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ARTIFICIAL INTELLIGENCE IN HOSPITALITY: A BIBLIOMETRIC REVIEW AND RESEARCH AGENDA

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Abstract: Artificial Intelligence (AI) has emerged as a focal point in the fields of tourism and hospitality. This research employs a bibliometric approach to evaluate the latest developments in AI specifically related to the hospitality industry. It highlights key themes, critical issues, important terminology, and the latest trends in AI research within this sector. A comprehensive analysis was conducted using 609 publications spanning from 1999 to 2024, sourced from Scopus. The results reveal a growing body of research, showcasing the contributions of various authors, institutions, and countries, along with the intricate dynamics of authorship networks, keyword co-occurrences, and keyword networks. Furthermore, a thematic map is provided, organizing the research into four distinct clusters. The study concludes by exploring potential future directions and research opportunities in this exciting area.
Keywords: Artificial intelligence; Hospitality; Bibliometric analysis; Research agenda; Information systems

1 INTRODUCTION

Technological advancements are reshaping our lives, with on-going discussions about WEB1 from the 1990s. Since 2006, WEB2 technology, marked by social networking, has become essential, allowing users to create content and connect globally [1-2]. Innovations now extend beyond web technologies, significantly impacting sectors like tourism, which has traditionally focused on service delivery. Early automation in booking and the use of electronic menus illustrate this shift [3-4]. The sporadic use of robots in service roles and technology's integration in the metaverse are also noteworthy [5-7].

The tourism and hospitality (T&H) sector has significantly transformed due to innovations in information and communication technologies (ICT) and AI [8-9]. Over the past two decades, ICT has enhanced travel experiences [10], while AI has personalized interactions and improved customer engagement through robotics in hotels and restaurants [11]. As we approach the end of the first quarter of the 21st century, discussions on artificial intelligence (AI) have intensified, highlighting its impact across industries, including tourism [12], management [13], and education [14], despite concerns about associated risks.

Researchers have shown significant interest in technology adoption across various user groups and contexts. Key studies include on information technology in hotels, on decision-making in small travel organizations, and on environmental technology challenges in hotels [15-17]. Additionally, a multitude of research efforts has examined the diverse elements that affect the acceptance of various technological innovations, particularly from the perspective of consumer behaviour. For example, Murphy and Rottet investigated biometric technologies, focusing on how user perceptions, privacy issues, and perceived usefulness influence the readiness to adopt these systems [18]. In a similar context, Haiyan K, et al. studied website acceptance [19], emphasizing the significance of website design, usability, and trust in enhancing user experiences and promoting engagement. In the area of mobile technology, Morosan C, et al. assessed the factors influencing acceptance [20], highlighting the importance of functionality, user-friendliness, and the perceived value of mobile applications in shaping consumer attitudes. Lee LYS expanded this inquiry to self-service technologies, identifying critical aspects such as user control [21], convenience, and the overall service experience that contribute to consumer acceptance [22]. The emergence of augmented reality has also attracted scholarly attention, with exploring how interactivity, immersion, and the novelty of experiences affect user acceptance of augmented reality applications. Similarly, Shin HH, et al. examined service robots [23], investigating the impact of trust, perceived reliability, and social presence on consumer willingness to engage with robotic systems in service contexts. Most recently, Chi OH, et al. explored the acceptance of artificial intelligence [24], analysing how factors such as transparency, perceived intelligence, and ethical considerations influence consumer attitudes toward AI technologies. Together, these studies highlight the complex nature of technology acceptance, demonstrating that consumer behaviour is shaped by an intricate interplay of psychological, social, and contextual factors across various technological fields. The rapid advancement of technology has significantly impacted knowledge in the hospitality and tourism industry, driven by researchers' interest. Numerous studies like, Morosan C, et al. have examined technological knowledge using qualitative content and bibliometric analyses, the latter gaining popularity for tracking research trends [20, 25-26].

However, existing bibliometric literature often focuses on specific areas, lacking a comprehensive view of technology-related publications in hospitality and tourism. Recent studies have looked at technology's impact on sectors like human resource management [27], the sharing economy [28], and dining services [27], as well as specific technologies like digital marketing [13], online platforms [29], and social media [30], leading to a lack of clarity on overall artificial intelligence progression. Moreover, previous studies on artificial intelligence (AI) have mainly been descriptive, focusing on specific aspects without a comprehensive overview. The use of AI in tourism and hospitality is increasing,

with significant growth expected [31]. Thus, a thorough review from this perspective is crucial for generating objective insights to guide future research. This study conducts a bibliometric analysis to assess the literature, identify research gaps, and suggest future directions beneficial for academics, industry practitioners, and policymakers. Hence the research question is build upon the current understanding of artificial intelligence in the tourism and hospitality industry and proposes a plan for future studies. It addresses the following question: -

RQ1: What are the patterns of AI integration in hospitality?

