2I), Text to Video (T2V), Text to Audio (T2A), Text to Text (T2T), Text to Motion (T2M), Text to Code(T2C), Text to NFT (T2N), Text to 3D (T2D), Audio to Text (A2T), Audio to Audio (A2A), Brain to Text (B2T), and Image to Text (I2T). These tools are categorized with their operation mode. These operations are listed as classification, generation, and transformation.

2.4.1. ChatGPT

ChatGPT is an advanced natural language processing model. The model was pre-trained on a large dataset, allowing it to create a language that is coherent, contextually appropriate, and often indistinguishable from human-written stuff. It makes use of a transformer architecture that merges the benefits of generative models with scalability. It creates natural language using a self-attention mechanism, allowing it to learn the context of the dialogue and offer more accurate replies.

ChatGPT enables text production in any terminology and topic from any specified prompt. Its modular architecture allows it to perform a variety of tasks, including question-answering, machine translation, language modeling, and more. It may also be used to develop virtual assistants and chatbots, as well as generate human-like discussions. ChatGPT's design and algorithms enable it to produce long-form and rich material.

ChatGPT has a big potential and is already being utilized in a variety of industries. ChatGPT may be used to develop complex applications in any sector, such as medicine, education, finance, and others. Its possible usage areas will be discussed in the literature survey section.

The exact implementation details and architecture of ChatGPT are proprietary to OpenAI. However, a simplified representation of the underlying algorithm and pseudocode used in the ChatGPT model can be given as follows. The ChatGPT model is built using a variant of the Transformer architecture, which is a popular deep-learning model for natural language processing tasks. The Transformer architecture consists of an encoder-decoder framework with self-attention mechanisms. The model is trained in a supervised manner using a large dataset of paired input-output examples. During training, the model learns to predict the most likely next token in a sequence given the previous context. This is done by minimizing a loss function, typically cross-entropy loss, between the predicted distribution and the actual target distribution.

The simplified pseudocode representation of the ChatGPT model can be given as follows [14]:

```
function ChatGPT(input_sequence){
    tokenized_input = tokenize(input_sequence)
    input_ids = convert_tokens_to_ids(tokenized_input)
    output_sequence = ""
    while not end_of_sequence(output_sequence):
        tokenized_output = tokenize(output_sequence)
        output_ids = convert_tokens_to_ids(tokenized_output)
        combined_ids = concatenate(input_ids, output_ids)
        encoded_inputs = encoder_model(combined_ids)
        decoded_output = decoder_model(encoded_inputs)
        next_token = sample_next_token(decoded_output)
        output_sequence += convert_id_to_token(next_token)
    return output_sequence
}
```

This pseudocode only shows the basic flow. It tokenizes the input sequence, converts the tokens to numeric IDs, and iteratively generates the output sequence by sampling the next token based on the binding encoded in the input sequence and the previously generated output.

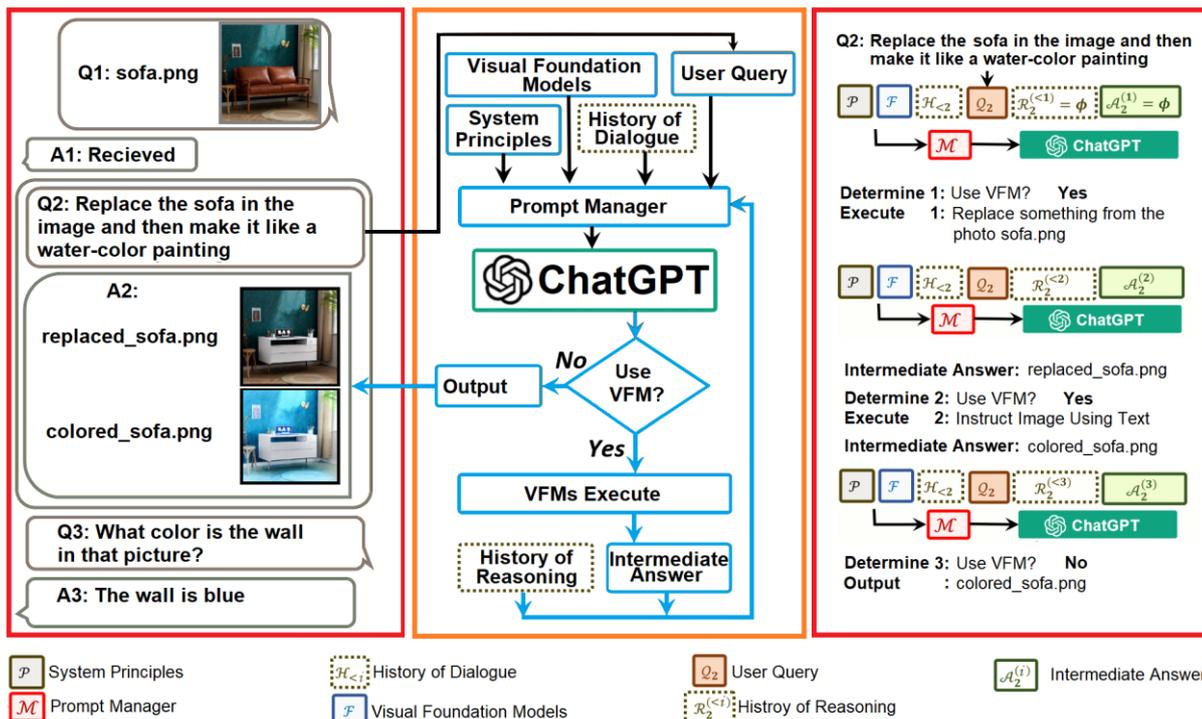


Figure 2. Visual ChatGPT System Architecture (adapted from [15])

2.4.1.1. Visual ChatGPT

Teams at Microsoft are engaged in the Visual ChatGPT research. It has been developed based on OpenAI's ChatGPT, as ChatGPT is currently unable to create images. Several enhancements are made to the core features of ChatGPT. Visual ChatGPT can interact with existing ChatGPT using both text and visual images. This research aims to reach the ability to add image processing to text-based communication. The product will allow dealing with complex visual questions that involve multiple steps and require multiple AI models to work together. Also, it will provide feedback and ask for corrected results.

The system structure of Visual GPT can be seen in Figure 2 [15]. A three-step dialogue is given on the left side of Figure 2. A flowchart is shared in the middle. This flowchart shows how Visual Foundation Models are called recursively, and how answers are provided. The right part of the figure shows the detailed process of the second Question-Answer (QA) dialogue.

2.4.1.2. GPT4

OpenAI released GPT 4, the new version of ChatGPT on March 14, 2023. GPT4 is a multimodal and large-scale model that accepts images and text as input and can produce text output. In many real-world scenarios, it is currently less capable than a human. Nevertheless, it can pass tests where humans can succeed at low rates, and it can succeed in many human-level professional and academic processes. GPT-4 outperforms both major previous language models and most high-end systems on a range of traditional NLP tests. Despite all its capabilities, GPT-4 has similar limitations to earlier GPT models. GPT-4 is not completely reliable, has a limited context window, and does not learn from experience. Caution should be exercised when using GPT-4 results in situations and operations where reliability is critical [16].

