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COMPARATIVE ANALYSIS OF ARTIFICIAL INTELLIGENCE (AI) IN TOURISM: THE CASE OF CHATGPT AND GEMINI

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ABSTRACT

This study focuses on comparing the performance of two leading artificial intelligence (AI) models, ChatGPT and Gemini, in generating touristic information about Ayasofya. While both models show strengths in providing historical and architectural detail, they contrast in their focus and depth of information. ChatGPT provides a concise and user-friendly overview, ideal for tourists looking for basic information, while Gemini targets to a deeper interest in history and architecture by offering a more comprehensive and technical analysis enriched with visuals. This comparison underlines the various capabilities of AI models in enhancing the tourist experience by providing information based on individual preferences and interests. Similar research on different destinations will be critical in shaping the future of AI technology in the tourism and travel industry.

Keywords: Tourism, ChatGPT, Gemini, Artificial Intelligence, AI, Istanbul.

INTRODUCTION

Tourism is an essential and ever-growing industry that plays a vital role in the global economy. As a matter of fact, in 2023, more than 1.4 billion tourists traveled worldwide and generating revenues exceeding 1.6 trillion US dollars (UNWTO, 2024). At this point, the constant growth and development of the tourism industry necessitates the adaptation of new technologies. In this context, artificial intelligence (AI) is a technology that has the potential to revolutionize the tourism industry as in many other sectors (García-Madurga & Grilló-Méndez, 2023). Artificial intelligence can be defined simply as computer systems and algorithms that simulate human intelligence and perform cognitive functions such as problem solving, learning and decision making (Sætra, 2023). Today, artificial intelligence brings the potential for more efficient and faultless processes in production, more complex and innovative products in engineering, faster and more accurate diagnoses in healthcare, more secure and transparent transactions in finance and banking, more personalized and interactive learning experiences in education, and smarter and autonomous vehicles in transportation (Chen & Decary, 2020; Cao, 2022; Doroudi, 2023; Umamaheswar & Valarmathi, 2023). This potential of artificial intelligence makes it one of the most crucial and exciting developments in the tourism industry, as in many other sectors (Tussyadiah, 2020; Kirtil & Aşkun, 2021). Therefore, the use of artificial intelligence is expected to become increasingly widespread in almost every aspect of tourism, from booking to marketing, revenue management to customer service. The aim of this study is to compare the performance of ChatGPT and Gemini as text-based artificial intelligence in generating touristic information.

The History of Artificial Intelligence

The concept of artificial intelligence dates back to the 1940s (Benko & Lányi, 2009). During World War II, the US developed ENIAC, a machine used for mathematical modeling and military calculations (Weik, 1961). Similarly, Colossus, developed by the UK, was designed to decrypt German Army codes during World War II (Sale, 2003). In the 1950s, Alan Turing, in his study "Computing Machinery and Intelligence", asked the famous question that would become, perhaps, the

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most important step in human history: "Can computers think?". This question became the focus of the Dartmouth Conference in the summer of 1956, which is considered the birth of AI as a discipline. In addition to acknowledging AI as a discipline, the conference helped to fund new research and development worldwide (Moor, 2006). The 1970s were a milestone for artificial intelligence research. Indeed, governments, particularly the US and the UK, made significant investments in artificial intelligence research. As a result of these investments, important progress has been made in the developing fields of computer-aided thinking and robotics (Raj & Seamans, 2019). Notably, MYCIN, developed in 1974, was used for medical diagnosis in healthcare (Van Melle, 1978), while LUNAR, developed in 1975, analyzed photographs from the Moon (Suggs et al. 2008). Discussions about the ability of artificial intelligence to mimic human intelligence were frequently mentioned during this period. In 1982, John Hopfield's development of the "Hopfield Network", a type of neural network that is very similar to the human brain and can solve complex problems, revitalized the interest in artificial neural networks (Krotov, 2023). In 1997, the Deep Blue program developed by IBM defeated Garry Kasparov, the most important chess player of the period, and once again demonstrated the potential of artificial intelligence in the machine-human war (Campbell, Hoane, & Hsu, 2002). The rise of the internet in the 2000s provided a huge source of data and information for AI researchers (Turner, 2019). In the same period, the commercial use of artificial intelligence in advertising, e-commerce and many other areas has brought criticism of artificial intelligence back to the agenda in many areas, especially in the labor market (Kalia, 2021). However, the developments in this period also contributed to the development of today's chatbot-based artificial intelligence applications.