RQ2: What future trends and key research paths can be identified?

2 LITERATURE REVIEW

The concept of artificial intelligence (AI) has evolved from a basic idea of intelligence to a sophisticated capability for analyzing large data sets and improving decision-making based on past experiences. This advancement relies on three key components: algorithms, big data, and processing power [32]. AI encompasses terms like 'machine learning,' 'deep learning,' 'neural networks,' and 'natural language processing' [33]. It has been widely adopted across various sectors, particularly in the travel and hospitality (T&H) industry, which benefits from increased productivity, operational efficiency, and personalized services [13]. AI applications in T&H include search and booking systems, demand predictions, virtual assistants, robots, service automation, kiosks, augmented reality (AR), and virtual reality (VR). There is growing interest in using AI models for tourism predictions, employing techniques like artificial neural networks and fuzzy logic [11-13].

The hospitality sector is increasingly integrating artificial intelligence (AI), with studies highlighting its benefits for functionality and innovation [34]. Despite concerns about AI's impact on jobs and the importance of human interaction, many consumers still prefer engaging with people over machines [35-36]. Nonetheless, AI's role in service delivery is growing. Initially focused on automation, AI's applications in tourism have expanded, with robots now used more in food and beverage services. As their social interaction and autonomy improve, their presence in tourism is expected to increase [31]. Chatbots, a key AI application, facilitate machine interactions that can influence consumer choices. Although the concept dates back to 1966, chatbots have gained significant traction recently, providing tourists with reliable information, reservations, and travel advice [3].

AI's application in the hotel sector spans various stages, aiding in hotel occupancy forecasting, predicting tourist flows, and enhancing resource management. Specialized research, such as facial expression analysis, helps assess how guest experiences impact happiness and repeat visits. AI also leverages social media, crucial in tourism, and is expected to grow due to its ability to manage online reviews, provide intelligent recommendations, and offer flexibility over traditional methods [37]. Additionally, AI enhances financing, learning, communication, and service delivery, introducing innovations in machine learning and big data. It addresses personalized marketing through automation and segmentation and evaluates pre- and post-travel experiences [38]. As AI adoption in tourism increases, so will academic research, making periodic bibliometric analyses vital for tracking developments and establishing a theoretical framework.

However, the hospitality industry encompasses a range of applications for artificial intelligence, which include: (1) search and reservation systems, (2) virtual assistants and chatbots, (3) forecasting tourism demand, (4) automation of services, (5) self-service kiosks and screens, (6) robotic systems and autonomous transport, (7) augmented reality (AR), and (8) virtual reality (VR). Recently, there has been a notable emphasis on AI methodologies for predicting visitor numbers, employing approaches such as artificial neural networks and support vector machines. Chatbots play a crucial role in facilitating the booking experience for travellers, while the COVID-19 pandemic has accelerated the deployment of robots for functions like check-ins, food delivery, and entertainment services. Additionally, AR and VR technologies are utilized to present tourist attractions and hotel facilities via mobile devices and head-mounted displays.

Previous studies have explored the role of artificial intelligence and its various applications, including robotics, augmented and virtual reality, and big data within the tourism and hospitality industries. For example, Doborjeh et al. [11] examined AI methodologies such as neural networks and machine learning, emphasizing their incorporation into the sector and the influence of AI applications on innovation. Mariani et al. [39] performed a systematic review of business intelligence and big data, highlighting the fragmented state of research and the associated methodological difficulties. Shin HH, et al. [40] investigated service robots [23], concentrating on their interactions with customers, management, society, and employees. Wei W assessed developments in VR/AR research, addressing user experiences and behaviors. Collectively, these studies illustrate the advancing theories and methodologies in this domain.