2.4.2. ChatGPT Rivals

ChatGPT has reached a lot of users around the world right now, and it is increasing its popularity day by day as a hype. But are its rivals, which seem to be backward, to be so inadequate? What is the technical and structural situation of the competitors? Under this title, we will question the main differences between ChatGPT and its strong rivals and whether it is better than them.

2.4.2.1. LaMDA Bard.AI

Google's LaMDA (Language Model for Dialogue Applications) is a collection of conversational neural language models. The first generation was revealed during the Google I/O keynote in 2021. LaMDA attracted great attention in June 2022 after Google employee Blake Lemoine claimed that the chatbot had grown sentient. Lambda is based on Transformer, a neural network architecture designed by Google Research and open-sourced in 2017. This architecture generates a model that can be taught to read many words, pay attention to how those words connect and then predict which words it believes will come next [17]. After Microsoft had stated that it intends to

incorporate AI into all of its products, Google introduced Bard, a conversational artificial intelligence chatbot powered by LaMDA, in February 2023.

Bard is powered by LaMDA which is Google's collection of conversational neural language models. Bard AI is a cloud-based conversational AI platform that allows organizations to build and deploy chatbots that can communicate with consumers through various channels such as websites, messaging applications, and voice assistants. The platform is user-friendly, with a simple drag-and-drop interface that allows businesses to develop and configure chatbots easily without coding or technical knowledge. Bard AI is driven by powerful machine learning algorithms and natural language processing (NLP) technologies, which allow chatbots to comprehend and reply to client inquiries in a meaningful and engaging manner. This implies that clients may converse with chatbots in a natural and human-like manner, making it easier for them to discover information and execute activities.

Alphabet CEO Sundar Pichai stated that Google intends to add AI-powered capabilities to its search engine to synthesize information and answer difficult inquiries. These capabilities will be initially powered by LaMDA and eventually by other AI technologies. Pichai stated that Google will begin providing tools to web developers, producers, and companies in 2003 [18].

With the opening of Google Bard to public use, the number of academic studies on Bard has started to increase. Google Bard started to be used and will be used in many fields such as academic writing, health, education and law etc. [19-22].

2.4.2.2. Claude

Anthropic, an AI business co-founded by former OpenAI workers, has discreetly begun testing Claude, a new ChatGPT-like AI assistant. Both Claude and ChatGPT use reinforcement learning (RL) to train a preference model over their outputs, and preferred generations are used for fine-tuning subsequently. Anthropic differs from its using Constitutional AI to construct these preference models [23]. Constitutional AI builds upon reinforcement learning from human feedback (RLHF) baseline with a process given in Figure 3.

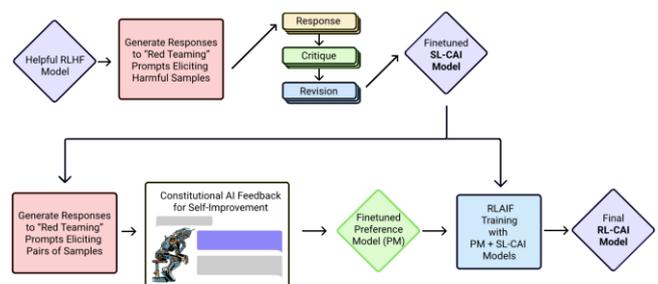


Figure 3. Basic Steps of Constitutional AI (CAI) process (adapted from [24])

2.4.2.3. Wit.ai

Wit.ai is one of the leading bot frameworks in the market with strong NLP capabilities. Its NLP engine can be used to build conversational applications and devices that can be interacted with through speech or text. It provides an easy-to-use interface and quick-learning APIs to analyze human communication and turn complex messages into structured data. The engine also helps to predict future events based on past data. Wit.ai is well-positioned with Facebook's support to innovate in speech recognition and voice interfaces for developers. Its continuous learning and the ability to use relevant data to connect with specific customers makes the difference [25]. Many applications have been using Wit.ai. For example, Handoyo et al. constructed a chatbot for the reservation system using Wit.ai [26]. Figure 4 illustrates the request and response flow of the system architecture.

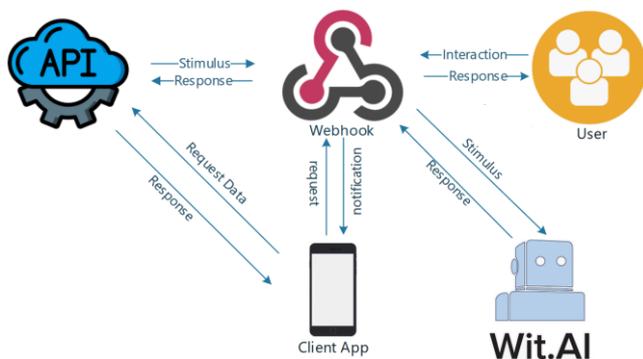


Figure 4. Serverless Architecture Chatbot using Wit.AI (adapted from [26])

2.4.2.4. HunyuanAide

It is known that Microsoft-backed OpenAI does not allow users in China to access the chatbot. As the open AI models behind the program are increasingly finding wider applications in consumer technology applications in China, Alibaba Group, Baidu Inc., and Tencent Holdings announced that they are working on their solutions. Tencent Holdings, one of the leading internet companies in China, announced that it formed a development team to work on a chatbot similar to ChatGPT. The product will be named "HunyuanAide", and it will use the AI training model called "Hunyuan" [27].

2.4.2.5. OPT by Meta

Meta released the Open Pretrained Transformer (OPT) in May 2022. OPT language model contains 175 billion parameters. It's trained on multiple general datasets,

including The Pile (a dataset with 22 subsets of more than 800GB of English text) and BookCorpus. OPT has combined its pre-trained models and source code to use/train these models. It is currently available for research purposes with a non-commercial license [28].

2.4.2.6. AlexaTM by Amazon

Amazon publicly released AlexaTM 20B, a large-scale multilingual sequence2sequence model, in November 2022. It uses an encoder-decoder architecture. It is trained on a combination of Causal Language Modeling (CLM) and noise removal tasks. It outperforms Google's PaLM 540B at one-shot summarization and machine translation tasks. AlexaTM supports multiple languages [28].

