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Impact of Artificial Intelligence on the Tourism Industry: A Literature Review

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Abstrak

Kecerdasan buatan (AI) telah memberikan dampak positif yang mendalam pada industri perjalanan dan pariwisata. Sistem rekomendasi yang didorong oleh AI memberikan saran perjalanan yang disesuaikan, meningkatkan seluruh pengalaman perjalanan bagi pengunjung dengan mempertimbangkan minat dan perilaku sebelumnya. Asisten virtual dan chatbot menawarkan layanan pelanggan sepanjang waktu, meningkatkan efektivitas operasional dan layanan klien. Manajemen sumber daya, ramalan permintaan, dan langkah-langkah keamanan semuanya ditingkatkan oleh AI. Namun, masalah seperti potensi penggantian pekerjaan dan kekhawatiran privasi harus diatasi. Berdasarkan tinjauan literatur sintesis naratif, penelitian ini mengidentifikasi 4 mode layanan berbasis teknologi AI: AI untuk tur virtual, AI untuk keberlanjutan, AI untuk rekomendasi, dan manajemen layanan AI. Selain itu, penelitian ini mencakup keuntungan teoretis dan praktis dari AI untuk sektor perjalanan dan pariwisata, termasuk saran yang disesuaikan, pengalaman pelanggan yang ditingkatkan, dan peningkatan produktivitas. Hasil penelitian memiliki kontribusi signifikan baik pada pemahaman teoretis maupun implementasi praktis manajemen layanan dan penerapan AI dalam berbagai industri.

Kata kunci: *Kecerdasan Buatan, Industri Pariwisata*

Abstrack

Artificial intelligence (AI) has had a profoundly positive impact on the travel and tourism industry. AI-driven recommendation systems provide tailored travel advice, improving the entire travel experience for visitors by taking into account their interests and previous behavior. Virtual assistants and chatbots offer round-the-clock customer service, enhancing both operational effectiveness and client service. Resource management, demand forecasting, and security measures are all improved by AI. However, issues such as potential employment displacement and privacy concerns must be addressed. Based on a narrative synthesis literature review, the study identified 4 modes of AI technology-based service encounters: AI for virtual tours, AI for sustainability, AI for recommendation, and AI service management. Additionally, it covers the theoretical and practical advantages of AI for the travel and tourism sector, including tailored advice, enhanced customer experience, and increased productivity. The research outcomes have significant contributions to both the theoretical understanding and practical implementation of service management and the application of AI in various industries.
Keywords: *Artificial Intelligence, Tourism Industry*

INTRODUCTION

The adoption of artificial intelligence (AI) is crucial in the era of digital technology. It has given many chances and difficulties to many industries, including the tourism industry, since its inception. Likewise, it is crucial to take into account AI's function while attempting to branch innovation on a global scale. With the potential to boost the economy and raise people's quality of life, many AI-powered technologies have been created (Dogru et al., 2023a; Koo et al., 2021). Today's tourism industries use highly competitive environment where new technology is common, customers demand excellent service and innovation is crucial in this dynamic environment because businesses must constantly adjust to shifting consumer tastes and market trends to remain relevant and competitive.

There are several uses for artificial intelligence systems in the tourism industry. From the standpoint of the consumer, AI facilitates users' access to better and more relevant information, increases their mobility, enhances their ability to make decisions, and ultimately improves the tourist experience (Gretzel, 2011; Tussyadiah et al., 2020). From a managerial standpoint, AI can be applied in practically all areas (Buhalis et al., 2019), but especially in productivity and promotion (Tussyadiah et al., 2020). According to Tussyadiah et al., (2020), artificial intelligence is also anticipated to support more environmentally friendly travel by leading consumers to view the world more socially. In the tourism sector, artificial intelligence technologies can either be standalone or integrated into already-existing applications and systems. These systems include recommendation engines, customization tools, chatbots, voice assistants, forecasting

instruments, autonomous agents, language translation software, and smart travel destinations (Dogru et al., 2023b). Tourists will typically interact with technology that integrates multiple of these systems, even if we analyze each system separately. A visitor might converse with a robot, for instance, that incorporates a conversational system as well as, depending on the situation, a recommender system, a personalization method, or an autonomous agent (Nam et al., 2021). A chatbot or voice assistant may be used to conduct the conversation with the user (Ade et al., 2023).

