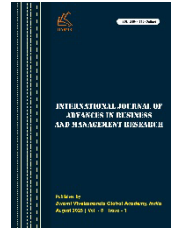# HARNESSING AI FOR SUSTAINABLE FUTURE TOURISM INDUSTRY

Priyanka Kanjilal[1*], Sandip Karmakar[2], Nilanjan Ray[3], Biman Maity[4], Sudip Basu[5]

Original Article

[1,2,3]JIS University, Kolkata, 700109 West Bengal, India

[4]Bharatiya Vidya Bhavan Institute of Management Science, Kolkata, 700097 West Bengal, India

[5]Asansol Engineering College, Asansol, 713305 West Bengal, India

*Corresponding Author's Email: priyanka.kanjilal07@gmail.com

## Abstract

Almost every aspect of travel and tourism is presently impacted by artificial intelligence (AI), which can be found in various applications, such as robotics, conversational systems, smart travel agents, customisation and recommender systems, applications for language translation, forecasting and prediction systems, and systems for natural language processing and speech recognition. This study seeks to highlight important themes, advantages, and disadvantages in the body of research on AI in tourism, while also providing insight into potential directions for future study, including the discovery of new fields within this framework. Artificial intelligence is evolving quickly. Artificial intelligence has the potential to enhance operational effectiveness, enhance customer service, customise travel experiences, and promote sustainability measures, thereby fostering a variety of industries, including tourism. Although the amount of research on this subject is increasing, a thorough and organised review of the literature is still required to highlight the best applications of AI in this setting and to pinpoint areas that require more investigation. The study is based on a review of previous studies with the help of PRISMA to try to find out how AI creates an impact on the future sustainable tourism industry.

*Keywords: Artificial Intelligence Applications; Digital Tourism; Overview of Reviews; Tour Planning Chatbot; Tourism Industry; Tourist Experience*

## Introduction

Computer science's artificial intelligence (AI) field aims to develop algorithms and techniques that give machines characteristics that normally need human intelligence, such as learning, reasoning, and comprehension [1]. AI is viewed as either a "curse or a blessing" due to its wide-ranging and significant societal effects, which can have both positive and negative effects [2]. AI's potential role arouses a wide range of feelings, from curiosity to terror [3]. Positively, AI technology has the potential to transform a number of industries by increasing productivity and employment [4].

The introduction of AI is not without its difficulties, though, such as privacy and data security issues and the moral dilemmas surrounding its application [5]. Automation is predicted to have the greatest impact on jobs requiring repetitive activities. These positions include lower-level duties in the service industry, such as data processing and customer service [6]. It is widely acknowledged that humans must collaborate and adapt to AI, which calls for new abilities and knowledge. AI offers prospects for job creation, human capability enhancement, and good economic consequences, even if it can have major implications on the labour market [7]. According to Dellermann [8], this may open the door for an ecosystem of "hybrid intelligence". The concept of human-AI co-creation is becoming more popular in a variety of

fields, suggesting that AI might enhance human talents rather than take their place [9]. Applications for artificial intelligence systems in tourism are numerous. From the standpoint of the customer, artificial intelligence (AI) enhances decision-making, increases mobility, helps users locate better and more pertinent information, and, in the end, improves the travel experience [10, 11]. According to Buhalis et al. [12], AI can be used in practically every facet of management from a commercial standpoint, particularly in productivity and promotion [11]. According to Tussyadiah [13], artificial intelligence is also anticipated to promote more environmentally friendly travel. AI is being utilised more and more to provide individualised suggestions for travel by examining user preferences, past travel experiences, and internet activity [14].

The emergence of augmented reality (AR) and virtual reality (VR) is transforming how tourists interact with their locations by providing immersive experiences that go beyond geographical limitations [15]. 24/7 customer support is provided by AI-powered chatbots and virtual assistants, who manage standard questions and free up human employees for more intricate exchanges [14]. Nowadays, travel platforms employ AI to evaluate large datasets, predict booking patterns, modify pricing policies, and provide personalised travel recommendations, all of which contribute to a smooth, end-to-end travel experience [16]. Furthermore, innovations aimed at consumers are not the only changes. Travel companies, hotels, airlines, and destination management organisations (DMOs) are using AI more and more to control crowd movements, expedite internal operations, and make data-driven policy choices. The tourist industry's business models are changing from human-intensive to technology-augmented service delivery, as seen by the increasing reliance on AI technologies [17]. There are several AI applications that can help accomplish this growth.