3 METHODOLOGY

Bibliometric analysis is a quantitative method for examining publication trends in a field which helps researchers to discover the disciplinary frameworks. Researchers, as noted by Mulet-Forteza C, et al.[41], use this approach to analyse knowledge progression in specific disciplines, identifying trends and shifts over time. This methodology has also been applied to academic journals by Sigala M, et al. and Loureiro SMC, et al. [23, 43], revealing dynamics in scholarly communication and the impact of articles. Additionally, it allows for in-depth exploration of niche subjects, helping scholars understand foundational theories and key advancements. Overall, this approach enhances our understanding of knowledge evolution and the academic landscape across various fields. It is also valued for its ability to document research quantitatively over time and has been widely applied in various fields, including innovation and tourism

management [43]. It provides an objective and comprehensive view of this rapidly evolving area [33]. In the hospitality and tourism sectors, bibliometric analysis has been employed to investigate a range of subjects, such as customer engagement, trust management, crisis management, sharing economy, and social media by Mody MA, et al. while this method has demonstrated its effectiveness in charting the development of themes within the field [28, 44].
Additionally, numerous methodologies have been employed in the examination of literature, including bibliometric analysis [45], systematic literature reviews [23], and content analysis [40], typically concentrating on a timeframe of 10 to 20 years. For example, Law R, et al. performed a bibliometric analysis of big data research within the fields of tourism and hospitality [25], covering the years 2008 to 2017, and identified significant studies, emerging research trends, and thematic clusters. The objective of our research is to consolidate the existing body of knowledge regarding artificial intelligence (AI) in tourism and hospitality through a bibliometric analysis of studies published up to 2024. This methodology employs statistical techniques to investigate the progression of a research domain by examining its conceptual and social frameworks. Consequently, this study utilizes bibliometric analysis to fulfil its aims.

3.1 Data Collection

This study utilized the Scopus database for a literature review, recognized for its high-quality, and standardized records. To enhance retrieval efficiency, the research was divided based on various terms related to "Artificial Intelligence" and "hospitality and tourism." An advanced search query was employed: TITLE-ABS-KEY (("AI" OR "artificial intelligence") AND ("tourist" OR "travel" OR "destination" OR "hospitality")). This investigation covers literature from 1999 to 2024, highlighting trends in AI within hospitality research and its historical, current, and future developments in tourism studies. Data collection involved extracting a CSV file from Scopus, which was analysed in MS Excel to eliminate inconsistencies and irrelevant entries. To ensure the research remains current, select studies from 2025 were included. The screening process resulted in 328 published journals and 609 journal articles. After thorough filtration, 328 articles were selected for bibliometric analysis, utilizing Microsoft Excel (Office 365 AI Plus) and VOSviewer for data visualization and processing. This whole process has been presented by the Figure 1 bellow.

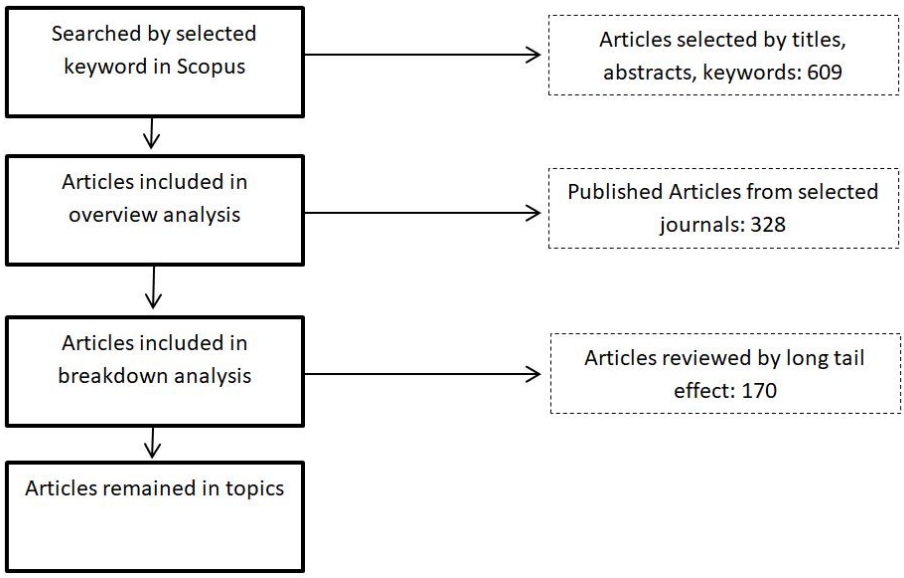

Figure 1 Workflow of the Study

4 FINDINGS

As of emphasizing the importance of integration of AI in tourism research in this study, Figure 2 depicts the past relevant papers. It illustrates the trends of publications year by year with the significance of this research area. Research in this field started in the year 2009 but became being double year by year from 2016. And still the pick year is 2024 which belongs more than double number of research 255 then the year 2023 110 research publications.