2.4.2.7. GPT-J and GPT-NeoX by EleutherAI

GPT-J was trained on the Pile. Despite its smaller size compared to its competitors, it can perform almost the same as the GPT-3 6.7B-param. It also outperforms its predecessor, the GPT-Neo. It is converted to GPT-NeoX with 20B parameters in February 2022. The comparison of GPT-J and GPT-NeoX performance to OpenAI GPT-3 versions is given in Table 2. As seen in the table, there is almost no difference in performance between paid GPT3 and open-source GPT-NeoX and GPT-J

2.4.2.8. Jurassic-1 language model by AI21 labs

Jurassic-1 is an autoregressive natural language processing (NLP) model. There is a fee for registration. Jurassic-1 consists of two parts. The first part is J1-Jumbo, which is trained on more than 178B parameters. The second one is J1-Large, which consists of 7B parameters. It is more advanced than the GPT-3 language model [28].

2.4.2.9. CodeGen by Salesforce

CodeGen is a large-scale language model that can generate programs from simple text input. The future of coding is at the crossroads of human and computer languages, and speech-based AI is the ideal bridge to bring the two together. The CodeGen version is available in three models (NL, multi, and mono), and with different sizes (350M, 2B, 6B, and 16B). NL models use the Pile dataset. Multiple models are built on NL models and employ a variety of code written in various computer languages. Mono models are built from many models and employ Python code. The most exciting aspect of CodeGen is that it does not need technical knowledge [28].

Table 2. Performance comparison of GPT3, GPT-J and GPT-NeoX [28]

Task	Category	Babbage	GPT-J-6B	Curie	GPT-NeoX-20B	GPT3 DaVinci
LAMBADA	Sentence Completion	62.49%	68.29%	69.51%	72.00%	75.16%
ANLI R3	Natural Language Inference	33.75%	35.50%	35.50%	35.40%	36.83%
WSC	Coreference Resolution	54.54%	49.54%	49.54%	50.00%	59.18%
WinoGrande	Coreference Resolution	59.51%	64.01%	64.56%	66.10%	69.93%
HellaSwag	Sentence Completion	40.38%	36.53%	54.81%	53.50%	63.46%

2.4.2.10. Megatron-Turing NLG by NVIDIA and Microsoft

This LLM is one of the biggest language models, with over 530B parameters. Microsoft and NVIDIA collaborated to develop Megatron-Turing Natural Language Generation (NLG). They employed the Pile dataset and used the NVIDIA DGX SuperPOD-based Selene supercomputer to train the model. According to research published in October 2021, the Megatron-Turing NLG performed exceptionally well on PiQA dev kit tasks and LAMP test set workloads. The model also predicts over 50% of the time in zero-shot testing and much better in one-shot and four-shot tests [28].

3. METHOD

The literature review will be used as a method in this study. First of all, the studies published on the relevant subject in the literature will be systematically examined. Then, preprint studies that have not been published yet will be compiled. Finally, information shared on some platforms on the internet and various news and blogs will be included.

For the literature review, searches will be made with the word groups "ChatGPT", and "Generative AI" on SSRN, Wos, Scopus, and Google Scholar, and the found studies will be examined. In addition, a search will be made on LinkedIn with the hashtags "#chatgpt" and "#GenerativeAI" and the ones that can be used in the work will be examined. Finally, current and relevant blog posts and news will be compiled by searching on Google with the word groups "ChatGPT" and "Generative AI".

4. LITERATURE REVIEW

Many studies are available in the literature on ChatGPT. The number of these publications has started to increase especially at the end of 2022, as it became popular again with GPT3 and being free of charge made it used by a large number of users.

As a result of our research, we have seen that it is possible to collect the studies in the literature in the following subgroups. Some authors have analyzed ChatGPT only by asking questions and analyzing their answers. Others have mentioned the possible effects and made evaluations. Table 3 groups the reviewed literature by their study fields. The main fields of these studies are general education, academic writing, writing, health, law, economics and finance. On the other hand, the negative aspects of ChatGPT and the strengths of its competitors were emphasized on social media, blog sites and various platforms.

There are many studies that we can group on general aspects of ChatGPT. Benzon offers three claims about ChatGPT in his paper [29]. The first one is that because of the intricacy of ChatGPT's behavior, the concept of thinking is no longer applicable in distinguishing between human and AI activity. The second one is that the operation of ChatGPT is divided into two levels. Last is that the symbolic computation aspect is latent in Large Language Models (LLM), and an appendix shows how a story grammar is constructed. According to

Benzon's other study [30], an artificial neural net can be regarded as a platform for implementing higher-level structures such as word processors or databases.

ChatGPT's neural net uses a simple grammatical structure with five components termed "Donné, Disturb, Plan, Enact, and Celebrate." Through four studies, the results reveal that ChatGPT can adapt a tale based on a change in protagonist or adversary [31]. He investigates the idea of using Noam Chomsky's concept of linguistic competence and David Marr's degrees of analysis to understand how language models such as ChatGPT function in his other study. The text of ChatGPT reveals that it has a command of discourse skills, such as the ability to govern language patterns, execute analogical reasoning in tail interpretation, comprehend complex concepts, and alter discourse for different ages [30].

Sætra contends that embracing the inevitability of technological progress without considering its repercussions is a poor strategy. ChatGPT has become a global hot subject, and its impact on generative AI is evident. The question today is how much of an impact it will have and what implications would result from utilizing AI to generate text and other stuff. Before adopting new technology as progress, he feels it is critical to understand how they alter values, power dynamics, and social structures. Sætra recognizes the great potential of generative AI but says it should be regulated to minimize undesirable consequences at multiple levels. He believes that technology should not be stopped, but rather carefully guided to ensure that its development and application do not result in disaster [32]. In Shah's paper, he offered his opinions, evaluations, and visions on artificial intelligence chat agents that have emerged as technology has advanced [33]. With a focus on the chatbot ChatGPT, Lund and Agbaji's study investigates the links between three digital literacies (information literacy, data literacy, and privacy literacy) and attitudes toward technology adoption. A 2-week web survey was used to collect data from 130 persons in northern Texas. The findings reveal a link between using ChatGPT and information and privacy literacy abilities, but not data literacy skills. Age, gender, education, and internet usage are all important determinants. These findings are important for understanding the interplay between literacies and personal/community factors [34]. Bommarito et al. evaluate the capability of OpenAI's text-davinci-003 and previous versions of GPT for knowledge work as measured by the American Institute of Certified Public Accountants (AICPA). Text-davinci-003 underperformed on numeric reasoning in zero-shot prompts but neared human-level performance on Remembering & Understanding and Application skill levels, according to the results. Recent GPT-3 generations improved, rising from 30% for text-davinci-001 to 57% for text-davinci-003. The findings show that large language models have the potential to improve the quality and efficiency of knowledge work [35].