Numerous studies on the use of AI in the tourism industry have surfaced recently, especially given the growing prominence of AI among academics and practitioners. To comprehend the theoretical underpinnings and the progression of knowledge regarding AI, examine the theme development, and suggest directions for future research, it is crucial to review current relevant research. Therefore, the purpose of this study is to review and evaluate scholarly papers that have been published to determine how AI is affecting the tourism sector. Along with identifying the theoretical and practical benefits that AI brings to the tourism industry, our goal is to assist practitioners who implement AI in overcoming significant obstacles from a commercial and technological standpoint.

RESEARCH METHOD

The review was carried out as a narrative synthesis review, in which the assessment of literature was conducted to investigate AI in the tourism industry. Narrative synthesis refers to the process of examining relevant literature and combining the findings of multiple studies in a manner that relies on written text and descriptions to clarify the synthesized results (Limna, 2023). A narrative review employs a more qualitative and descriptive method of literature synthesis. Without strictly adhering to a methodical procedure, it focuses on summarizing and discussing the key conclusions and themes of the included studies.

The material and data came from a variety of journal papers on Scopus, which have the greatest influence and include a lot of publications. The inclusion criteria encompassed studies that provided a clear definition of artificial intelligence in the tourism sector, were published, and underwent peer review. The advanced search was conducted using the following query: "AI" OR "artificial intelligence" OR "AI adoption" AND "tourist" OR "tourism". Data were extracted in March 2023, and only English-language, peer-reviewed publications were chosen. This approach produced 473 publications within the year 2019 to 2023. The corpus was then reduced to only include

works that fell inside the study's purview based on titles, abstracts, keywords, and subject area. As a result, a final list of 12 documents was kept for additional research.