Chatbot Based Artificial Intelligence

Chatbot-based artificial intelligence are AI products that can chat with users via text or voice (Adamopoulou & Moussiades, 2020). Chatbots use natural language processing (NLP) technologies to understand and interpret human language (Lalwani et al. 2018). This technology consists of a number of processes that involve computers understanding and interpreting human language (Rapp, Curti, & Boldi, 2021). In fact, natural language processing technology primarily receives data in text or audio format. This data is cleaned of confusing punctuation, unnecessary spaces and symbols. Then, the system tries to determine the meaning of each word. In addition, sentence structures and relationships are analyzed within the system to extract the meaning and purpose of the text or audio. Finally, the system responds to the user by producing output in text or audio format related to the received data (Rapp, Curti, & Boldi, 2021).

ChatGPT

ChatGPT, released in 2022, is a large language model (LLM) based chatbot artificial intelligence platform developed by OpenAI that can chat with users via text. While the base model chatgpt 3.5 had a processing capacity of 1.3 billion parameters, the later GPT-4 increased this capacity to 175 billion (ChatGPT, 2024). This major improvement enables ChatGPT to understand human language much more deeply and produce natural, fluent responses. ChatGPT's capabilities are not limited to chat. Depending on the task required, it can be used in many different areas such as question-answering, summarizing, translation, coding, text generation. The ability to follow sentence context, manage multiple topics simultaneously and respond to even open-ended, difficult questions makes it unique. Moreover, ChatGPT constantly learns and evolves as it interacts with users and receives feedback, thus becoming even smarter and more capable over time.

Gemini

Gemini, launched in 2023 as Bard, is a chatbot based artificial intelligence developed by Google AI. Building on predecessor models such as LaMDA and PaLM 2, Gemini is a multi-modal large language model (MLLM). Gemini is available in three different versions: 34 billion parameters in the Nano (basic) model, 137 billion in the Pro model and up to 540 billion in the Ultra model (Gemini, 2024). Besides being a text-based chatbot as ChatGPT, Gemini can also process many different types of data, such as images and videos. Considering its processing capacity, Gemini can quickly adapt to new information and tasks, solve complex problems and make logical deductions.

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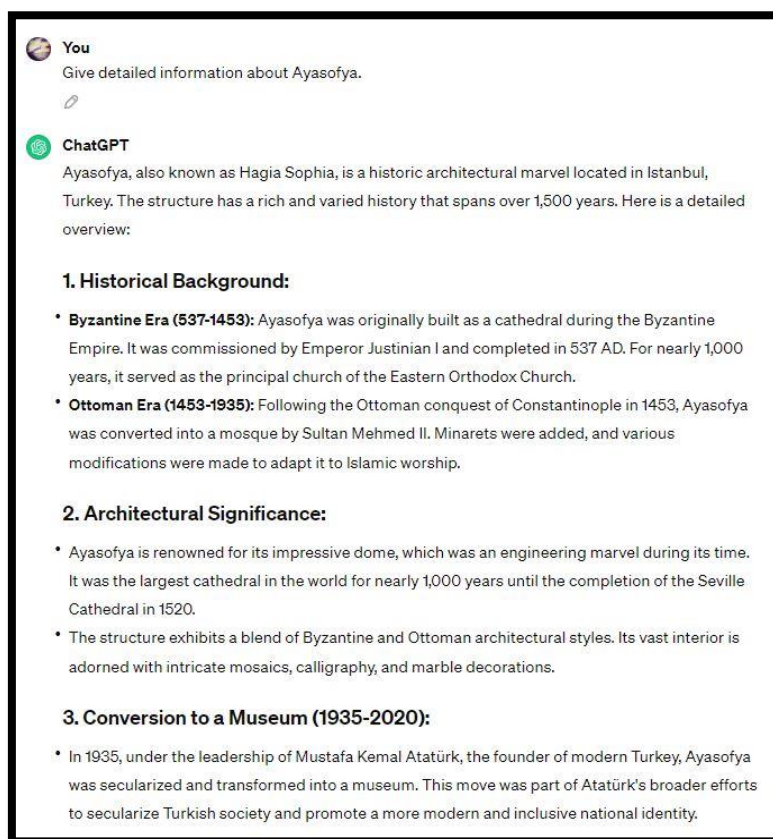
METHOD