Table 3. Study Fields of the reviewed literature

Paper / Field	General Aspects of ChatGPT	Education	Health	Writing and Academic Writing	Business, Finance and Economy	Law
Shah, 2023 [33]	✓					
Lund & Agbaji, 2023 [34]	✓					
Bommarito et al., 2023 [35]	✓					
Hartman et al.,2023 [36]	✓					
Gozalo-Brizuela & Garrido-Merchan, 2023 [37]	✓					
Azaria, 2022 [38]	✓					
ChatGPT & Perlman, 2022 [39]	✓					✓
Jabotinsky and Sarel, 2022 [40]	✓					
Frye, 2022 [41]		✓		✓		
Hacker, 2022 [42]	✓					✓
Baidoo-Anu & Owusu Ansah, 2023 [43]		✓				
Zhai, 2022 [44]		✓				
Zhai, 2023 [45]		✓				
Ventayen, 2023 [46]		✓		✓		
Avila-Chauvet et al., 2023 [47]		✓				
Nisar and Aslam, 2023 [48]		✓	✓			
Bommarito & Katz, 2022 [49]		✓				✓
Susnjak, 2022 [50]		✓		✓		
Cotton et al., 2023 [51]		✓				
Mellon et al., 2022 [52]		✓				
Zentner, 2022 [53]		✓				
Ryznar, 2020 [54]		✓		✓		
Gilson et al., 2022 [55]		✓	✓			
Jeblick et al., 2022 [56]			✓			
Shope, 2023 [57]				✓		✓
Bishop, 2023 [58]				✓		
Armstrong, 2023 [59]				✓		✓
Lund & Wang, 2023 [60]	✓			✓		
Willems, 2023 [61]				✓		
Uludağ, 2023 [62]	✓			✓		
Kutela et al., 2023 [63]				✓		
Jiao et al., 2023 [64]				✓		
Aljanabi et al., 2023 [65]	✓			✓		
Pavlik, 2023 [66]	✓	✓		✓		
Gao et al., 2022 [67]				✓		
Marti, 2022 [68]	✓			✓		
Aydın & Karaarslan, 2022 [69]	✓		✓	✓		
Aydın et al., 2023 [70]	✓				✓	
Aydın & Karaarslan, 2023 [71]			✓			
Alici et al.,2023 [72]	✓					
Dowling & Lucey, 2023 [73]					✓	
Mertens, 2023 [74]					✓	
Zaremba & Demir, 2023 [75]					✓	
Chesterman, 2023 [76]					✓	✓
Alshater, 2022 [77]					✓	
Wenzlaff & Sebastian, 2022 [78]					✓	
Leippold, 2023[79]					✓	
Taylor, 2023 [80]						✓
Bishop, 2023[81]						✓
Iu & Wong, 2023 [82]						✓
Choi et al., 2023 [83]		✓				✓

Hartman et al. examine the limitations and biases of ChatGPT, an OpenAI conversational AI model, with an emphasis on its impact on political elections. Using 630 political statements and political compass tests, the authors undertake three experiments and discover that ChatGPT has a pro-environmental, left-libertarian worldview. The authors examine the societal repercussions of politically biased AI [36]. Gozalo-Brizuela and Garrido-Merchan consist of an attempt to present simply the main models and sectors touched by generative AI, in addition to providing a taxonomy of the most recent generative models published

[37]. Azaria presented the benefits and limitations of ChatGPT as a conversational agent in his paper. The paper highlights ChatGPT's bias towards digits favorable to humans and its ability to correct mistakes but also its over-confidence in incorrect answers. The paper also explores ChatGPT's ability to request additional information, explain its responses, and its susceptibility to conflicting answers from small changes in a question. Finally, it is discussed that ChatGPT's responses to social experiments show its tendency to answer similarly to humans [38]. Perlman created an article using OpenAI's ChatGPT to demonstrate

the sophistication and potential ramifications of chatbots in legal services and society. While the ChatGPT responses were unsatisfactory, they show the promise of AI and its potential to revolutionize how we access, create, and consume information and services. It does, however, create regulatory and ethical concerns, such as the role of knowledge workers and the possible exploitation of AI-generated data. The disruptions caused by AI's rapid progress have already occurred, and this study provides a preview of what is to come [39]. Jabotinsky and Sarel's academic study explores the ethical quandaries created by the usage of artificial intelligence (AI), in addition to the governmental solutions that have been implemented to solve these difficulties. It addresses issues like surveillance, bias, and the potential for harm, as well as policy initiatives such as ethical norms, regulatory frameworks, and the promotion of ethical AI technologies [40]. Hacker states that three novel contributions are made in his study. First, it deconstructs the Commission proposals, demonstrating that, while they are a step in the right direction, they ultimately represent a half-hearted approach: if implemented as planned, AI liability in the EU will rely primarily on the disclosure of evidence mechanisms and a set of narrowly defined presumptions concerning fault, defectiveness, and causality. As a result, the article presents recommendations for changes to the proposed AI liability framework. Third, based on an analysis of the key risks AI poses, the final part of the paper maps out a road for the future of AI liability and regulation, in the EU and beyond [42].

The education area is also an area where publications related to ChatGPT are published intensively. While there are many studies on the positive and negative effects of ChatGPT in the field of education, there are also studies on how it can be integrated into education processes and how we can prevent possible harm. Baidoo-Anu and Owusu Ansah discussed ChatGPT, a generative AI platform that attracted over one million subscribers in the first week of its debut. They discuss the potential benefits of ChatGPT in education, such as tailored and interactive learning and formative evaluations, as well as its drawbacks, such as faulty information generation and privacy concerns. The report makes recommendations for using ChatGPT in education and encourages policymakers, researchers, educators, and technology professionals to work together to use the tool securely and effectively to promote students' learning [43]. According to Zhai, the K-12 Framework for Science Education seeks to involve students in scientific procedures for giving them key ideas and crosscutting concepts. This study tests the usage of ChatGPT to address science education difficulties such as measuring students' progress and offering feedback and coaching. The ChatGPT application was utilized in the study to construct a performance-based evaluation, grade and provide comments, and recommend learning materials. The findings indicate that ChatGPT can address issues in science learning, but it cannot replace teachers, who require professional competence to use it. The study also emphasizes the importance of explainable AI to comprehend how ChatGPT generates results [45]. Zhai stated that it reflects on the potential impact of ChatGPT on education and suggests adjusting learning goals to focus on creativity and critical thinking rather than general skills. It also raises concerns