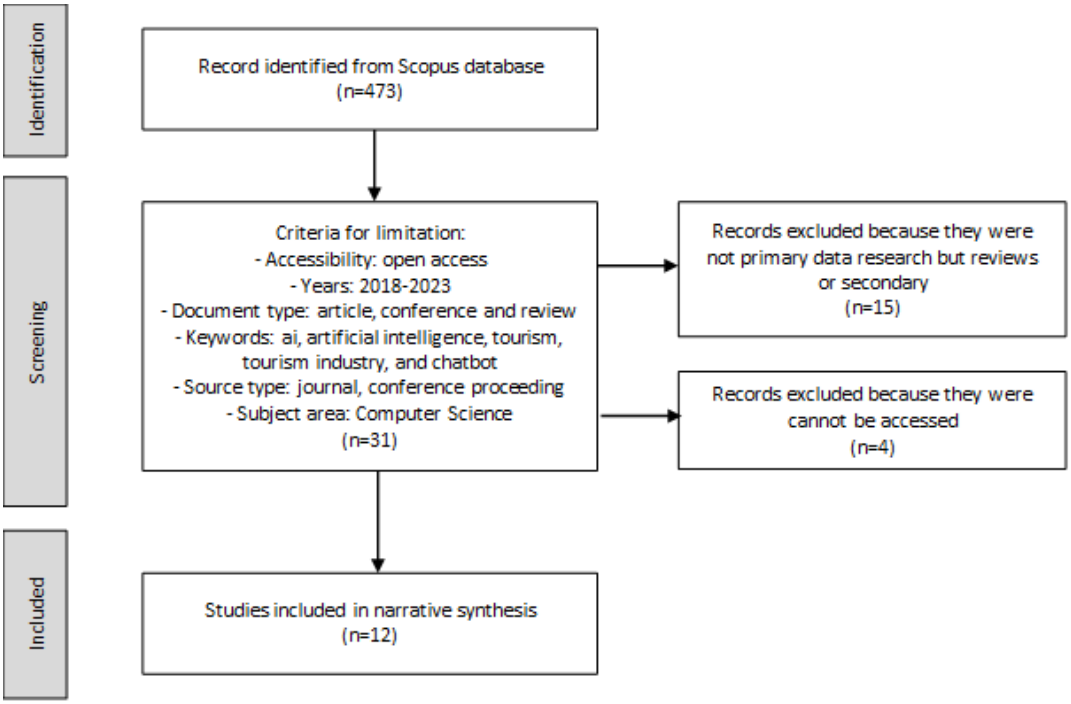

Figure 1. Process of article selection.

RESULT AND DISCUSSION

Result

The cluster analysis conducted based on the 12 articles indicated that 4 of them used AI technology to generate digital restoration and virtual tours to improve the experience of the tourist attraction, 3 articles on sustainability in tourism, 3 articles used AI to provide recommendations for tourists to explore attractions and destinations, and 2 articles focused on a chatbot to efficient production management and tourist interaction as shown on Table 1.

Table 1. Clustering Analysis

Area studies	Number of articles	References	Application
Image Restoration and Virtual Tour	4	Ferras et al., Iglesias et al., Zhao et al., Gupta et al.	AI for Virtual Assistance AI in VR and AR AI for 3D design Facial biometric AI
Sustainability in tourism	3	Mingotto et al., Wang, Jiang et al.	AI and robotics AI for heritage protection AI and GIS

Area studies	Number of articles	References	Application
Recommendation for tourist attractions and destinations	3	Fararni et al., Ding, Wu et al.,	AI and Big data AI for travel routes AI for publicity
Chatbot for tourist guidance and service management	2	Alotaibi et al., Flandrin et al.	Chatbot for tourist assistance Chatbot to enhance hospitality

Image Restoration and Virtual Tour

AI has revolutionized the fields of Digital Restoration and Virtual Tours by offering innovative solutions that breathe new life into historical artifacts and transport users to distant places. In digital restoration, artificial intelligence (AI) algorithms examine harmed or deteriorated photos, artworks, or documents and cleverly recreate missing or faded sections, returning them to their former splendor. Scholars, historians, and fans can access and examine these objects with remarkable clarity because of the preservation of cultural heritage. On the other side, AI-powered platforms design engaging, immersive experiences that mimic real-world settings in virtual tours. Users may navigate through famous landmarks, museums, and even ancient locations while receiving guided information catered to their preferences thanks to powerful computer vision and natural language processing. Ferras et al., (2020) use AI to enhance the tourist experience in Lanzarote by offering a virtual assistant via the "CACT Lanzarote" app that enables users to communicate with the assistant using their natural voice and receive precise information based on their location and preferences. This research aims to explain how AI-powered digital transformation in the tourist sector can be crucial to ensuring the industry's preservation and continued expansion in the future. (Ferràs et al., 2020). It also shows how advanced technologies such as AI, in combination with open innovation and customer-driven insights, can improve innovation in mature industries, as is the case of tourism.

Another study in the field of digital transformation conducted by Iglesias et al., (2021) is by utilizing a photorealistic immersive system using augmented situated visualization within virtual reality. The system allows image data and extracted features from a real-world location to be captured and modeled in a Virtual Reality (VR) environment combined with Augmented Situated Visualizations (ASV) overlaid and

registered in a virtual environment (Iglesias et al., 2021). The system enables to development virtual environment where remote locations can be simulated and explored interactively from any location in the world by combining these technologies with methodologies from Data Science and Artificial Intelligence (AI), such as image analysis and 3D reconstruction. The system aims to present experts with the output of AI algorithms in a way that they can understand and use, combining a photorealistic VR environment with Augmented Situated visualization (ASV) for automatically detecting and visualizing extracted features of a real environment without having to be on-site.