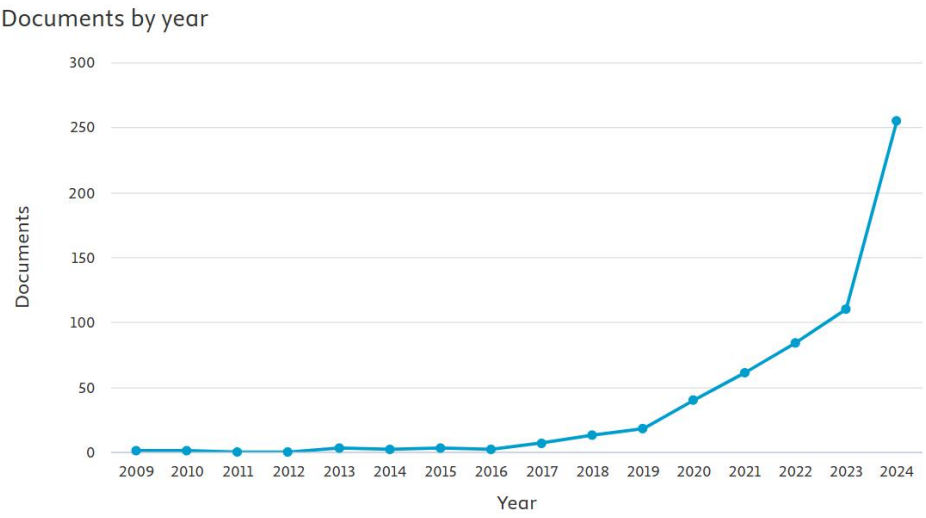

Figure 2 Number of Documents Published Per Year

Figure 3 Top Sources of this Study

Total 328 scientific papers have been selected for this study, which are published by 328 sources. Figure 3 displays publications by the top 5 sources. The International Journal of Contemporary Hospitality Management (blue line) has seen a significant surge in publications, especially between 2023 and 2024, leading among its peers. In contrast, Worldwide Hospitality and Tourism Themes (red line) maintained steady output from 2010 to 2020, with a slight increase thereafter. The Journal of Hospitality and Tourism Technology (green line) and the Journal of Hospitality Marketing and Management (purple line) have steadily risen since 2016, while the International Journal of Hospitality Management (orange line) has fluctuated but also trended upward recently. Overall, all journals show an upward trend in publications, though at varying rates.