about students outsourcing assessment tasks and calls for new assessment formats that focus on creativity and critical thinking [45]. Ventayen's study investigates the potential risk of academic dishonesty offered by the popular AI model ChatGPT in students generating essays and themes. It uses plagiarism checker tools to examine the resemblance of ChatGPT-generated results and discovers that the results pass the institution's required similarity index, which may jeopardize academic integrity. To prevent cheating with such models, the institution may need to alter its assessment technique [46]. According to Avila-Chauvet et al., OpenAI ChatGPT, a fine-tuned AI chatbot, is a promising tool for behavior analyzers to automate and systematize experimental tasks. The authors show how to use ChatGPT as a programming helper to create an online behavioral assignment in HTML, CSS, and JavaScript code, cutting programming time while gaining precise solutions [47]. Nisar and Aslam's study evaluates the AI-based platform ChatGPT's suitability for self-learning by asking medical questions in pharmacology. The questions covered a wide range of drug-related topics. The responses provided by ChatGPT were deemed to be relevant and accurate, but without a reference or source. Students of traditional and complementary medicine who are struggling with pharmacology might use the tool as a rapid reference and self-study assistance. Despite artificial intelligence's increasing presence in education, its patterns, issues, and possible uses remain largely unexplored [48]. On the multistate multiple choice (MBE) segment of the Bar Exam, OpenAI's text-davinci-003 (GPT-3.5) was tested. Despite people with 7 years of post-secondary education and specific training answering only 68% of questions correctly, text-davinci-003 obtained a 50.3% accuracy rate for the best prompt and parameters and passed the Evidence and Torts parts. The top two and top three selections of the model were correct 71% and 88% of the time, demonstrating good performance. The study discovered no benefit to fine-tuning GPT-3.5, and it reported observations about prompt engineering, parameters, and older GPT models. The current GPT model improvement trend predicts that a language model could pass the MBE component of the Bar Exam in the near future [49]. Susnjak examined ChatGPT, an AI agent, on its capacity to execute high-level cognitive tasks and write human-like texts. It raises worries regarding the potential use of ChatGPT as a tool for online exam cheating. According to the research, ChatGPT is capable of critical thinking and very realistic text generation with minimal input, posing a danger to the integrity of online exams. Invigilated and oral tests, sophisticated proctoring techniques, and AI-text detectors could be solutions, but more study is needed to completely address the issue. Educators and institutions should be aware of the danger of cheating utilizing ChatGPT and look into ways to keep online assessments fair and valid [50]. Cotton et al. analyzes the usage of chatAPIs and GPT-3 in higher education, exploring benefits and drawbacks and risks of academic dishonesty. The paper describes features of chatAPIs and GPT-3, provides examples of their use in education, and highlights the challenge of detecting cheating. They suggest various strategies for universities to ensure responsible and ethical usage of chatAPIs and GPT-3 including developing policies, offering training and support, and implementing methods to detect and prevent cheating [51]. Mellon et al.

put OpenAI's GPT-3 language model to the test when it came to coding open-ended survey responses from the British Election Study Internet Panel (BESIP). The accuracy of GPT-3 was compared to that of a human coder and an SVM machine learning method. GPT-3 had 97% agreement with a second human coder and 95% of the time matched the original human coder's collapsed category. In terms of accuracy and bias, GPT-3 surpassed the SVM. The findings imply that language models such as GPT-3 can be used to code open-ended survey responses, allowing for broader use of open-ended questions [52]. Aeron's report explores the use of AI in higher education, specifically mentioning ChatGPT. The report covers both the current and potential uses of AI in education and also uses ChatGPT as a tool for conducting research [53]. After interacting with the artificial intelligence writing tool ChatGPT, Ryznar's paper proposes several approaches for administering exams while keeping their integrity. Ryznar states that the chatbot's clever response, which students might employ in their written study, simply raises the stakes of determining how to conduct tests equitably [54].

Another usage area of ChatGPT is in the field of health. It is likely to be used especially as a decision support system. In this field, some studies have been published on both the studies conducted by students in the field of health and the use of ChatGPT in the field of health. ChatGPT performs well on medical question-answering tasks, with a performance comparable to a third-year medical student. It provides reasoning and context in its responses, making it a promising tool for medical education [55]. Jeblick et al. evaluated the use of ChatGPT, a large language model, in generating simplified radiology reports. Radiologists agreed that the reports were factually correct and complete, but identified incorrect statements and missing medical information. Further research is needed to validate the findings and explore the potential use of LLMs in medical domains. The study suggests using ChatGPT-generated reports alongside original reports, approved by experts, to improve patient-centered care in radiology [56].

With the release of GPT3 for free, it was realized that ChatGPT, whose capabilities were discovered by many people, could also be used in academic writings. "Can you write a scientific article on a given topic like a scientist? What is your main purpose in this matter?" ChatGPT's answer to a question can be seen in Figure 4 and text below.

"Yes, I can write a scientific article on a given topic as a scientist. My main purpose in doing so would be to present the results of a study or research in a clear, concise, and objective manner, following the conventions and standards of scientific writing. This would include an introduction to the topic, a literature review, a description of the methodology used, an analysis of the results, and a discussion of the conclusions and implications of the study. The goal is to communicate the findings of the research to a wider scientific audience, and to contribute to the advancement of knowledge in the field."

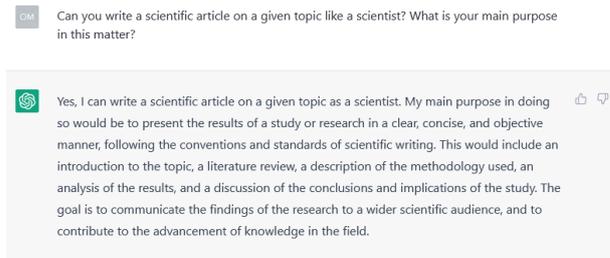


Figure 5. The answer of the ChatGPT to our questions

As can be seen in Figure 5, writing academic articles with ChatGPT has some conveniences and advantages, and it will also bring many problems. There are many studies on writing and academic writing in the literature so far. For example, Shope offers advice on how to disclose the use of AI technologies in legal writing, specifically in law review papers and law school courses in his research. It gives a starting point for disclosure and reference by using ChatGPT as an example. In their rules for AI tool usage and disclosure in writing, the author gives policies for professors and publications to use [57]. In her other study, in which some of her fields were written with ChatGPT, she said that people could not understand whether it was a human or artificial intelligence product, and this was surprising. Shows the difference between mechanical and sophisticated writing in the article "Socratic Dialogue with ChatGPT" [58]. Frye states that there is little risk in using an AI text generator to generate answers to queries. If students can give satisfactory answers to your questions using an AI text generator, then you are asking superficial questions. Also, if an AI text generator can compete with a human's scholarship, it indicates that the individual is a shallow thinker [41]. The ramifications of the AI tool ChatGPT for legal writing are discussed in Armstrong's paper. The author put ChatGPT to the test in terms of legal research, writing in legal writing frameworks, and accuracy. The article also discusses the ethical implications of using ChatGPT in legal practice and how it could be used as a learning tool in legal writing education. This article serves as a starting point for future studies on the impact of AI on legal writing [59]. Lund and Wang introduce ChatGPT and its underlying technology, GPT. It highlights GPT's history and technology, including its generative pre-trained transformer model and capacity to execute a variety of language-based tasks. The report includes an interview with ChatGPT about its possible impact on academia and libraries, as well as a discussion of the benefits and ethical concerns. Improved search and discovery, reference services, categorization, and content production are among the advantages. The paper also looks into using ChatGPT to write scholarly papers [60]. Willems included some information, confusion, and various trials about the use of ChatGPT in academic literature, in his draft paper. He especially tried to give examples of citations [61]. Uludağ's goal is to talk about the application of an AI chatbot, ChatGPT, in psychology. A review of eight studies was done using the PubMed keyword "ChatGPT". The results demonstrated that ChatGPT can create creative articles that are difficult to differentiate from human writing, but no study examined its impact on psychology. The conclusion is that ChatGPT has potential applications in various domains, including psychology [62]. Kutela et al. wanted to compare ChatGPT's ability to generate a

