

A Study on the Understanding and Effective Use of Generative Artificial Intelligence

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Abstract

This study would investigate the generative AIs currently in service in the era of hyperscale AIs and explore measures for the use of generative AIs, focusing on 'ChatGPT,' which has received attention as a leader of generative AIs. Among the various generative AIs, this study selected ChatGPT, which has rich application cases to conduct research, investigation, and use. This study investigated the concept, learning principle, and features of ChatGPT, identified the algorithm of conversational AI as one of the specific cases and checked how it is used. In addition, by comparing various cases of the application of conversational AIs such as Google's Bard and MS's NewBing, this study sought efficient ways to utilize them through the collected cases and conducted research on the limitations of conversational AI and precautions for its use. If connected to city-related databases, it can provide information on city infrastructure, transportation systems, and public services, so residents can easily get the information they need. We want to apply this research to enrich the lives of our citizens.

Keywords: *Chat Generative Pre-trained Transformer(ChatGPT), Generative AI, Conversational AI, Information Security*

1. Introduction

A change began when Klaus Schwab introduced the Fourth Industrial Revolution at the World Economic Forum in 2016. In technology, the evolution of machine learning and artificial intelligence has been noted while in life, the development of information and communication technology has brought about the era of the Internet of Things, which is beyond ubiquitous computing. This study identified the types and current status of generative artificial intelligence and studied specific application cases centered on ChatGPT and conversational artificial intelligence. This study checked the working principle and current status of interactive AI through ChatGPT and compared individual cases. In addition, this study actively utilized generative AI to improve the lives of citizens as part of solving social problems and suggested effective use methods.

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2. Main Text: Theoretical Background

Generative AI enables users to quickly generate new content based on a variety of inputs. The inputs and outputs of these models can include texts, images, sounds, animations, 3D models, or other types of data.[1] Generative AI uses artificial neural networks to teach itself to identify and understand patterns and structures in the input data and generate new content. Generative AI is used in many fields, and the following is the current status of generative AI in linguistic, visual, and conversational domains.

① Novel AI

The first is NovelAI [2], a novel AI in the linguistic domain. NovelAI is a self-learning AI model that has been trained on real-world literature and can produce a variety of stylistic and textual structures. In addition, there is a large amount of data that has been utilized as a text-based game played by users, and it shows good results in predicting and outputting the next sentence. Therefore, it is evaluated as a program that shows a high degree of freedom.

② Painting AI

The second is Midjourney [3], a painting AI in the visual domain. Midjourney is an artificial intelligence software developed by an independent artificial intelligence research institute, and it is known as a pictorial artificial intelligence specialized in the art sector that is strong in realistic expression and shows good results in abstract depictions as well. The winner of the digital art category of the ‘Colorado State Fair Art Competition’ held in August 2022, “Space Opera Theater” [4], attracted attention after it became known that the work was composed by this AI software.

Painting AI is said to learn existing paintings and reorganize them according to the user’s keywords to create artworks, but such learning has been criticized by artists for infringing copyright and has been sued for violating the U.S. Digital Millennium Copyright Act (DMCA) and the Unfair Competition Law of California.



Figure 1. The art “Space Opera Theater”

③ Conversational AI

Conversational AI is AI that uses natural language processing and generation techniques to have human-like conversations with users.[5] Examples include chatbots, voice-activated assistants, virtual chatbots, large-

scale language model-based services, and AI search engines. Conversational AI learns from large amounts of data and then recognizes and responds to voice/text input by mimicking human interaction. Conversational AI aims to communicate more naturally by automating and improving conversations with humans.



Figure 2. Conversational AI ChatBot Charlie

These conversational AIs are technically similar but have various application cases, such as chatbots that provide useful information to users and create learning experiences (Charlie the E-Advisor) and virtual chatbots that communicate while leaving a fun conversation experience (Iruda). In addition, because they are focused on being used to communicate with humans, they are built with a universal language model and can handle more diverse needs than other models do. In particular, through the case of ChatGPT, which is the most prominent among these conversational AIs, this study will examine the specific uses and applications of conversational AIs and suggest effective ways to utilize them.

2.2 The Concept and Learning Principle of Generative AI ChatGPT

2.2.1 ChatGPT

ChatGPT is a conversational AI service developed by OpenAI. ChatGPT was developed based on GPT 3.5, which self-learns texts through deep learning and is an interactive weak AI that is repeatedly trained by reinforcement learning through human feedback. In Korea, it was mentioned at the State Council earlier this year, and its usefulness in improving work efficiency on behalf of humans, such as writing speeches and meeting minutes, was noted.