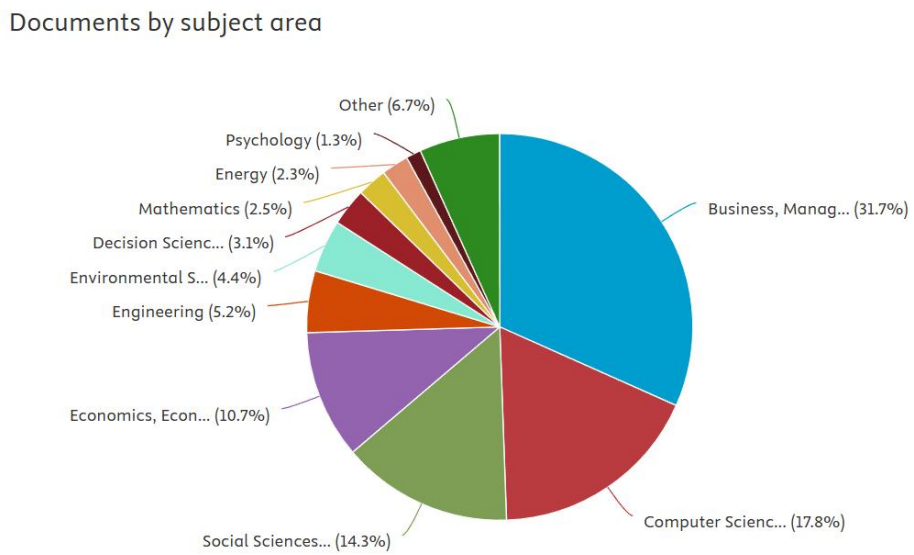

Figure 4 Emerging Subject Areas

Figure 4 represents the leading subject areas covered by artificial intelligence in hospitality publications. Therefore, AI enabled leisure research is mainly highlighted by Business, Management and Accounting (31.7%), Computer Science (17.8%) and Social Sciences (14.3%). Moreover, other subject areas are Engineering, Environmental Science, Economics, Energy, Arts and Humanities and so on. Hence, advancement in AI not only influences tourism but also profoundly impacts the development of business and economy. This impact is particularly evident in the realm of research area within social and business platforms, rather than being confined solely to technical aspects. On the other hand, figure 5 presents the distribution of the research works classified by country or territory, incorporating information from top 15 different nations or regions. The top five countries are identified as follows: India, which leads with over 140 documents; the United States, in second place with just over 120 documents; China, with a total nearing 110 documents; the United Kingdom, which has just under 100 documents; and Turkey, with approximately 60 documents. Other countries included in the analysis are Portugal, Malaysia, Spain, Australia, and the United Arab Emirates, each of which has fewer than 60 documents.

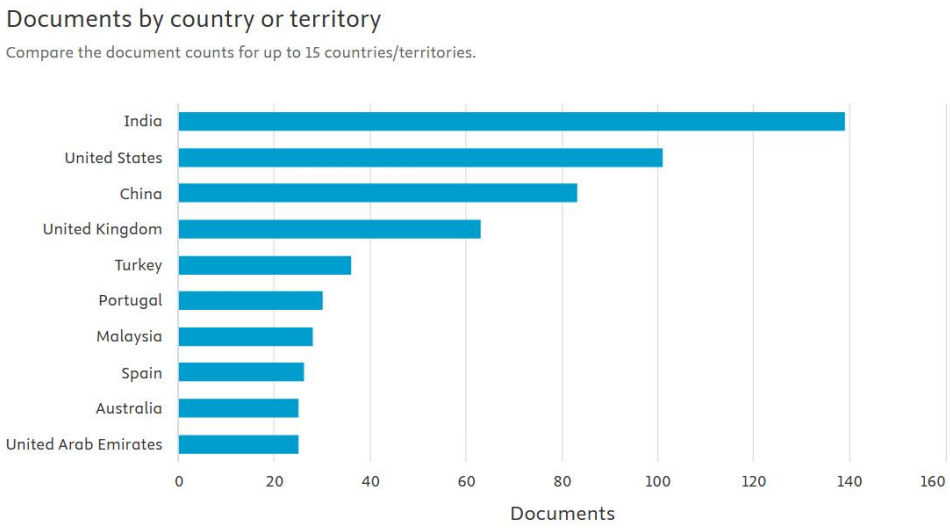

Figure 5 Dominating Countries in this Field

Figure 6 offers a clear visual depiction of the number of research, showcasing the differing levels of productivity among these authors. For example, S. Ivanov leads this research area with 12 evidences, showcasing a strong commitment to research. D. Gursoy follows closely with 11 research work, indicating healthy competition. R. Law and C. Webster tie for third with 10 documents each, reflecting equal dedication. D. Buhalis has produced 9 paper though he is the pioneer of digital tourism, while A. Bilgihan, Y.K. Dwivedi, and H. Kong each have 7. M.B. Talukder and O.H. Chi contribute 6 and 5 documents, respectively. Overall, the chart highlights varying productivity levels among these authors, emphasizing their individual contributions to research.