In this study, the performances of chatbot based ChatGPT and Gemini artificial intelligence models were compared to provide accurate, comprehensive and personalized information about Ayasofya. Istanbul has become one of the most visited destinations, hosting more than 17 million visitors worldwide in 2023. At this point, it is assumed that ChatGPT and Gemini, which are today's important Chatbot-based artificial intelligence applications, are frequently used for tourists to access accurate, comprehensive and up-to-date information about destinations. Therefore, according to data from the Istanbul Directorate of Culture and Tourism, Ayasofya was identified as the most visited destination in Istanbul. Subsequently, both artificial intelligence models were asked the same question "*Give detailed information about Ayasofya*" and it was compared which model provided more accurate, comprehensive and up-to-date information.

RESEARCH FINDINGS

In the study, chatgpt's responses were analyzed first. The results are shown in Figure. 1 and Figure. 2. As shown in Figure. 1, in the introduction part of the response, ChatGPT stated that Ayasofya is also known as Hagia Sophia and that the building has a rich history spanning over 1,500 years. Subsequently, in the historical background section, information about the history of Ayasofya was presented to the user by dividing it into various periods. It is stated that Ayasofya was originally a cathedral built by Emperor Justinian I during the Byzantine Empire and completed in 537. It is also noted that it was a main church of the Eastern Orthodox Church for nearly 1,000 years.

Figure. 1 ChatGPT's response about Ayasofya.



Source:
Author's

conversation with ChatGPT.

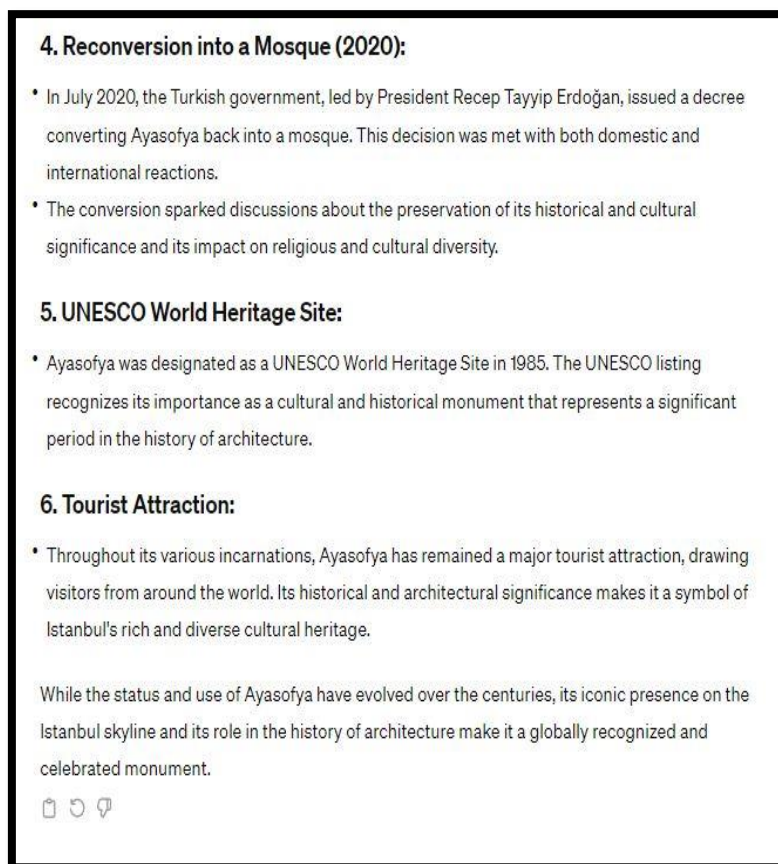
After the Ottoman conquest of Constantinople in 1453, Ayasofya was converted into a mosque by Sultan Mehmed II, with minarets and other Islamic additions. ChatGPT also mentioned the architectural features of Ayasofya. Indeed, Ayasofya is famous for its impressive dome, which was an