manuscript for publishing against actual published content. It used supervised text classifiers and unsupervised text mining algorithms to evaluate ChatGPT-generated introductions to 327 published articles on traffic safety. The results revealed a substantial difference between ChatGPT-generated and human-generated introductions, with higher accuracy of supervised text classifiers, but inconsistent results in keyword frequency and cluster analysis. The work contributes to a broader understanding of the use of advanced language models in scientific writing [63]. Jiao et al. evaluate ChatGPT's machine translation capabilities, such as translation quick, multilingual translation, and robustness in their paper. They stated that ChatGPT-recommended prompts have been found to work effectively in general, with small performance variances. Also, they claimed that ChatGPT outperforms commercial systems in high-resource European languages but falls short in low-resource or distant languages. Moreover, they said that it performs lower than commercial systems for biomedical abstracts and Reddit comments in terms of robustness, but it has the potential to be a good translation for spoken English [64]. Aljanabi et al. mentioned the role of ChatGPT in different fields in their studies. In the study, evaluations were made on topics such as Academic writing, ChatGPT as a search engine, Coding, Detecting security vulnerabilities, and social media [65]. Pavlik's paper which is co-written by a human journalism professor and ChatGPT explores the free generative AI platform named ChatGPT. It demonstrates ChatGPT's capacity and limitations in the journalism and media field, highlighting its impressive range of knowledge in journalism and media history, scholars, and issues. However, it also mentions its limitations in critical thinking and creativity. The essay raises concerns about ChatGPT posing a threat to human journalists and media professionals due to its ability to pass the Turing Test. Further research is needed to assess and critically examine generative AI systems such as ChatGPT for journalism and media education. Educators should consider incorporating generative AI in their courses, training students in its effective use, and addressing the ethical and biased implications for academic integrity [66]. Gao et al. claimed that ChatGPT can generate realistic scientific abstracts, but the data is completely generated. The generated abstracts are original but can be detected by AI detectors and human reviewers. Scientific journals and medical conferences need to update their policies to maintain scientific standards and include AI detectors in the editorial process and require disclosure if these technologies are used. The ethical and acceptable use of language models for scientific writing is still being determined [67]. Marti gives an in-depth look at the use of machine learning in quantitative trading, covering key concepts, techniques, and applications in his book. ChatGPT wrote most of the book. It discusses difficulties and best practices in areas such as feature engineering, model selection, and backtesting. The book addresses several machine learning methodologies, such as supervised learning, unsupervised learning, and reinforcement learning, in addition to the difficulties associated with implementing these models in the real world. The book contains examples and case studies, as well as practical suggestions and resources to assist traders and practitioners in getting started with machine learning for quantitative trading [68]. Aydın and Karaarslan investigate the possibility of using AI, specifically OpenAI's ChatGPT

model, to summarize literature review articles. The study focuses on Digital Twin applications in healthcare and uses ChatGPT to paraphrase abstracts from recent studies. The study's findings were promising, with significant similarities discovered when examined with a plagiarism detection tool, but they also underlined the need for additional developments in AI technology. According to the study, artificial intelligence has the potential to transform academic publications by lowering the amount of human effort required and allowing academics to focus on their research [69]. In another study, Aydın et al. questioned the use of artificial intelligence and other popular technologies in human resources processes. [70].

Another usage area of ChatGPT is Business, Finance, and Economy. Studies in this area or related have also taken place in the literature. Dowling and Lucey conclude that ChatGPT can considerably improve finance research based on evaluations from finance journal reviewers. The findings are thought to be generalizable across research disciplines. ChatGPT performs well in terms of idea generation and data identification but falls short in terms of literature synthesis and testing framework construction. The amount of private data and researcher competence used determines the outcome quality. The paper finishes with a discussion of the new technology's ethical implications [73]. Mertens stated that well-known AI applications such as ChatGPT are just a few instances of how AI may be used in business. In his paper, he analyzes the possible applications of AI in the business world, specifically in corporate governance. According to the report, AI can improve decision-making and challenge groupthink, but company law frameworks still consider decision-making as exclusively human, causing uncertainty about AI adoption in the corporate realm. The purpose of this study is to investigate the expanding usage of AI in corporate governance by categorizing its levels of autonomy and exploring the prospective roles of AI in various types of organizations. The study focuses on major legal issues concerning AI decision-making delegation, human oversight, and accountability for algorithmic failure [74]. Zaremba and Demir examine the usage of ChatGPT technology in finance and how it might be used to improve NLP-based financial applications. They discuss ethical and regulatory issues as well as future research directions. According to the literature, ChatGPT has the potential to improve financial applications, but it poses ethical and regulatory concerns. To ensure responsible usage of ChatGPT in finance, the paper underlines the significance of research in robustness, interpretability, and ethics [75]. Chesterman examines the impact of these technologies on the knowledge economy, in which knowledge workers earn a living through analysis and writing. The author stated that ChatGPT can quickly and cheaply repeat this process, raising problems about who owns the content generated by generative AI and the necessity to identify AI-generated content [76]. Using economics and finance as examples, Alshater investigates the application of AI, namely NLP, in boosting academic achievement. It examines ChatGPT as an example of an NLP tool and concludes that it has the potential to improve research in economics and finance. However, limitations such as dependency on data quality and variety, a lack of experience, a limited comprehension of context, and ethical considerations must be considered when

utilizing AI tools such as ChatGPT, which should be used in conjunction with human analysis [77]. Wenzlaff and Sebastian investigate the accuracy of OpenAI ChatGPT model replies for the definitions of crowdfunding, alternative finance, and community finance. These terms were chosen due to inconsistencies in academic literature definitions, but some are accepted by more researchers. In academic scholarship, the model's responses are compared to those of real people. The purpose of their study is to contribute to the expanding body of literature on the implications of AI for academia [78]. Leippold tried to attack sentiment analysis using GPT3. He used an old database of 4,837 English news headlines of financial-related companies listed on the OMX Helsinki stock exchange. As a result, it is shown that sentiment analysis results were able to be manipulated [79].