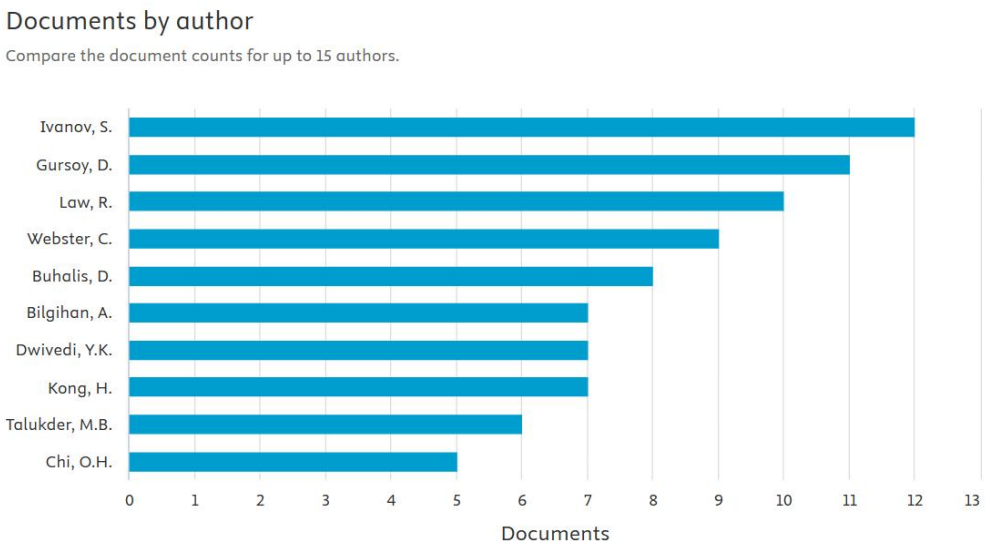

Figure 6 Lead Researchers of this Field

Table 1 List of Top Publications

Publication Year	Document Title	Author	Journal Title	Citation
2023	So what if ChatGPT wrote it?'- Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy	Dwivedi, Y.K. et al.	International Journal of Information Management	1431
2019	Technological disruptions in services: lessons from tourism and hospitality	Buhalis, D. et al.	Journal of Service Management	582
2020	Effects of COVID-19 on hotel marketing and management: a perspective article	Jiang, Y. & Wen, J.	International Journal of Contemporary Hospitality Management	579
2019	Real-time co-creation and nowness service: lessons from tourism and hospitality	Buhalis, D. & Sinarta, Y	Journal of Travel and Tourism Marketing	500
2020	Adoption of AI-based chatbots for hospitality and tourism	Pillai, R. & Sivathanu	International Journal of Contemporary Hospitality Management	439
2020	From high-touch to high-tech: COVID-19 drives robotics adoption	Zeng, Z. et al.	Tourism Geographies	436
2021	What makes an AI device human-like? The role of interaction quality, empathy and perceived psychological anthropomorphic characteristics in the acceptance of artificial intelligence in the service industry	Pelau, C. et al.	Computers in Human Behavior	428
2019	Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate	Li, J.J. et al.	Tourism Management	389
2020	Leveraging human-robot interaction in hospitality services: Incorporating the role of perceived value, empathy, and information sharing into visitorsâ€™ intentions to use social robots	de Kervenoaet al.	Tourism Management	354

2020	Antecedents of customersâ€™ acceptance of artificially intelligent robotic device use in hospitality services	Lin, H. et al.	Journal of Hospitality Marketing and Management	211

Table 1 presents an overview of the most frequently cited literature. Citations serve as a measure of the impact of research, and the publications that receive high citation counts exhibit notable distinctions within their respective fields. Table 1 enumerates the most significant works on artificial intelligence in the hospitality sector from 1999 to 2024, totalling 5,150 citations. The ten most cited papers demonstrate an interdisciplinary approach, comprising six studies focused on tourism, service, marketing, and transportation, alongside one article pertaining to health. Furthermore, all authors are affiliated with academic institutions, highlighting the pivotal role that educational and research organizations play in making substantial contributions to this domain. The article titled "So what if ChatGPT wrote it?" by Dwivedi et al. in 2023 examines the influence of artificial intelligence on research and policy. This work was published in the International Journal of Information Management and has garnered upto date highest citations i.e. 1,431. In addition, the 2019 study by Buhalis et al., titled "Technological disruptions in services," explores the impact of technology on the tourism and hospitality sectors. This research has been cited 582 times and is featured in the Journal of Service Management. Similarly, Jiang and Wen's 2020 article, "Effects of COVID-19 on hotel marketing," published in the International Journal of Contemporary Hospitality Management, has garnered 579 citations. Moreover, Buhalis and Sinarta's 2019 research, "Real-time co-creation and nowness service," appears in the Journal of Travel and Tourism Marketing and has received 500 citations. Furthermore, the contributions of Pillai and Sivathanu in 2020, Zeng et al. in 2020, Pelau et al. in 2021, 20, and De Kervenoael et al. in 2020 have also played a significant role in shaping this area of research.