A number of new study trends in this area have been noted by Thayyib et al. [18], including eWOM, service recovery, customer happiness, brand/destination image, service quality, big data, netnography, e-tourism, green experiences, Web 2.0, Travel 2.0, smart tourism, and the use of neural network models, Support Vector Regression (SVR), and Artificial Neural Networks (ANNs) in tourist forecasting. According to Soliman et al. [19], during the COVID-19 epidemic, concepts like "task analysis-training," "deep learning-convolutional neural networks," and "optimisation" have been extremely significant.

The full potential of emerging technologies in tourism requires addressing issues including data complexity, algorithmic bias, financial problems, and socio-ethical considerations [20]. With the acceleration of digital transformation, the integration of AI technologies into smart tourism ecosystems has fostered effortless and context-sensitive travel experiences. Booking.com and Trip.com already implement AI through machine learning to provide customised suggestions for travel plans, while Siri and Google Assistant help plan and guide travellers using voice commands in real time. These advances serve to meet the changing demands of tourists and, at the same time, offer powerful new ways to aid in competitive pricing, resource management, and service customisation for tourism operators [13]. Additionally, the ongoing COVID-19 pandemic has intensified the need for automation and contactless systems, especially in AI technology. Travel agencies are moving towards a hybrid model that integrates AI with human interaction to retain relevance in the advanced digital marketplace. This change is not merely an alteration in the equipment utilised but rather an indication of a change in the construct of the tourism industry's business models, employment structures, and market's demographics. The goal of this study is to document the modern influences, innovations, and transformational effects of AI technologies in the field of tourism. It places particular focus on the impact of AI on the operations of trip planning, service provisioning, management at the destination, and corporate strategic planning. The primary aim is to evaluate the effect of intelligent technologies on the tourism domain while developing strategies for the possible threats and challenges posed by AI-powered tourism technologies.

**Objectives of study**

The growing application of Artificial Intelligence (AI) technologies is changing the planning, marketing, and peculiarities of travel in the tourism sector. Although AI-based programmes provide better personalisation and cost reduction, their effect on traditional service models, especially travel agencies, is still not investigated. Moreover, there is no adequate analysis of the acceptance and trust that the travellers have towards AI services, as well as their satisfaction. This creates unique possibilities and difficulties concerning the use of AI in tourism in relation to changes in operations and consumer behaviour, as well as the consequences for the workforce. The focus of this research is to

formulate an all-encompassing review of existing literature on the application of AI technologies in the tourism industry, identifying central issues, major themes, strengths and limitations. Additionally, it aims to recommend directions for further study towards the effective and responsible use of AI in tourism. Based on a systematic review of literature reviews conducted during the past five years, we highlight the most important areas of AI application. This study of the state of research and development in the area focused on the most common uses of AI and its potential applications and challenges.

**Review Process and Database Search**

This study only takes into account empirical research conducted to determine the reasons for the increasing interest in artificial intelligence in tourism. The focus on recent papers stems from the need to document the new frontiers in the field of research. To look at the latest studies on dark tourism, a comprehensive review of the literature was done. According to Paul and Menzies [21], a systematic literature review (SLR) is considered the most academic and informative type of review approach. According to Kraus et al. [22], SLR aims to address a research subject, frequently related to the situation of a field of study at the moment. The secondary data collected from previous studies related to AI in tourism was identified using keywords such as 'artificial intelligence applications', 'tourism industry', 'overview of reviews', 'digital tourism', 'tourist experience', 'tour planning chatbot', 'operational effectiveness', 'opportunity', and 'challenges'. The previous data collected from sources like ScienceDirect and Emerald Insight and Google Scholar show a total number of databases found related to the above topic is 534. The studies included in the systematic review are 14. This research includes a wide spectrum of AI technologies with the goal of improving many facets of travel experience, such as chatbots, virtual assistants, sentiment analysis, augmented and virtual reality, and robots. In the tourist industry, the study emphasises how AI is advancing digital transformation, enhancing customisation, and fostering sustainability. The growing number of articles indicates the interest of both academia and business in using AI to develop and enhance tourism-related services (refer to Figure 1).