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engineering marvel in its time. It is important to note that Ayasofya was the largest cathedral in the world for nearly a thousand years, until the completion of the Seville Cathedral in 1520.

The building was also adorned with mosaics, calligraphy and marble ornaments, a mixture of Byzantine and Ottoman architectural styles. It is noteworthy that ChatGPT informs that Ayasofya was converted into a museum between 1935 and 2020 and then started to be used as a mosque again in 2020.

Figure. 2 ChatGPT's response about Ayasofya (continued).



Source:

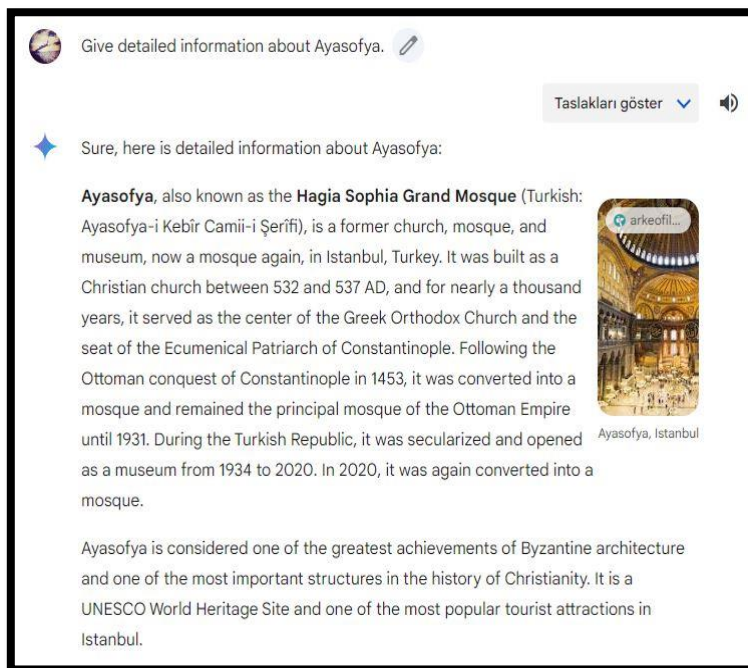
Author's conversation with ChatGPT.

As can be seen in Figure. 2, ChatGPT informs that Ayasofya was designated as a World Heritage Site by UNESCO in 1985. Finally, it was noted that throughout its various transformations, Ayasofya has been a major tourist destination, attracting visitors from all over the world.

As with ChatGPT, Gemini's responses were also analyzed and the results are shown in Figure. 3, Figure. 4 and Figure. 5. First of all, Gemini provides basic information about Ayasofya in the form of preliminary information. It is also important that Gemini supports this information with photographs. As ChatGPT, Gemini also stated that the other common name of Ayasofya is Hagia Sophia. Gemini also revealed that Ayasofya is a former church, mosque and museum in Istanbul, built as a Christian church between 532-537 AD, and served as the center of the Greek Orthodox Church and the seat of the Ecumenical Patriarch of Constantinople for nearly a thousand years.