2.2.2 How ChatGPT Works

The full name of ChatGPT is Chat-Generative Pre-trained Transformer. This means that ChatGPT is a pre-trained transformer AI that generates responses through conversations. In addition, it learns itself through supervised learning, pre-learning, and reinforcement learning like the previous generative AIs. In particular, ChatGPT is different from other generative AIs in that it continuously learns by Reinforcement Learning with Human Feedback (RLHF) as a conversational AI.

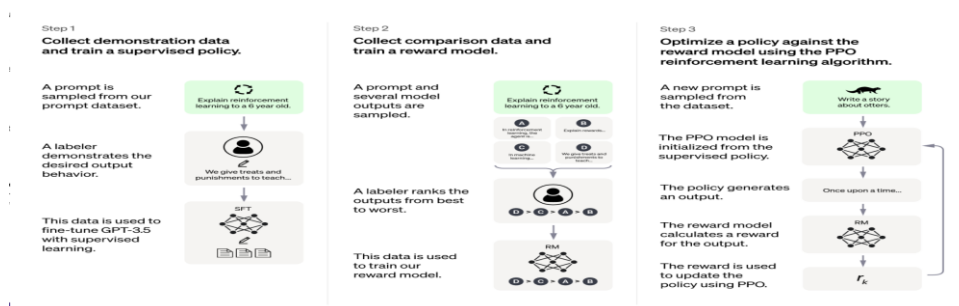


Figure 3. The Mechanism of ChatGPT[6]

Figure 3 shows the mechanism of ChatGPT.

2.2.3 Defining and Comparing Different Generative AIs

Table 1. Definition and comparison of various generative AI

	Naver_Hyper CLOVA X	Microsoft_New Bing	Google _ BARD
Definiton	<ul style="list-style-type: none"> - Super-scale AI that is an upgrade to the original Hyper CLOVA - It combines customers' own data with Hyper CLOVA to provide instant responses tailored to user needs 	<ul style="list-style-type: none"> - Microsoft's large-scale AI - A search engine that integrates OpenAI's GPT-4 with Bing 	<ul style="list-style-type: none"> - An artificial intelligence search engine service based on the Language Model for Dialogic Applications (LaMDA), a conversational AI model that supports natural conversations from Google
Comm onality	<ul style="list-style-type: none"> - Developing conversational AI to evolve existing systems to improve customer experience 		
Differe nces	<ul style="list-style-type: none"> - AI that understands Korean the best - Personalized AI - It can easily create the AI model you want 	<ul style="list-style-type: none"> Generative AI specialized for conversations AI search engine provides the latest information and sources 	<ul style="list-style-type: none"> - Search for the latest information based on Google search engine - Ability to provide image data using Google Search

Table 1. This section defines and compares the different types of generative AIs.

3. Generative AI: Features and Application Cases of ChatGPT

There are various generative AIs, but ChatGPT has various application cases that stand out from other generative AIs. There are many good application cases of ChatGPT in the present society, but there are definitely some areas that are abused or still need to be supplemented, and the following are examples.

3.1 Positive use for socially marginalized groups

ChatGPT can use natural language processing technology to provide an interface that makes it easier for users to communicate. Accessibility features include providing information via voice commands for people who are blind or have physical limitations or allowing voice input for people who have difficulty using a keyboard. It can also be utilized to provide an easy way to understand and access information for marginalized populations, as they may have difficulty accessing information. For example, ChatGPT can be used to help people navigate websites or search for information, or to provide information on social welfare programs or support services.

There are a variety of other psychological and educational supports available, and ChatGPT can be used to help the socially weak improve their daily lives and increase their independence. Furthermore, these uses can be customized to suit individual situations and needs, and as technology advances, they can be utilized in a

wider variety of ways.

3.2 Examples of negative issues such as confidentiality leaks

On March 11, 2023, Samsung Electronics' DS (Division of Semiconductor) was granted permission to use ChatGPT, and shortly thereafter, an incident of ChatGPT misuse occurred. According to the DS internal bulletin board, one meeting content and two facility information were shared on ChatGPT. Nevertheless, Samsung Electronics explained that it would not restrict the use of generative AI and would devise ways to coexist with it. In contrast, some companies in major overseas countries such as the United States and Japan have restricted ChatGPT.

4. The Use of Generative ChatGPT-type AI to Improve Citizens' Lives

4.1 Application in the field of urban systems engineering utilizing generative AI

There are many ways for ordinary citizens to live in the city and improve their quality of life through the use of ChatGPT. For example, there are information provision and counseling services based on life AI, and the actual application results are as follows.

1) Information Provision Service

Various information about the city can be provided to citizens. For example, public transportation information, nearby restaurants, tourist attractions, hospital locations and hours, cultural event information, etc. can be provided to help citizens live conveniently in the city.