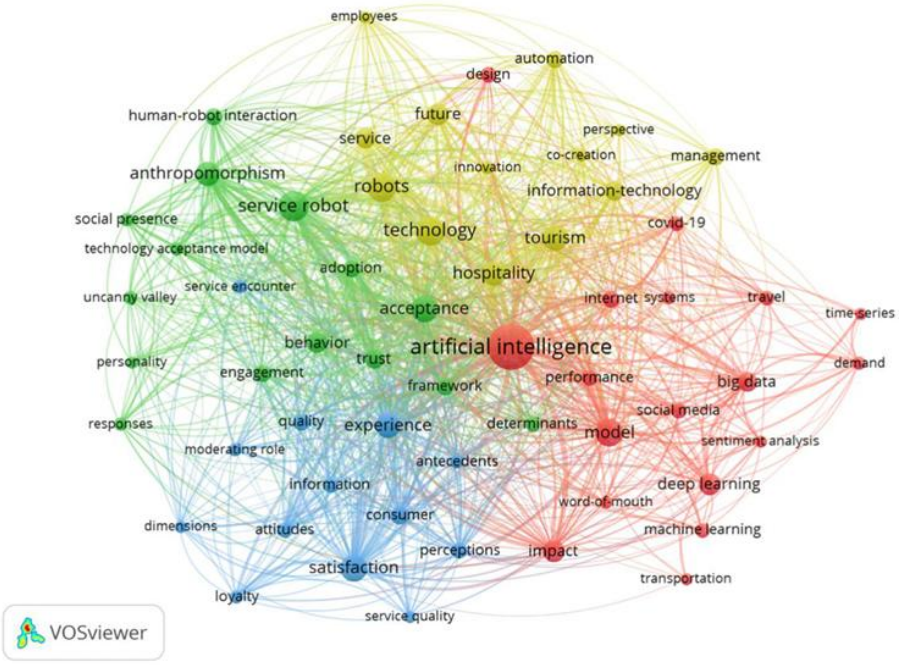

Figure 7 Map of Thematic Clusters

Figure 7 explores the interaction of artificial intelligence and service robots within various contexts, such as tourism and hospitality. It discusses critical concepts like human-robot interaction, technology acceptance models, and the impact of COVID-19 on consumer behavior and engagement. It highlights the importance of design, trust, and social presence in shaping user experiences and responses to automated technologies, emphasizing the need for innovative approaches in management and service encounters. For example: The travel industry is increasingly relying on robots to enhance service quality, driven by demand for contactless experiences post-COVID-19. Understanding consumer attitudes towards these technologies is vital for successful integration. Besides, designing robots with human-like features can improve engagement and social presence, yet risks falling into the uncanny valley, where too much realism causes discomfort among users. Social media serves as a platform for consumer feedback and word-of-mouth, significantly influencing perceptions of robots and automation in service encounters. These technologies are essential for improving robot performance and personalization, enabling better responses to consumer needs and enhancing overall satisfaction. In a jest the following clusters can be found, like:

Cluster 1 explores the acceptance of technology, with a particular emphasis on "service robots," "acceptance," "anthropomorphism," "behaviour," and "trust," all of which shape tourists' perceptions of artificial intelligence [9]. By employing social presence theory alongside the Technology Acceptance Model (TAM), research has been conducted to

understand how tourists come to accept and trust service robots [21]. Significant determinants of AI acceptance identified in the literature include anthropomorphism, performance, personalized service, cuteness, and humour [46-47]. Besides, the theory of uncanny valley also addresses technological anxiety and distrust among some tourists [9, 33].

Cluster 2 investigates the realm of artificial intelligence technology, emphasizing concepts such as deep learning, big data, Artificial Intelligence along with its model and impact. It utilizes AI models and neural networks to optimize intelligent transportation systems and forecast tourism demand [48]. In the context of unstructured social media data, techniques such as sentiment analysis and text mining are employed to transform this data into time series for predictive analysis can be observed in the stud of Li X, et al. and Rust RT [49-50]. Furthermore, Pereira V, et al. and Gaur L, et al. [51-52] highlighted that the application of AI technologies is essential for enhancing business management and marketing strategies, thereby facilitating the recovery of the hotel and tourism industries in the aftermath of the pandemic.

Cluster 3 investigates the emerging trends associated with "robots," "technology," "tourism," "hospitality," and the "future," with a particular emphasis on the advancements and challenges present within the sector. The implementation of artificial intelligence (AI) significantly enhances the experiences of tourists and optimizes hotel operations, leading to increased efficiency, cost reduction, and enhanced competitiveness. Nevertheless, the integration of AI also presents several challenges, including employee acceptance, adaptability issues, feelings of insecurity, and elevated turnover rates [42]. Looking forward, AI is anticipated to generate additional opportunities for the automation of services within the hotel and tourism sectors [22].

Cluster 4 examines customer perceptions with an emphasis on "satisfaction," "experience," "quality," and "attitudes." These elements are frequently associated with real-time online data and the monitoring of consumer behaviour [46-47]. This analytical framework evaluates the perceptions, attitudes, satisfaction levels, and loyalty of tourists.