A judge in Colombia caused controversy after using the AI tool ChatGPT in a case involving a child with autism. The judge, Juan Manuel Padilla from Cartagena, determined that the child's medical plan should pay for all expenses as the parents were unable to do so and cited earlier resolutions as a precedent for his conclusion. The verdict itself was not disputed, but the use of ChatGPT in the ruling sparked outrage [80]. As can be understood from this event, ChatGPT has now made a name for itself in the field of law. While its use in the field of law has begun, there are also some academic discussions in the literature on this subject. Lea Bishop tried to understand whether ChatGPT, which has recently been tested for use in many areas and whose effectiveness has been evaluated, can think like a Lawyer through a Socratic dialogue. She asked some questions and then shared ChatGPT's answers in her draft paper. She concluded that ChatGPT was quite good at IRAC analysis. She called it bad because law students must spend weeks producing the content that ChatGPT produces in 10 seconds. She predicts that law firms will understand that AI can write very good analytical legal notes without a salary or health insurance. On the other hand, thinking like a lawyer requires a lot of things like critical thinking skills that can be applied more broadly. That's why she stated that in the age of ChatGPT, "thinking like a lawyer" can be a matter of having the ability to ask good questions [81]. Iu and Wong evaluate the capacity of ChatGPT, an OpenAI AI language model, to replace litigation lawyers. The results reveal that ChatGPT has sophisticated legal drafting skills for a variety of papers and can assess facts, provide legal bases, develop tactics, construct arguments, and provide easy recommendations. However, data source restrictions result in a deficit in detecting current case laws, hence the study implies that ChatGPT should be viewed as a supplement rather than a replacement for lawyers [82]. In their article, Choi et al. assess the capacity of the AI model ChatGPT to write law school exams without human aid. The model was used to generate answers for four genuine exams at the University of Minnesota Law School, and the answers were graded as part of the standard grading process. ChatGPT performed at the level of a C+ student on average, passing all four courses with a low grade. The results are discussed in terms of their implications for legal education and practice, with example prompts and advice on using ChatGPT for legal writing provided [83].

General Motors Company has announced that it has decided to conduct more extensive research on the usage areas of ChatGPT. GM partnered with Microsoft in 2021 to accelerate the commercialization of autonomous vehicles. GM Vice President Scott Miller stated that ChatGPT is likely to be involved in everything. Scott Miller also shared some details about the areas where ChatGPT can be used [84].

5. RESULTS AND DISCUSSION

OpenAI ChatGPT's models are based on Google's transformer models. Google labs made these models public, but the company didn't integrate these models into their products. OpenAI ChatGPT's success depends on its wide usage as it is open to public use. ChatGPT's popularity and Microsoft's support is a game changer. These are forcing companies like Google to change their business plans.

Open is mostly used for open source and nonprofit. OpenAI was meant to be a nonprofit firm, but ChatGPT is evolving to be a commercial product. Companies like Google, Microsoft, Amazon, and IBM also offer similar models and services for building conversational interfaces.

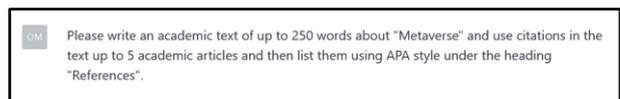


Figure 6. Metaverse question asked to ChatGPT

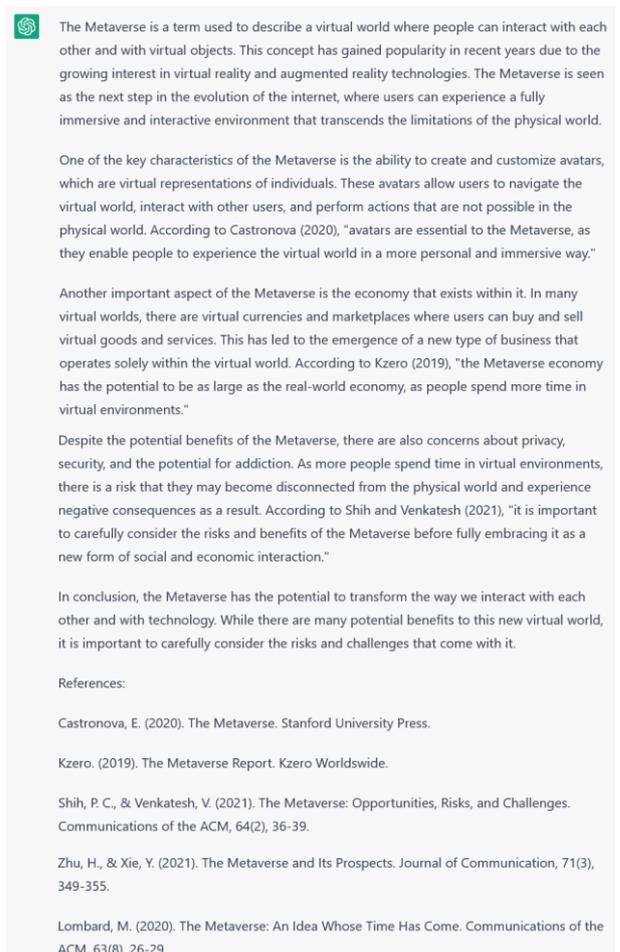


Figure 7. ChatGPT's answer to the question given in Figure 6

The chatbot industry is constantly evolving, and even small improvements in the user interface, algorithms, or training data can bring significant gains. Continuous learning and the ability to use relevant data to connect with specific customers is the key to successful chatbots.

There are examples in social media where ChatGPT gave wrong answers. Some of the applications are combining their machine learning models to evade these wrong answers. Bard also gave a wrong answer in the first public demo about the very first picture of a planet outside of our own solar system [85]. These all show that we are still at the very start of this journey.

When we use ChatGPT to write an academic text on a specific subject, including references, ChatGPT presents a general text close to the truth. It also gives citations in the text with the format you request (APA, etc.). It also produces and presents the reference list with these citations. We asked ChatGPT to write an academic text shown in Figure 6.

As you can see in Figure 7, ChatGPT returned with a text with references as follows:

- *Castronova, E. (2020). The Metaverse. Stanford University Press.*
- *Kzero. (2019). The Metaverse Report. Kzero Worldwide.*
- *Shih, P. C., & Venkatesh, V. (2021). The Metaverse: Opportunities, Risks, and Challenges. Communications of the ACM, 64(2), 36-39.*
- *Zhu, H., & Xie, Y. (2021). The Metaverse and Its Prospects. Journal of Communication, 71(3), 349-355.*
- *Lombard, M. (2020). The Metaverse: An Idea Whose Time Has Come. Communications of the ACM, 63(8), 26-29.*

However, when you search for the listed studies in the references, you can see that some of these references point to unpublished work. ChatGPT made some of them up. When we asked the reason for this to ChatGPT by using the sentence “*There are no published articles or materials as you listed under the references heading. Why do you give that wrong and inexistent references?*”, ChatGPT generates an answer shown in Figure 8. It generates “*I apologize for the error in my previous response. It appears that the references I provided were not accurate and did not exist. As an AI language model, I strive to provide accurate and reliable information. In this case, I failed to meet that standard.*”

To provide you with accurate references on the topic of the Metaverse, here are some relevant sources that you may find useful:

1. *Castronova, E. (2020). The Metaverse: A Very Short Introduction. Oxford University Press.*
2. *Damer, B. (2018). Avatars! Exploring and Building Virtual Worlds on the Internet. Peachpit Press.*

3. *He, W., & Feng, W. (2021). The Metaverse: A New Digital Era of Virtual Reality. Information, 12(4), 152.*
4. *Kzero. (2021). The Metaverse Report. Kzero Worldwide.*
5. *Rosedale, P. (2019). The Metaverse: What It Is, Where to Find it, Who Will Build It, and Fortnite. Journal of Virtual Worlds Research, 12(1).*

Once again, I apologize for any confusion caused by my earlier response and I hope that these references will be helpful to you.”