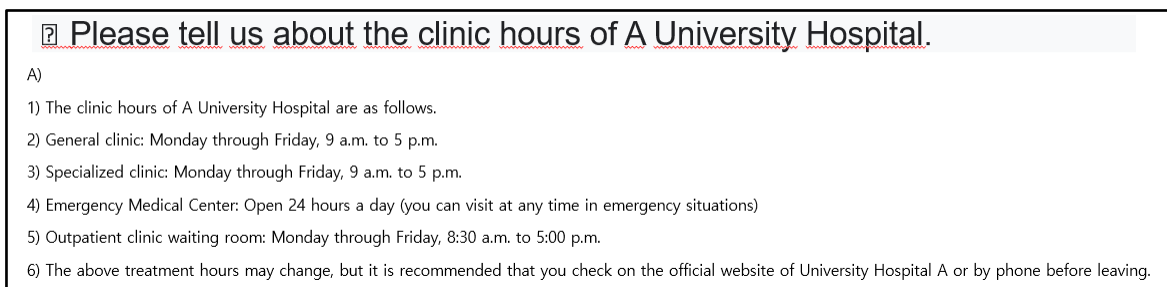


Figure 4. ChatGPT's response to questions about A. University Hospital Clinic Hours

As shown in Figure 4, the researcher asked ChatGPT about the opening hours of A. University Hospital in the city and received a response that guided us to the opening hours of each type of office.

2) Counseling Services

Generative AI can be used to improve consultation services provided by cities. For example, citizens' questions or reports at report centers or consultation centers in the city can be quickly processed through generative AI to resolve citizens' inconveniences.

An actual example of using AI to process data generated by a city's report center or counseling center is Boryeong City's 'Boryeong City Chatbot Counselor.' This service provides non-face-to-face online services such as civil service and various administrative information through live chat.

4.2 Pros and Cons of ChatGPT in Urban Systems Engineering

Pros: By using ChatGPT, necessary knowledge and information can easily be provided for residents and city managers, and problems such as traffic congestion and infrastructure defects can quickly be detected through real-time monitoring. In addition, ChatGPT can increase the convenience and satisfaction of city residents in terms of providing personalized city services, and it can also be used to manage infrastructure.

Cons: Since ChatGPT is based on data, the lack of city data or incomplete data may affect the performance of ChatGPT and the reliability of the results. Also, ChatGPT does not perfectly understand and respond like a human, so it may misunderstand the intent of a question or provide incorrect information. Finally, since ChatGPT learns from training data, it may reflect biases or inaccuracies inherent in the training data.

Given these pros and cons, any application of ChatGPT should be sensitive to ethical considerations such as privacy, fairness, and discrimination, and should be timely and active. Generative AI and the following examples are very useful in the era of the 4th Industrial Revolution. Among the Metaverse designs, real characters can engage in social, economic, and cultural activities like the real world in a virtual space using the ZEPETOapp, suggesting infinite possibilities for activating virtual space[7][8].

5. Conclusion

In urban systems engineering, which improves the quality of life of citizens, ChatGPT is mainly used as a way to solve urban problems. Various public institutions are also actively trying to adopt problem-solving using AI. If connected to city-related databases, it can provide information on city infrastructure, transportation systems, and public services, so residents can easily get the information they need. In the era of personalized services, individual users can interact with ChatGPT to provide personalized city services. By applying ChatGPT to urban problem-solving, it is possible to achieve expected effects in various aspects such as urban efficiency, safety, convenience, and effective functionality.

Thus, this study can be used as baseline data for realizing the application of customized generative AI in various fields by utilizing AI, one of the most powerful future technologies. In addition, this study noted that generative AI can have more natural conversations and provide more detailed and accurate answers to users than ever before. Generative AI can contribute much to improving people's quality of life based on its proper capabilities, and legal regulations should be prepared in policy in case these technologies are used in the wrong direction.

References

- [1] Generative AI. (n.d.). Nvidia. <https://www.nvidia.com/en-us/glossary/data-science/generative-ai/>
- [2] NovelAI, (n.d.). NovelAI. <https://novelai.net/>
- [3] Midjourney, (n.d.). Midjourney <https://www.midjourney.com/>
- [4] Dong-Hoon Jeon. (2022). "A painting drawn by artificial intelligence takes first place... "Is this also art?", https://imnews.imbc.com/news/2022/world/article/6404569_35680.html
- [5] IBM (n.d.). "What Is Conversational AI?". <https://www.ibm.com/topics/conversational-ai>
- [6] OpenAI. (2022). "ChatGPT Method". <https://openai.com/blog/chatgpt/>
- [7] Kim Gokmi & Ju Hyun Jeon, "A Study on the Copyright Survey for Design Protection in Metaverse Period", vol.10, no.3, pp. 185, 2021.
- [8] JuHyun Jeon, "A Study on Education Utilizing Metaverse for Effective Communication in a Convergence Subject", Vol.13 No.4 129-134 (2021)