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## What does ChatGPT show about the future impacts of large language model applications on tourism?

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### Abstract

1 ChatGPT, as a life-changing technology, has become the topic of discussion in academia and industry. Built on top of a large language model (LLM), ChatGPT can significantly impact different fields; therefore, understanding these impacts on various sectors, like tourism, is crucial. This viewpoint aims to critically discuss opportunities, challenges, and impacts of adopting large language model applications in the tourism industry. Few studies have been conducted about this novel topic in tourism. Furthermore, businesses are starting to explore large language model applications. LLMs are expected to be integrated with voice assistants and robots. Since previous studies have not discussed significant LLM-driven voice assistants and specifically robots, this viewpoint, while reviewing existing studies, focuses on the highlighted gaps to provide a new perspective.

**Keywords:** ChatGPT, tourism, artificial intelligence, large language models.

### Introduction

Technological advancements have transformed the tourism industry over the last two decades by making companies revolutionize their business models (Buhalis et al, 2019). Artificial intelligence (AI), in particular, has significantly changed tourism over recent years. Service robots, chatbots, virtual assistants, recommender systems, forecasting techniques, and translation applications are some AI use cases in the tourism industry that benefit businesses and travelers (Bulchand-Gidumal, 2020). With the current pace of AI development, it can be expected to witness the emergence of new research areas and applications in tourism (Ladhari et al, 2022). Large language models are AI tools developed substantially in recent years. ChatGPT is a well-known example of an LLM application that can be suitable to demonstrate the result of these advancements.

A generally accepted definition of large language models is not available yet. However, LLM often refers to a statistical model including neural networks with many parameters, allocating



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probability to a series of words. LLMs are capable of performing a wide range of tasks, including translation, conversation, and answering questions (Carlini et al, 2021; Shen et al, 2023). Introduced in November 2022 by OpenAI, Chat Generative Pretrained Transformer (ChatGPT) is a chatbot developed based on a fine-tuned version of GPT 3.5 and 4 large language models. Right after its release, ChatGPT attracted outstanding attention from the media, industry, and academia (Javaid et al, 2023). ChatGPT can generate comprehensive and relevant natural language text responses to unstructured queries in conversations about a wide range of topics. The chat history is considered when the chatbot generates replies (Sobania and Hanna, 2023), which can result in improved answers (Javaid et al, 2023). Since ChatGPT is developed on a multilingual model, it can receive questions and generate answers in numerous languages. It can also translate different languages (Jiao et al, 2023). ChatGPT can generate creative content that enables it to write music lyrics, poems, and stories (McGee, 2023). Another ability of ChatGPT is opinion mining, which allows it to extract attitudes and emotional tones expressed in a piece of text (Susnjak, 2023). Furthermore, ChatGPT can generate code and automatically fix bugs in provided code (Sobania and Hanna, 2023). Based on preliminary studies, ChatGPT has an acceptable performance in translation (Peng et al, 2023) and automatic bug fixing (Surameery and Shakor, 2023) compared to existing commercial solutions. In addition, it is considered a capable tool in summarizing, inquiry responding, recommendation, and service support (Javaid et al, 2023). Mentioned abilities of ChatGPT can reveal the capabilities of LLM-based applications.

Despite its capabilities, ChatGPT has limitations. Its performance while solving mathematical problems is inefficient (Frider et al, 2023). Moreover, ChatGPT might generate inaccurate and unreliable responses (Borji, 2023), leading to the spread of misinformation and disinformation. Another disadvantage of ChatGPT is related to its training dataset. Answers generated by ChatGPT might be affected because of the fundamental bias existing in its training dataset (Borji, 2023; Zhuo et al, 2023). In addition, ChatGPT has trained on a dataset that contains knowledge up to 2021 (Borji, 2023), which might change with the introduction of plugins from OpenAI (2023). This enables ChatGPT to retrieve real-time data from other databases. ChatGPT's reasoning abilities are not as good as humans (Borji, 2023). Even with ethical and security measures implemented by OpenAI to fight against the inappropriate use of ChatGPT, workarounds are available to bypass these protocols (Zhuo et al, 2023). These disadvantages can be applied to all LLM applications.

Despite implementing different AI tools in tourism, the industry has yet to adopt LLM-based applications like ChatGPT (Chao et al, 2021). Although some tourism executives are impressed by the capabilities of ChatGPT, they are waiting for empirical and scientific evidence (Habtemariam, 2023). On the other hand, due to subject novelty and the long publication process, scholars cannot investigate new topics rapidly. It is essential to highlight the opportunities and challenges of deploying LLM applications in tourism (Ali and OpenAI, 2023; Carvalho and Ivanov, 2023; Ivanov and Soliman, 2023). Therefore, this viewpoint aims to provide new insights while reviewing the scarce literature about LLM applications based on the capabilities and limitations of ChatGPT.