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Figure. 3 Gemini's response about Ayasofya

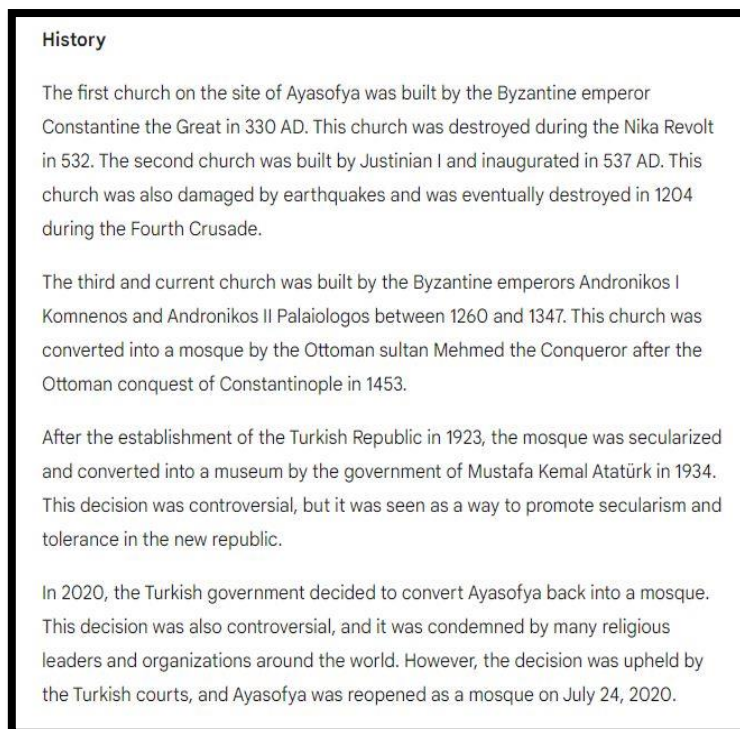


Source:

Author's conversation with Gemini.

Gemini informed that after Istanbul was conquered by the Ottomans in 1453, it was converted into a mosque and used as the main mosque of the Ottoman Empire until 1931, opened as a museum during the Republic of Turkey from 1934 to 2020 and was converted back into a mosque in 2020. Like ChatGPT, Gemini also stated that Ayasofya was listed as a World Heritage Site by UNESCO, but did not provide any information on when it was included in this list.

Figure. 4 Gemini's response about Ayasofya (continued).



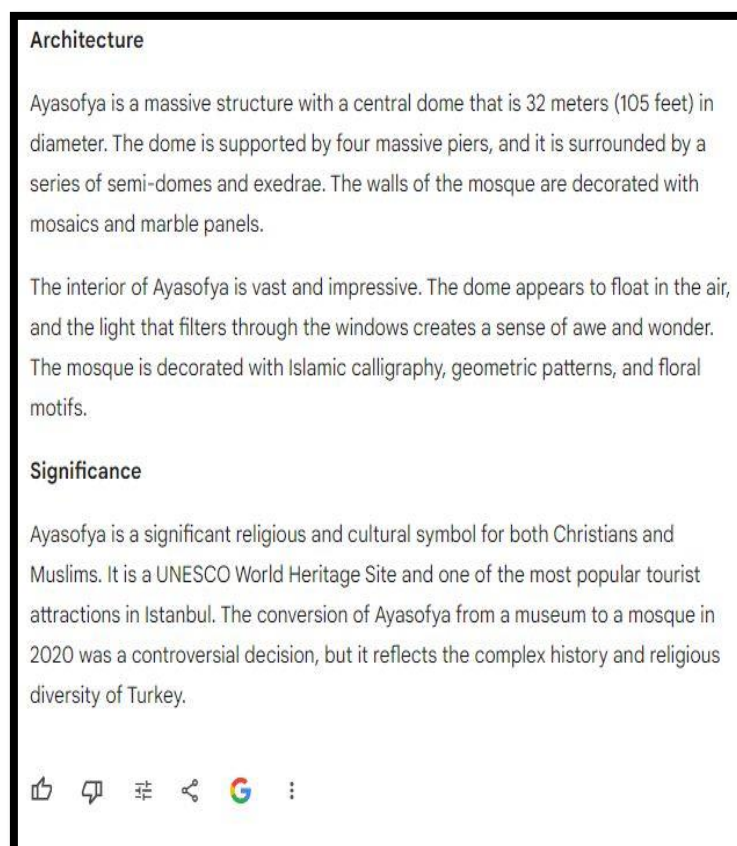
Source:
Author's

conversation with Gemini.