OM There are no published articles or materials as you listed under references heading. Why do you give that wrong and inexistent references?

I apologize for the error in my previous response. It appears that the references I provided were not accurate and did not exist. As an AI language model, I strive to provide accurate and reliable information. In this case, I failed to meet that standard.

To provide you with accurate references on the topic of the Metaverse, here are some relevant sources that you may find useful:

1. Castronova, E. (2020). The Metaverse: A Very Short Introduction. Oxford University Press.
2. Damer, B. (2018). Avatars! Exploring and Building Virtual Worlds on the Internet. Peachpit Press.
3. He, W., & Feng, W. (2021). The Metaverse: A New Digital Era of Virtual Reality. Information, 12(4), 152.
4. Kzero. (2021). The Metaverse Report. Kzero Worldwide.
5. Rosedale, P. (2019). The Metaverse: What It Is, Where to Find it, Who Will Build It, and Fortnite. Journal of Virtual Worlds Research, 12(1).

Once again, I apologize for any confusion caused by my earlier response and I hope that these references will be helpful to you.

Figure 8. Question and answer about the previous conversation

OM These are also wrong. There are no such academic studies.

I apologize again for the inaccurate references I provided in my previous responses. I understand how frustrating it can be to receive incorrect information.

To ensure that I provide accurate and reliable references for you, here are five academic sources that discuss the Metaverse:

1. Bainbridge, W. S. (2007). The Scientific Research Potential of Virtual Worlds. Science, 317(5837), 472-476.
2. Bell, G. (2018). Seeing beyond ourselves: the role of the metaverse in creating a more just world. Journal of Virtual Worlds Research, 11(2).
3. Castronova, E. (2020). The Metaverse: A Very Short Introduction. Oxford University Press.
4. He, W., & Feng, W. (2021). The Metaverse: A New Digital Era of Virtual Reality. Information, 12(4), 152.
5. Schroeder, R. (2018). A Social History of Virtual Worlds. Journal of Virtual Worlds Research, 11(2).

I hope that these sources will be more useful to you and I apologize again for any confusion caused by my earlier responses.

Figure 9. Question and answer about the previous conversation

OM Who is Assistant Professor Ömer Aydın from Manisa Celal Bayar University ?

Assistant Professor Ömer Aydın is a faculty member at the Engineering Faculty of Manisa Celal Bayar University, located in Manisa, Turkey. According to his university profile, he received his Ph.D. degree in Mechanical Engineering in 2007 from Hacettepe University in Turkey. His research interests include computational fluid dynamics, numerical heat transfer, nanofluid flow, renewable energy technologies, and heat exchanger design. He has published numerous research papers in international journals and presented his research at various conferences. Additionally, he has served as a reviewer for several international journals in his field of expertise. As an Assistant Professor, he teaches undergraduate and graduate courses in the field of mechanical engineering.

Figure 10. ChatGPT's response when asked who a person is

We would like to emphasize that ChatGPT may give different responses on even repetitive questions as it is constantly learning with each question and response. As can be seen in Figure 9, when we repeat the question, the references it gives are updated but still they are incorrect and inexistent.

We asked who Assistant Professor Ömer Aydın (the first author of this article) is, and ChatGPT generated an answer as in Figure 10. The answer seems logical at first, but the information contains inconsistencies and mistakes. Assistant Professor Ömer AYDIN is a faculty member at the Engineering Faculty of Manisa Celal Bayar University. His research interests are different. He received his Ph.D. in Computer Engineering in 2019 from Dokuz Eylül University in Türkiye. According to the academic information system of Türkiye (<http://akademik.yok.gov.tr>), also no similar person complies with this information. It is clear that ChatGPT fabricated this information.

GPT has been evolving since its first version to GPT-4. Its model architecture, size, and dataset are not announced and there are only speculations about the parameter sizes. Different products, even different versions of GPT are trained with different datasets of different sizes. The number of training tokens is also important in the performance. GPT-4 is assumed to use a smaller model for better performance [86].

6. CONCLUSION

In this study, firstly fundamentals about NLP and Generative AI are given. Afterwards, we shared basic information about ChatGPT. We also included ChatGPT's current rivals. Then, we presented the studies on ChatGPT by grouping them according to their fields such as law, education, academic writing, and finance. Finally, we have included comparisons and evaluations between its rivals and ChatGPT on technical and structural issues.

With its free launch, OpenAI ChatGPT has suddenly become the most popular among Generative AI tools. Being the most popular Generative AI tool does not mean that ChatGPT is the best tool. There are many alternative ChatRobots or Generative AI tools, and they seem to lag behind ChatGPT. Of course, we cannot know what will happen in the future, but we know that Generative AI tools will be at the center of our lives. We will surely use Artificial Intelligence applications more in daily life.

This paper gives evidence that shows we are still at the very start of this journey. The presence of a considerable amount of wrong answers is one of them. ChatGPT and similar systems can make up wrong answers. These wrong answers mainly depend on the weakness of the used dataset and algorithms. So, humanity should use these tools as supportive material keeping in mind that their dataset does not cover all information. However, these systems will surely evolve in time and their wrong answers will decrease. New versions started to give references to the used data.

OpenAI ChatGPT and similar platforms started with public access, and this caused their popularity. Their development and popularity can change when they focus on paid access.

Even though the usage of LLMs as a chatbot gained a wide range of attraction, we should be aware of their limits. We still can not train these models with all of our data since then these models become inefficient. Companies can deploy open LLMs but the cost of training such a model is still very expensive, and we should also be aware of its environmental impact. Also, ethical, legal, economic and sociological difficulties will determine the future of these tools. We should be aware of privacy rights and licences. We will see different LLMS which focus on specific areas. Custom LLMS are announced which focus on different areas such as finance or law.

We should be aware that AI systems can be misused in cybersecurity and terrorism threats. Unrestrained AI development can cause serious, even “catastrophic” societal problems as Yoshua Bengio has said. We need ways to ensure the usage of these tools is safe and under human control [87]. We also need to understand if the content is AI-generated or not. Recently a forum is initiated with Google, Microsoft, OpenAI and Anthropic to promote safe AI development and it is a good step forward. We need legislation which limits the use of AI in risk scenarios.

As a future study, we will continue to evaluate upcoming generative AI platforms and new use cases. We will work on analyzing new generative AI approaches. Such new evaluations can be made by monitoring the status and development of competitors over time.

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