*Figure 1: Databased Searches on Artificial Intelligence and its Applications in the Tourism Industry*
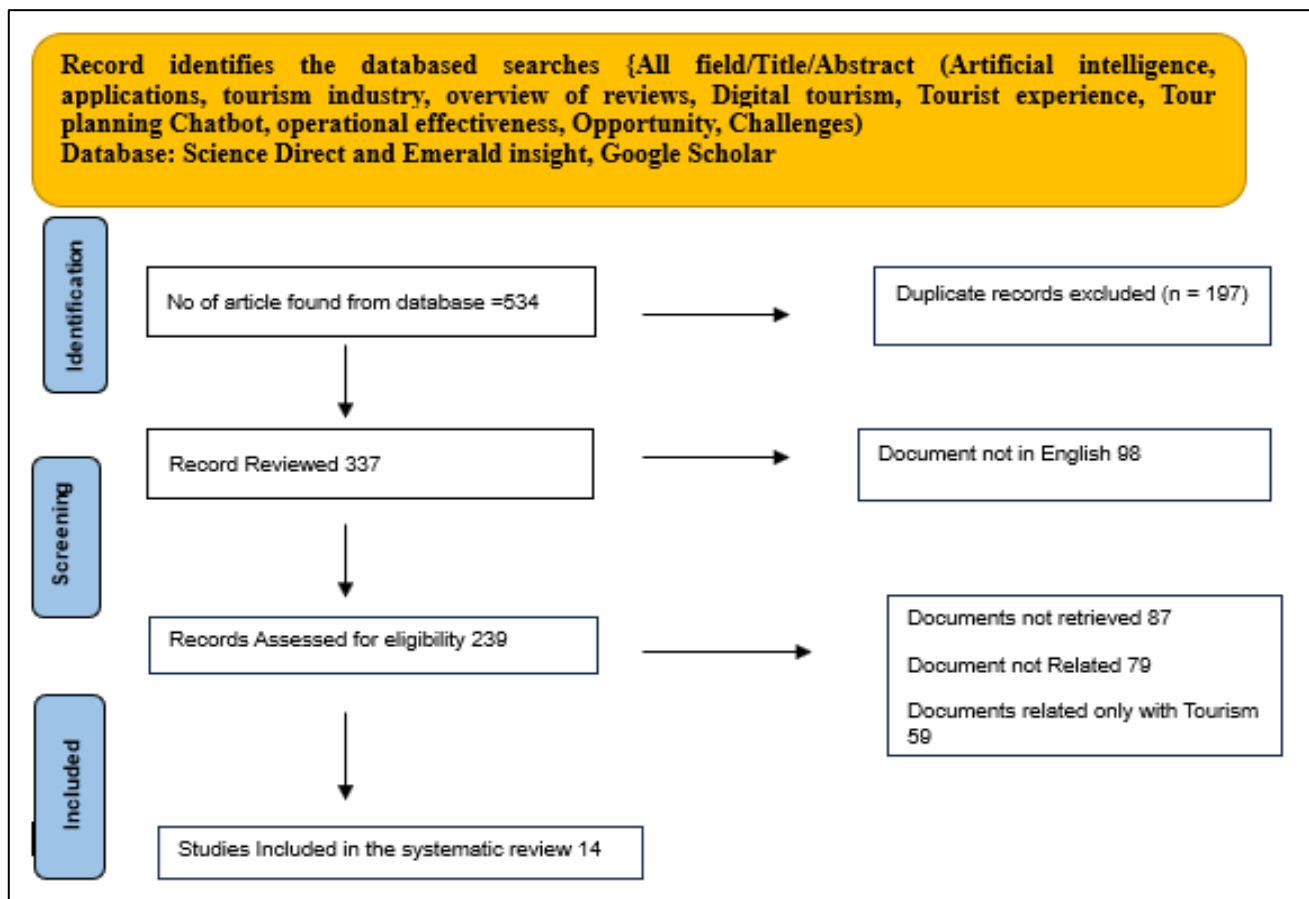