The application of digital twin (DT), AI, and fifth-generation (5G) technology in the art design of digital tourist attractions is becoming increasingly popular (Zhao et al., 2022). A digital twin is a computerized representation of a physical object or phenomenon that acts as its real-time digital equivalent. The study presents an analytical structure for adapting digital information to complicated systems in museums and explains the artistic obstacles for heritage properties, such as accessibility, execution time, security level, and the efficiency of 3-dimensional designs. The cognitive needs of the visitors are given top priority in the digital museum's interface design, which also considers user comfort and visual perception throughout the usage process. Combining AI technologies and wearable devices into digital museums could assist in boosting involvement and improving education.

The intelligent system can quickly verify and identify individuals, enhancing customer experience through personalization (Gupta et al., 2023). Facial biometric AI is useful for tourism organizations dealing with large volumes of travelers, ensuring safety and security in service setups like airports, trains, and hotels. The study investigates how artificial intelligence (AI)--powered facial recognition technology improves value in the travel and tourist industry. Personalization, data-driven service delivery, security and safety, and frictionless payments are the four main themes identified through thematic analysis. The impact of AI-driven facial recognition on corporate guests' experiences is mapped. Findings indicate that AI-based facial recognition can facilitate the travel and tourism industry in understanding travelers' needs, optimizing service offers, and value-based services. Personalized trip planning, connection with email and calendar features, and quick bill summaries are a few examples of data-driven services that can be used.

Sustainability

AI has the potential to significantly improve sustainability in the travel and tourism sector, assisting in the sector's transition to more ethical and environmentally friendly practices. AI can optimize resource management, such as electricity and water usage, in

hotels and other tourism facilities, decreasing waste and carbon footprints. This is done using data analytics and predictive modeling. Real-time data on visitor flows and congestion can be analyzed by AI-powered systems, allowing destinations to deploy crowd control measures, prevent over-tourism, and reduce the negative effects on sensitive ecosystems and nearby populations. Additionally, AI's ability to process enormous volumes of data also aids in the formulation of tourism planning and policy that is in line with objectives for socio-cultural and environmental preservation. By encouraging conservation, ethical travel, and good socio-economic effects on destinations, AI's application in the tourism sector has the potential to advance sustainability.

The development of AI and robotics has become a common topic in the travel and tourism industry, with companies adopting advanced technologies to improve operations processes, minimize costs, enrich customer experiences, or propose new ones. The technological dimension can be considered one of the components of service innovation (Mingotto et al., 2021). Studies have investigated the phenomenon from several interrelated perspectives, with seven main research domains identified: robot design (functionality, mobility, appearance), human domain (both consumers' and employees' attitudes, reactions, roles, etc.), robot manufacture (hardware and software), functions in tourism businesses (marketing, operations, etc.), services cape (legal, economic, social aspects), education, training, and research institutions. The current paper describes an action research project that led to the installation of a humanoid social service robot with supervised machine learning at a hotel front desk in Italy. The rapid and continuous evolution of these technologies and the complexity of their disruptive effects make the impact on the way service is provided and delivered, as well as perceived by customers' crucial. Further research contributions are needed in the field of customers' and employees' attitudes, changing roles that they may take in the service encounter, service design, impacts on processes, operations, jobs, organizational redesigning, and employees' training.

AI technology is applied in the protection and inheritance of cultural landscapes in traditional villages, focusing on image restoration technology, intelligent positioning, and radio frequency (RF) technology (Wang, 2022). The research aims to develop a comprehensive approach to protect and preserve the cultural landscape of traditional villages, ensuring their preservation, due to weak protection, lack of supervision awareness, and the implementation of the relocation policy. Traditional villages can be partially restored using this technology, and radio frequency (RF) technology and

intelligent location allow for real-time monitoring of these villages while taking into account things like weather and the durability of services. This approach has great reference significance for the management of various historical and cultural heritage.