5 DISCUSSION, CONCLUSION AND FUTURE AGENDA

This bibliometric analysis provides an overview of artificial intelligence's role in tourism research, highlighting its rapid growth through key publications, collaborations, research areas, and technological advancements. It is one of the first studies to assess AI's evolution in the tourism sector, addressing a significant gap by exploring critical dimensions of AI. Since its inception in 1955, AI has developed significantly and is now set to transform society. This research explores the evolution of AI in the tourism sector and its implications for social sciences. While often seen as complex, AI's roots lie in early fields like mathematics, economics, philosophy, and psychology [36], AI, particularly through automation and robotics, is rapidly transforming the travel and hospitality (T&H) sector [9]. Its diverse applications are increasingly prevalent, influencing both businesses and travelers. It should be recognized as a significant economic and societal advancement [9-10]. The study's findings on popular keywords highlight both numerical (e.g., digital economy, forecasting, big data) and human-centric (e.g., recommender systems, sustainability, personalization) aspects of AI.

However, AI research in the hospitality sector is growing, with a significant increase in interest since the first relevant paper in 1991. A notable surge in publications and citations occurred in 2016, attracting considerable attention from researchers. Studies on AI are categorized into four areas: AI technology, technology acceptance, consumer perception, and future trends. Initially focused on AI technology, research has shifted towards consumer acceptance. Recent studies feature in-depth analyses, but there is a lack of research on "social media" in AI technology and "determinants" in technology acceptance. Additionally, few studies explore the "moderating role" in consumer perception. The future trends category shows growing interest in "robots," particularly "service robot–adoption" and "service robot–acceptance," though research on "robots-acceptance" is limited, indicating a focus on service robots in travel and hospitality. Most studies are published in leading tourism and management journals, covering various aspects of tourism, service, marketing, and transportation. The COVID-19 pandemic has underscored the importance of AI in this sector, which seeks efficiency, reliability, empathy, and safety. The use of robots, like concierge and waiter robots, has increased to reduce disease transmission. Ambient intelligence can enhance guest satisfaction by adjusting hotel room settings based on preferences, while also lowering costs. Travel and hospitality companies are reimagining their services through technology and automation, utilizing biometrics, facial recognition, and voice assistants to provide tailored services and improve data collection.

As AI becomes integral to hotel industry, it is expected to enhance every phase of a tourist's experience, fostering innovative services and blending physical and digital elements [10]. While AI offers opportunities for improved efficiency and cost reduction, it also presents challenges such as job redesign and potential displacement. Experts agree that AI will not eliminate jobs but will change the work environment, allowing employees to focus on more fulfilling tasks [51]. To succeed, T&H companies must engage their workforce and embrace new AI technologies, while also addressing potential negative impacts on employee well-being to enhance engagement and commitment. The integration of technology and AI is enhancing smart tourism and destinations by merging digital innovations with physical environments [45]. Future smart tourism will feature advanced technologies like location-based apps, cloud infrastructure, travel-focused social media, and big data analytics. Innovations such as virtual and augmented reality tours, visitor flow sensors, wearable tech, and smart mapping will also be significant [19]. A "smart" destination goes beyond technology adoption; AI enables real-time insights, aligning tourist preferences with services. This evolution promises new value, increased engagement, and improved experiences, but also raises concerns about traveler security and privacy.

This bibliometric analysis indicates a growing interest in automation, service robotics, and smart tourism, while also highlighting a gap in research on the negative aspects of AI compared to its benefits. The rise of AI technologies raises important questions about employee roles and well-being, alongside privacy and security concerns related to big data and analytics. This research emphasizes the increasing role of AI in hospitality, revealing important findings across various criteria. The topic's relevance and the rise in academic studies suggest that scholars should focus on this area in future research. Upcoming studies could examine the incentives and risks of AI in the tourism industry and conduct bibliometric analyses periodically. While outlining the existing academic literature, this study also indicates that AI is likely to become a key global issue. The reviewed studies suggest AI's growing integration into daily life, prompting public authorities and private sector leaders to create policies that mitigate AI risks while leveraging its benefits.

Finally, this study proposes four key research areas for the coming years: (1) AI's impact on workplace dynamics; (2) privacy and security issues with big data; (3) the evolution of smart hospitality; and (4) the intersection of automation, robotics, and tourist experiences. It also offers a bibliometric analysis of a contemporary topic, suggesting that information on the subject is readily available. However, it faces significant limitations in systematic evaluation and time management. By using appropriate filters in a major global database, relevant data can be collected. Efforts were made to address these key limitations, particularly in systematic evaluation and efficient time use.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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