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## LLM applications and tourists

LLM applications like ChatGPT are expected to substantially impact traveler experience before, during, and after the trip (Carvalho and Ivanov, 2023). In the pre-trip phase, tourists search for information using multiple sources, including the Internet, to choose the most desirable destinations and products, schedule their trip, and assess alternative options (Buhalis et al, 2019; Gursay, 2019). By generating comprehensive answers summarized from numerous sources, LLM-based applications such as ChatGPT can present quick and accurate information to assist and accelerate the tourist decision-making process. In addition, considering previous conversations while responding enables ChatGPT to provide personalized information and recommendations, which can facilitate finding suitable tourism products such as accommodation, attraction, food and beverage, etc. (Carvalho and Ivanov, 2023; Dwivedi et al, 2023). Ultimately, LLM-based applications will accelerate and transform tourists' search process. Releasing plugins for ChatGPT (OpenAI.com, 2023) will enable the chatbot to handle hotel and flight bookings; therefore, travelers can receive pre-trip tourism and hospitality services to make, edit and cancel reservations using LLM-driven chatbots (Carvalho and Ivanov, 2023) and voice assistants.

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During the trip, LLM-based applications can be a part of the tourism experience. Travelers can use LLM-driven concierge services to learn more about destinations and tourism activities (Carvalho and Ivanov, 2023; Dwivedi et al, 2023). With the help of LLM-based applications connected to third-party databases using plugins (OpenAI.com, 2023), tourists can purchase their desirable events and activities while staying at the destination. In addition, interacting with robots (Reis et al, 2020) and voice assistants (Buhalis and Moldavska, 2022) can be a part of the tourist experience during the trip. Implementing LLM-based tools like ChatGPT can significantly enhance the performance of voice assistants (Carvalho and Ivanov, 2023) and robots, resulting in more intelligent customer service (Dwivedi et al, 2023). LLM-driven robots and voice assistants will be able to respond to more complicated requests in natural language with more accuracy, leading to notable performance improvement compared to previous solutions. This can result in an enhanced tourist experience during the trip in hotels and museums as the quality of interaction with voice assistants and service robots increases, which might benefit some groups, like accessible tourists, more than others. LLM-driven voice assistants and robots can be implemented in museums to enrich the experience of visually impaired visitors by providing accurate and detailed descriptions. Tourists also can use ChatGPT or other LLM-based applications to write captions for social media reflecting their travel experience (Carvalho and Ivanov, 2023).

After the trip, LLM-based applications such as ChatGPT can assist tourists in writing reviews and stories about their travel experiences. LLM-based applications like ChatGPT have the potential to benefit travelers if implemented by tourism businesses.

## LLM applications and tourism businesses

LLM applications such as ChatGPT are expected to transform business processes in various industries (Javaid et al, 2023), including tourism (Carvalho and Ivanov, 2023). One of the business processes which is expected to change by adopting LLM applications is marketing (Javaid et al, 2023). ChatGPT can be implemented as a content creator by tourism businesses to produce summarized yet detailed textual content (Dwivedi et al, 2023) independently or as an



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assistant tool for marketers. Hotels, restaurants, museums, and other sectors of the tourism industry, can use LLM-generated content throughout the Internet and social media to provide helpful information to their customers. LLM-based applications like ChatGPT can extract useful information from tourist reviews (Carvalho and Ivanov, 2023), which can help businesses to improve their products. Furthermore, LLM-based applications like ChatGPT can be used as a marketing consultants providing strategies to achieve business goals (Javaid et al, 2023).

Tourism businesses and destination management organizations (DMOs) can use plugins that grant ChatGPT access to their content (OpenAI.com, 2023). This can enable ChatGPT to act as a real-time service provider during the booking process for airlines and hotels. It can also provide information during the trip as a hotel concierge system (Carvalho and Ivanov, 2023). Museums and attractions can deploy LLM-based voice assistants and robots to provide detailed descriptions to visitors and answer their questions. These LLM-driven voice assistants can improve the experience of visually impaired visitors. Tourism companies can implement LLM-driven chatbots like ChatGPT on their websites and applications. Through LLM-based chatbots, tourism businesses can provide valuable information and services to travelers and guests (Carvalho and Ivanov, 2023). LLM-based chatbots can be a platform for hotel and airline reservations, museums, attractions, and event ticketing.