The study by Jiang et al. (2023), examines the integration of artificial intelligence (AI) methods with geographic information visualization and sustainable development in low-carbon rural slow tourism. The research focuses on the development options related to low-carbon tourism in rural areas, proposing a low-carbon rural slow tourism recommendation method based on AI and Cross-Media Retrieval (CMR) data. The study highlights the importance of CMR techniques in identifying rural tourism scenarios, enabling passengers to quickly identify tourist attractions to save preparation time and provide more flexible time for the tour process (Jiang et al., 2023). The study's findings have helped slow, low-carbon rural tourism expands sustainably in several ways. The study intends to advance low-carbon rural slow tourist sustainability and encourage sustainable development in rural regions by utilizing AI and CMR approaches.

Recommendation

AI has the potential to be a potent instrument for promotion and suggestion in the travel and tourism sector, greatly improving the travel experience for visitors and more successfully advertising places. AI-driven recommendation systems can provide individualized travel suggestions that cater to each person's interests, budget, and prior travel behavior by evaluating enormous volumes of data, including user preferences, past travel habits, and feedback. These suggestions may include places to stay, places to see, places to eat, and activities, enhancing the vacation with experiences that suit the tastes of the traveler. AI may also improve marketing initiatives by detecting possible target markets and customizing marketing strategies accordingly. AI can identify patterns, estimate demand, and even peak travel seasons through data-driven insights, enabling the tourist industry to deploy resources wisely and make the most of its advertising efforts.

Fararni et al. used a hybrid recommendation strategy in their 2021 study to present a fresh architectural and conceptual framework for tourism recommender systems. In contrast to conventional systems, which offer suggestions for a list of tourist attractions based on preferences, this system serves as a thorough trip planner, creating intricate itineraries with a variety of tourism resources for predetermined visit lengths. Their main goal is to progress and promote tourism in Morocco by creating a recommendation system that combines big data technology, artificial intelligence, and operational research. These recommendation systems function as information filters that direct users

to the offers (goods, services, etc.) that best suit their needs by gauging their level of interest from navigational data. The suggested big data system attempts to incorporate deep learning methods for recommendation and opinion analysis (Fararni et al., 2021). The literature review examines popular recommendation techniques like collaborative filtering and content-based methods, each of which has its unique innovations and is categorized using user information and filtering. The most common type of filtering is content-based, which suggests destinations based on similarities between user profiles, habits, and likes rather than by matching user preferences with previously investigated objects.

A recommendation research article by Ding (2021) focuses on designing reasonable travel routes with the least time cost and the highest experience index using artificial intelligence-based wireless sensor travel route planning. The study proposes an improved TSP route planning model that combines the normal distributed random number (ND) with the genetic algorithm (GA) and proposes the ND-GA algorithm. The model analyzes the overall structure, node structure, communication mode, and network coverage of the wireless sensor network, and gives a mathematical model of wireless transmission energy consumption. The paper also introduces a 10-year travel route plan multi-target planning model and a combined prediction model to forecast the above cost and improve the multitarget planning model built above. The model is then used to obtain a detailed travel plan by addressing the challenges of AI technology in the tourism industry. It can contribute to the overall development of the tourism industry and contribute to the overall growth of the tourism industry (Ding, 2021).

Another study focuses on using artificial intelligence (AI) algorithms to study the promotion and publicity of ice and snow tourism (IST) (Wu et al., 2022). This study's main goal is to evaluate the urgent needs of Ice and Snow Tourism (IST) external publicity using digital technology and dynamic vision sensor technologies. In order to improve the depiction of IST images through AI, the study combines the digital logic technique and the AlexNet algorithm. The study's main obstacle is the standard models' poor accuracy in recognizing and publicizing IST poster emotions. The research uses the Chi-square test and an upgraded version of the AlexNet algorithm to construct a customer service-focused intelligent IST publicity model to get around this problem. The research's practical applications have a big impact on the IST industry's ability to progress digitally and technologically. The paper also emphasizes the benefits of applying the artificial neural network (ANN) algorithm to the differential evolution model and optimizing

invasive weeds, which results in a higher convergence of neural network coefficients compared to existing approaches.