*Source: Illustrated by Author*

**Theoretical Framework (See Table 1 below)**

*Table 1: At a Glance Historical Contributions*

| Basis | Contributors | Contribution |
|---|---|---|
| Predicting | Doborjeh et al. [23] | Talk about how artificial intelligence (AI) might help predict future business circumstances, revenue, and patterns in demand from visitors. |
| | Lv et al. [24] | For efficient forecasting in hospitality and tourist management, stress the use of various data sources, including government databases, professional databases, and operation data. |
| | Chen et al. [25] | Determine the best strategies for capitalising on the growing trend in the hotel sector, which include BI- and IT-driven solutions. |
| | Li et al. [26] | Draw attention to some of the drawbacks and difficulties associated with using internet data for tourist forecasting, such as the accuracy of search engine data and the existence of noise or unrelated information in social media data. |
| Increasing effectiveness in operations | Li et al. [27] | Spoke about how intelligent robotics could be used to help with issues facing the hotel sector. |
| | Yang and Chew [28] | Spoke about how intelligent robotics could be used to help with issues facing the hotel sector. |
| | Jiao and Chen [29] | Spoke about the difficulties in interpreting the results and the requirement for substantial computer resources when using AI techniques for tourist forecasting. |
| | Liu et al. [30] | Highlighted how AI techniques are increasingly being used in tourist forecasting but pointed out some of their drawbacks, such as their complexity and requirement for vast quantities of data. |
| Experience of tourists | Samara et al. [20] | AI enables suggestions in the travel sector that are based on trust. |
| | Elkhwesky et al. [31] | AI has a lot of potential to improve consumer experiences. |
| | Giotis and Papadionysiou [32] | With the use of IT technology, travel agencies may send tailored marketing messages to specific consumers. |
| | Das et al. [33] | AI can provide alternatives for augmented reality travel experiences. |
| Adaptability | Gaur et al. [34] | To support sustainable tourism projects and lessen the ecological impact of the sector, AI-powered solutions may improve waste management, optimise resource allocation, limit energy usage, and improve health and safety protocols. |
| | Kirtil and Askun [35] | Chatbots and virtual assistants driven by AI can encourage travellers to make well-informed decisions regarding their vacation and activities, thereby promoting responsible tourism practices. |
| | Elkhwesky et al. [31] | One eco-friendly innovation that drones can help with is the provision of live virtual tours of open-space tourism destinations. |
| | Giotis and Papadionysiou [32] | When technology replaces conventional printed materials like brochures and posters, it lowers the amount of paper used, minimizes waste production, and supports sustainability initiatives overall. |

*Source: Collected by Author*

*Figure 1: 1 VOSviewer research trends visualization*
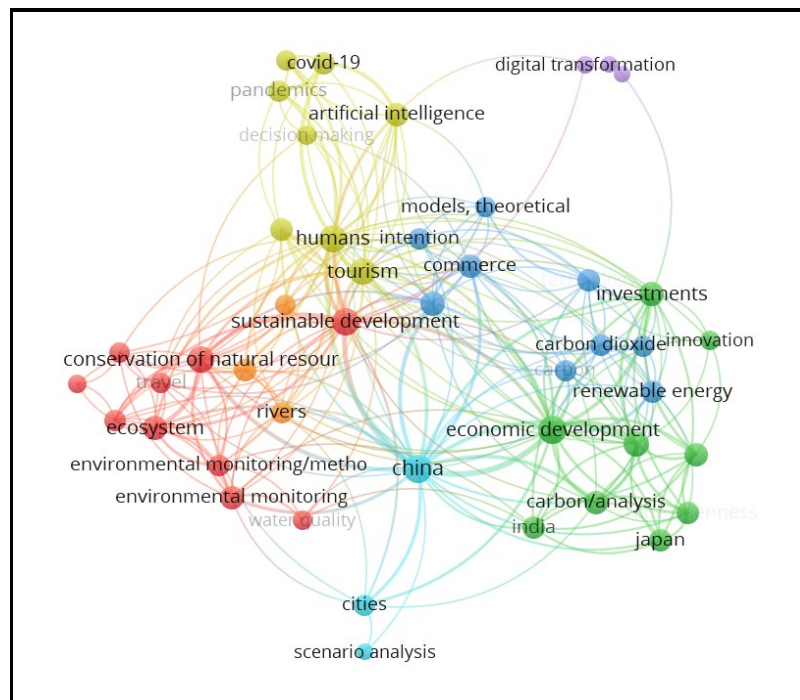