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Providing customer service support could be challenging in the tourism industry as it consists of interdependent sectors that shape the tourist experience (Mich and Garigliano, 2023). Providing effective customer service support requires information from different sources. LLM-based applications such as ChatGPT are expected to transform customer service support in tourism. These tools can assist customer service support staff by providing summarized and comprehensive responses to complex questions from an extensive dataset. It also can be deployed as a stand-alone customer service support system considering the ability to provide more accurate responses based on the context and the conversation history alongside its 24/7 availability (Dwivedi et al, 2023). LLM-driven systems can enable companies to provide customer service support helping tourists with their reservation and booking problems and other challenges travelers face while staying at their destinations. The responses generated by ChatGPT or other LLM-based applications can be inaccurate or biased, and downtimes can also be expected. Therefore, relying on ChatGPT or other LLM-based applications as a customer service support assistant or independent system could be challenging. Ultimately, implementing LLM-based applications in customer service support has the potential to speed up the process and increase travelers' satisfaction while reducing the cost of businesses as the number of customer service support employees can be reduced.

Back office and internal operations of tourism businesses can be revolutionized by adopting LLM-driven tools like ChatGPT (Javaid et al, 2023). These tasks can be done more efficiently. For example, human resource departments in tourism companies can use LLM applications to design interview questions and job descriptions. Summarizing reports using LLM-based applications can also facilitate communications between different departments in tourism businesses (Carvalho and Ivanov, 2023).

Artificial intelligence has already changed the tourism job market. However, tourism and especially hospitality mostly remain labor-intensive due to the importance of face-to-face communication between hosts and guests. It is expected that the accelerating speed of AI advancements will cause many job eliminations alongside the emergence of new positions



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requiring new skill sets (El Hajal and Rowsom, 2020). As mentioned above, LLM-based applications like ChatGPT can be deployed as consultant, translation, programming, content creation, and customer service support tool assisting employees or performing independently; therefore, ChatGPT and other LLM-based applications can be implemented as an assistant for employees or substituting them in tourism businesses to reduce costs and/or provide innovative products and services (Carvalho and Ivanov, 2023). The best examples of jobs that can be significantly affected by ChatGPT and other LLM-based applications are concierges, marketing content creators (Dwivedi et al, 2023), programmers, and consultants. This can result in notable changes in the tourism job market (Carvalho and Ivanov, 2023). New skill sets will be necessary in order to find positions, and some of the current skill sets will become obsolete. By adopting LLM applications in tourism, students and employees must learn new skills to start or improve their careers. Ali and OpenAI (2023) and Ivanov and Soliman (2023) argue that LLM-based applications such as ChatGPT can transform tourism education for both students and employees. Simulating interaction with customers and high-resource language learning are among the functions of LLM-based tools for education (Ali and OpenAI, 2023).

## Challenges of using LLM-based applications in tourism

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Security, privacy, and ethical issues of adopting AI-driven technologies have been important topics in various industries, including tourism. (Ivanov and Umbrello, 2021). By generating inaccurate, unreliable, and biased responses (Borji, 2023), ChatGPT adds to these challenges. It might have a negative effect on the image of destinations and the brand of businesses by generating misinformation and disinformation (Carvalho and Ivanov, 2023). Moreover, customizing answers requires user information that needs to be stored by ChatGPT. This can cause legal, privacy, and security issues, especially when there is a lack of transparency about privacy policies. These challenges can become more complex when the tourism industry adopts LLM-based applications and LLM-driven chatbots, voice assistants, and robots.

## Conclusion

In this viewpoint, future impacts of LLM-based applications on the tourism industry have been discussed based on the characteristics of ChatGPT. As one of the first studies on this topic (Ali and OpenAI, 2023; Carvalho and Ivanov, 2023; Ivanov and Soliman, 2023; Mich and Garigliano, 2023), this viewpoint focuses on the potential impacts of LLM applications on tourism to provide valuable information to researchers and industry shareholders. Adopting LLM applications in tourism can potentially transform the job market, tourist searching process, and tourist interaction with voice assistants and service robots, among other customer service supports. Furthermore, it can revolutionize business processes such as marketing and human resource management. It can also increase the complexity of security, privacy, and ethical challenges arising from AI implementation in tourism. Researchers are already investigating the impacts of LLM-based applications on the tourism industry. A future research topic can be comparing the performance of marketing and business strategies designed by LLM-based applications such as ChatGPT with current strategies. The interaction of tourists with LLM-driven service robots and voice assistants and the impact of these robots and assistants on tourists' experience can also be a topic for future studies. It is also important that researchers understand the characteristics of early adopters of LLM-based applications in tourism industry.



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