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Figure. 4 shows that Gemini provides detailed historical information about Ayasofya. Gemini states that the first church on the site of Ayasofya was built by the Byzantine Emperor Constantine the Great in 330 AD; however, this church was destroyed during the Nika Rebellion in 532, a second church was built by Justinian I in 537 AD, this church was also damaged by earthquakes and destroyed in 1204 during the Fourth Crusade. Subsequently, Gemini mentions that the third and current building was built by the Byzantine emperors Andronikos I Komnenos and Andronikos II Palaiologos between 1260 and 1347 and was converted into a mosque by the Ottoman sultan Mehmed the Conqueror after the Ottoman conquest of Constantinople in 1453. Gemini also provided information on the conversion of Ayasofya into a museum and then back into a mosque.

Figure. 5 Gemini's response about Ayasofya (continued).



Source:
Author's

conversation with Gemini.

According to the information provided by Gemini, the architectural features of Ayasofya can be seen in Figure 5. Gemini gives more technical details compared to ChatGPT. Ayasofya has a dome with a diameter of 32 meters, the dome is supported by four pillars, and the walls of the building are decorated with mosaic and marble panels. Similarly, the impressive elements of the interior structure of Ayasofya were emphasized. The mosque was decorated with Islamic calligraphy, geometric patterns and floral motifs. Figure. 5 also states that, the building is an important religious and cultural symbol for both Christians and Muslims. It is also noted that Ayasofya is a UNESCO World Heritage Site and is one of Istanbul's most popular tourist attractions.

CONCLUSION

In this study, the performance of ChatGPT and Gemini in providing information about Ayasofya was compared. In the comparison made on the Ayasofya case, it is seen that the knowledge, skills and perspectives provided by ChatGPT and Gemini are different. ChatGPT, from a general point of view, summarized the historical process of Ayasofya by dividing it into periods and mentioned important

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milestones. Architectural features and cultural significance are explained in a simple, user-friendly language. This can be useful for tourists who want to get basic information about Ayasofya. Gemini, on the other hand, has used a more academic and technical language, giving a more in-depth look at the history and architecture of Ayasofya. Details such as the phases of the building, earthquakes and restorations are given together with historical processes. Architectural features are explained in technical terms and measurements, and components such as building materials and ornaments are mentioned. This detailed and technical approach may be more attractive to tourists interested in architecture and history. This detailed and technical view may be more suitable for tourists interested in architecture and history. Similarly, while ChatGPT preferred a text-based format, Gemini used visual materials to enrich the information. For Gemini, the use of visual materials is an important advantage, especially in terms of understanding the architectural details and conveying the grandeur of the building.

Although ChatGPT and Gemini are considered to be very successful artificial intelligence models in providing information about Istanbul's touristic destinations, both models have their strengths and weaknesses. ChatGPT provides information about tourist destinations from a general point of view, while providing basic information in a simple, concise and understandable language. This feature can be useful for tourists who are not familiar with technical terms. Despite this advantage, ChatGPT can sometimes become inefficient for users looking for in-depth information and technical details. Moreover, given that the database was last updated in January 2022, ChatGPT is likely to face problems in providing up-to-date data. In contrast, Gemini offers in-depth and comprehensive information about tourist destinations. In Gemini, historical periods, architectural details, cultural features, etc. are discussed in a detailed way. In addition, the effective use of visual images in the presentation of information can help tourists better understand the destination. Against these advantages, Gemini tends to use technical and academic language, which can be difficult for some tourists to understand.

Given the emerging nature of AI models, studies on this field are crucial. In future studies, similar comparisons in different cities and destinations may provide a wider perspective on the development of AI-based tourist information providing systems.

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