*Source: Collected by Author*

The VOSviewer-based bibliometric visualisation provides a comprehensive mapping of research themes associated with sustainable development, drawing from the co-occurrence of terms in scholarly literature (refer to Figure 1). The colour-coded network identifies six major thematic clusters, each signifying a unique domain within the broad field of sustainability studies. The red cluster represents environmental sustainability and natural resource conservation, comprising terms such as "sustainable development", "conservation of natural resources", "ecosystem", "environmental monitoring", and "sustainable development goals". These terms coalesce around the ecological aspects of sustainability, emphasizing the preservation of biodiversity, monitoring of environmental indicators like water quality and rivers, and alignment with the United Nations' Sustainable Development Goals (SDGs). This cluster highlights a deep concern within academia for preserving natural ecosystems amid growing developmental pressures. The blue cluster, on the other hand, focuses on commerce, industry, and technological modelling. Terms like "commerce", "industry", "technology", and "models, theoretical" suggest a research emphasis on the industrial and commercial dynamics underpinning economic systems. Theoretical modelling serves as a critical tool in this cluster to forecast outcomes and shape policies for sustainable industrial practices. This indicates a movement towards integrating sustainability into business and operational frameworks.

The green cluster demonstrates a robust integration of economic growth with environmental and energy policies. Central terms such as "economic development", "renewable energy", "carbon analysis", "carbon dioxide", "innovation", and geographical markers like "India" and "Japan" point to comparative, policy-orientated research into how nations reconcile development with climate action. The cluster's focus on carbon emissions and trade openness indicates a nuanced understanding of sustainability in the context of globalisation and green innovation. Meanwhile, the yellow cluster illustrates the interplay between human behaviour, decision-making, and emerging technologies such as artificial intelligence. It is composed of terms like "humans", "artificial intelligence", "decision making", "COVID-19", and "pandemics". This cluster emerged in response to the COVID-19 pandemic and reflects a critical shift toward digital and AI-driven tools for managing public health crises and shaping sustainable human behaviour. The presence of "tourism" within this cluster denotes its susceptibility to global disruptions and its dependence on both human behaviour and technological adaptation.

The purple cluster—comprising only "digital transformation"—exists as an isolated yet increasingly relevant research area. Its limited linkage with other clusters may signify its status as an emerging or niche focus that will likely gain broader integration over time, especially as digitisation becomes foundational to sustainable operations and governance. Finally, the cyan cluster centres on "China", along with "cities" and "scenario analysis". This cluster highlights regional sustainability research with China as a focal case, reflecting its significant role in global environmental and urbanisation challenges. The term "scenario analysis" further suggests that forward-looking tools and predictive models are being used to chart urban sustainability pathways in rapidly developing contexts.

The cross-cluster linkages—illustrated by connecting lines—reveal the interdependence among different domains. Nodes such as "sustainable development", "humans", and "tourism" serve as key intersection points, indicating their multidimensional relevance. These terms traverse ecological, technological, economic, and social dimensions, underscoring the interdisciplinary nature of sustainability discourse. The map not only captures established themes but also signals emerging trends, such as AI in behavioural modelling and digital transformation, positioning them as future areas of expansion.

The outcome of this analysis is a granular understanding of the intellectual structure and evolving landscape of sustainability research. It identifies environmental preservation, economic growth, technological advancement, human-centred AI, and regional urban planning as core research pillars. Simultaneously, it highlights underexplored areas like digital transformation as opportunities for future inquiry. Visualisation facilitates academic planning, allowing scholars to identify clusters for deeper investigation, and supports policy strategists in recognising where integrated frameworks are most needed. In essence, this VOSviewer map acts as both a reflective tool of past and present research focus and a roadmap for interdisciplinary and forward-looking sustainability.

**AI-enabled Virtual Travel Assistants (VTAs)**

VTAs have emerged as transformative tools within the tourism and hospitality industry, leveraging artificial intelligence (AI) to enhance traveller experience, personalisation, and operational efficiency. These virtual assistants integrate natural language processing (NLP), machine learning (ML), and predictive analytics to provide real-time, context-aware support across the customer journey—from planning and booking to on-trip assistance and post-travel feedback. At the core of VTAs lies personalisation, where AI analyses user behavior, preferences, and historical data to offer tailored recommendations on destinations, accommodations, activities, and dining. This is closely tied to 24/7 multilingual support, allowing VTAs to engage travellers globally, removing linguistic and temporal barriers. Additionally, intelligent itinerary generation enables users to receive dynamically optimised travel plans based on budget, interests, time, and local events (refer to Table 2).