Chatbot

Chatbots have the potential to greatly enhance services in the tourism industry by providing quick and personalized assistance to travelers. These virtual assistants may interact with clients around the clock, responding to their questions quickly and effectively, which raises customer satisfaction. Chatbots can provide up-to-the-minute details on travel destinations, lodging options, airlines, and attractions, assisting visitors in making wise decisions and smoothly organizing their travels. Chatbots can give personalized suggestions, recommending appropriate experiences and activities based on individual interests by assessing user preferences and behaviors. Chatbots can also easily handle the booking process, make bookings, and manage itinerary adjustments. Their multilingual skills help them communicate with visitors from other countries, removing any language obstacles and ensuring effective encounters. Overall, the use of chatbots improves customer service, saves time, lowers operational costs, and gives travelers a less stressful and more pleasurable trip.

Alotaibi et al. (2020) present a case study on the use of an AI chatbot for tourism recommendations in Jeddah, Saudi Arabia. The chatbot, developed as a mobile application, simulates a natural language conversation with users, providing a two-way interaction and a single point of contact for all user communications. The chatbot's final examination revealed that it could comprehend user requests and meanings and that the interaction was successful. Users were satisfied with the idea of expressing their needs in their natural language and enjoyed the interaction. In addition, the paper emphasizes the importance of AI in various sectors, including booking services, banks, insurance companies, education, media, food ordering, health and medicine, e-commerce, and tourism. The paper aims to develop "smart guidance," a text-based chatbot mobile application, to assist tourism and hospitality in Jeddah city. The text presents a chatbot that combines all tourist needs and offers 24/7 service availability in Arabic. It answers users' questions related to their desired destination, recommends offers, and highlights real-time events to satisfy tourists' needs and demands, saving time and effort. These AI-powered chatbots use machine-learning approaches to understand human language and create their answers to complex questions. These bots become smarter with each new conversation and can deal with large amounts of data, but they require longer training time (Alotaibi et al., 2020). High-level chatbots use complex underlying technologies for seamless interaction with humans. AI chatbots use Natural Language Processing (NLP)

and Machine Learning (ML) to understand user messages and predict appropriate answers.

Chatbots also can be used to enhance work activity and employment in the hospitality sector by proposing an alternative approach to implementing technology in work design through a human-centered approach (Flandrin et al., 2021). It advises an analysis of smart technologies based on a case study of a chatbot or conversational agent (CA) and proposes an alternative to implement technology in work design. The findings demonstrate that not all stakeholders have the same perception of chatbots. Designers and strategy workers consider the technology as a way to improve the customer experience and reduce work constraints by eliminating tasks and creating a new task redistribution. Furthermore, the use of chatbots reveals greater flexibility for the operational staff. This study also emphasizes how human intelligence contributes to the development of flexible and contextually appropriate tourist systems. From a general point of view, the introduction of technologies has led to a profound reorganization of the stage and backstage tasks. They can also be deleterious to work and service relationships when the conditions of their implementation are not thought out in advance. The article suggests designing these work systems through a human-centered approach by contributing to the development of Artificial Intelligence (AI) technology at the service of humans and their work.

CONCLUSION

The use of AI in the tourism industry has seen exponential growth, offering various advantages for tourism service providers, such as enhancing productivity and operations efficiency and creating convenient and personalized service experiences. The definition of AI has changed over time, from intelligence to the capacity to act autonomously on vast amounts of data to the use of memories and past experiences to improve decision-making. Artificial Intelligence (AI) has the potential to revolutionize the tourism industry by enhancing the tourist experience, improving productivity, and promoting environmentally friendly travel. There are various types of AI applications in the tourism industry, including search/booking engines, tourism-demand forecasting, virtual agents/chatbots, robots and autonomous vehicles, service automation, kiosks/self-service screens, augmented reality (AR) devices, and virtual reality (VR) devices. The use of AI models for tourist forecasting has gained significant attention in recent years, with chatbots or conversational assistants being used in booking procedures. However, to fully utilize AI's potential for developing effective, individualized, and sustainable travel

experiences in the future, careful consideration of ethical and workforce consequences is essential.

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