*Table 2: AI Application in Tourism Essential Features*

| Feature | Description |
|---|---|
| Personalization | AI-driven tailored recommendations based on user profiles and past behavior |
| 24/7 Multilingual Support | Always-on assistance in multiple languages to cater to global travelers |
| Intelligent Itinerary | Automated, optimized planning based on user preferences and real-time data |
| Booking Integration | Seamless reservations via linked travel service providers |
| Real-time Updates | Notifications on flight status, weather, traffic, and health advisories |
| AR/VR Previews | Immersive previews of destinations and accommodations for decision support |

*Source: Collected by Author*

Another critical feature is integrated booking assistance, where VTAs streamline the reservation process across flights, hotels, and experiences through API integration with travel platforms. VTAs also offer real-time travel updates, such as flight delays, weather alerts, and safety advisories, enhancing situational awareness. Increasingly, VTAs embed AR/VR capabilities for virtual destination previews, contributing to informed decision-making (refer to Table 3).

*Table 3: AI enabled VTAs Contributions*

| AI enabled Virtual Travel Assistants | Hallmarks |
|---|---|
| Virtual Travel Planner | Virtual travel planners assist in locating and booking flights, hotels, rental cars, and other accommodations according to preferences and budgetary constraints. |
| Virtual Trip Advisors | Virtual trip advisors can provide personalised travel suggestions tailored to the user's interests, past travel experiences, and specific preferences. |
| Real-Time Trip Assistants (Updaters) | Real-time Trip Assistants (Travel Updaters) can provide updates on flight status, travel delays, and other relevant travel information to keep travellers well-informed regarding their travel itineraries. |
| Virtual Concierge Services | Advanced virtual assistants are capable of offering concierge-level services, including booking restaurant reservations, scheduling tours, and coordinating transportation for the entire trip. |
| Virtual Customer Support | Virtual customer support assistants can assist travellers with customer support needs, such as booking adjustments, cancellations, or refunds. |

*Source: Collected by Author*

## Result

Convenience also ranks relatively high (mean = 3.48), reflecting a growing reliance on digital platforms for navigation, planning, and local interaction. Conversely, AI Intervention Usefulness scores the lowest (mean = 3.15), which may indicate limited exposure to or trust in AI-based tools among tourists, or perhaps a lack of widespread implementation in tourist services. Sustainability Awareness and Eco-Friendly Options, with values of 3.42 and 3.29, respectively, suggest that while environmental consciousness is present, the availability or visibility of green tourism practices might still be developing. The similar standard deviations across variables (around 1.2) indicate a consistent range of opinions within the sample. Collectively, these findings highlight a balanced distribution of perceptions and point toward areas where tourism services can focus to elevate satisfaction—particularly in enhancing information dissemination, technological utility, and sustainable practices (see Table 4 below).

The Descriptive Statistics table presents the central tendencies and dispersions of key variables influencing tourist satisfaction in a sample of 184 respondents. The mean score for tourist satisfaction is 3.45 (on a likely 5-point Likert scale), with a standard deviation of 1.218, suggesting a moderate level of satisfaction with some variability in responses. Among the predictors, information availability has the highest mean (3.65), indicating that tourists generally perceive that relevant information is readily accessible during their visits. This suggests its potential as a strong influencer in enhancing tourist experience.

*Table 4: Descriptive Statistics*

|  | **Mean** | **Std. Deviation** | **N** |
|---|---|---|---|
| Tourist Satisfaction | 3.45 | 1.218 | 184 |
| AI Intervention Usefulness | 3.15 | 1.276 | 184 |
| Mobile App Convenience | 3.48 | 1.178 | 184 |
| Information Availability | 3.65 | 1.276 | 184 |
| Sustainability Awareness | 3.42 | 1.239 | 184 |
| Eco Friendly Options | 3.29 | 1.206 | 184 |

*Source: Authors Computation*

The regression analysis investigates the influence of several independent variables—AI Intervention Usefulness, Mobile App Convenience, Information Availability, Sustainability Awareness, and Eco-Friendly Options—on the dependent variable, Tourist Satisfaction. The descriptive statistics show relatively balanced means and standard deviations, with all variables ranging between 3.15 and 3.65, suggesting a moderate to high level of agreement among respondents. The Model Summary indicates a strong correlation (R = 0.764) and a high $R^2$ = 0.583, implying that 58.3% of the variance in tourist satisfaction is explained by the model. The Durbin-Watson value (2.009) is within the acceptable range (1.5–2.5), indicating no autocorrelation in residuals and confirming the model's stability (see Table 5 below).

*Table 5: Model Summary[b]*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | 0.764a | 0.583 | 0.571 | 0.797 | 0.583 | 49.771 | 5 | 178 | 0.000 | 2.009 |
| a. Predictors: (Constant), Eco-Friendly Options, AI Intervention Usefulness, Sustainability Awareness, Information Availability, Mobile App Convenience | | | | | | | | | | |
| b. Dependent Variable: Tourist Satisfaction | | | | | | | | | | |

*Source: Authors Computation*

The ANOVA table supports the model's overall significance, with an F-statistic of 49.771 and a *p*-value of 0.000, signifying that the combination of predictors has a statistically significant relationship with tourist satisfaction. This validates the inclusion of the selected variables and confirms their collective importance in predicting the outcome variable. The regression model therefore meets key statistical assumptions, enhancing confidence in its predictive capacity. The large regression sums of squares relative to the residual indicate that much of the variability in satisfaction is accounted for by the predictors, strengthening the model's explanatory power (see Table 6 below).

**Table: 6 ANOVA[a]**

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 158.259 | 5 | 31.652 | 49.771 | 0.000[b] |
| | Residual | 113.198 | 178 | 0.636 | | |
| | Total | 271.457 | 183 | | | |
| a. Dependent Variable: Tourist Satisfaction | | | | | | |
| b. Predictors: (Constant), Eco-Friendly Options, AI Intervention Usefulness, Sustainability_Awareness, Information Availability, Mobile App Convenience | | | | | | |

*Source: Authors Computation*

The Coefficients table provides more granular insights into individual predictors. Information Availability ($\beta$ = 0.485, *p* = 0.001), Mobile App Convenience ($\beta$ = 0.379, *p* = 0.000), and AI Intervention Usefulness ($\beta$ = 0.413, *p* = 0.000) emerged as the strongest and most statistically significant predictors. These findings highlight the increasing importance of digital tools and accessible information in enhancing tourist experiences. Additionally, Sustainability Awareness ($\beta$ = 0.285, *p* = 0.006) and Eco-Friendly Options ($\beta$ = 0.239, *p* = 0.001) also significantly contribute to satisfaction, emphasizing the growing role of environmentally responsible tourism practices. All VIF values are below 2, indicating no multicollinearity concerns. Overall, this model offers a well-founded, statistically robust framework for understanding the multifaceted drivers of tourist satisfaction, blending technological convenience with sustainable tourism expectations (see Table 7 below).

*Table 7: Coefficients*[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | Constant | 0.422 | 0.204 | | 2.070 | 0.040 | | |
| | AI Intervention Usefulness | 0.328 | 0.070 | 0.413 | 0.534 | 0.003 | 0.430 | 1.326 |
| | Mobile App Convenience | 0.311 | 0.083 | 0.379 | 0.979 | 0.000 | 0.363 | 1.757 |
| | Information Availability | 0.427 | 0.073 | 0.485 | 0.418 | 0.001 | 0.399 | 1.505 |
| | Sustainability Awareness | 0.280 | 0.070 | 0.285 | 0.006 | 0.000 | 0.463 | 1.162 |
| | Eco-Friendly Options | 0.241 | 0.071 | 0.239 | 0.393 | 0.001 | 0.472 | 1.118 |
| a. Dependent Variable: Tourist Satisfaction | | | | | | | | |

*Source: Authors Computation*

## Discussion

The results of this study underscore the multifaceted nature of tourist satisfaction, revealing significant influences from both technological and environmental factors. The regression analysis confirms that information availability, mobile app convenience, and AI intervention usefulness are the most influential predictors of tourist satisfaction, which aligns with the growing emphasis on digital tools and real-time access to information in tourism services [36, 37]. The positive influence of mobile app convenience ($\beta = 0.379$) and information availability ($\beta = 0.485$) highlights the increasing demand for seamless digital experiences, where tourists expect quick, reliable access to information and services through mobile applications [38]. This is consistent with recent trends where AI and mobile technology play pivotal roles in enhancing operational efficiency and customer experience [39, 40].

Despite the emphasis on digital tools, the relatively low score for AI Intervention Usefulness (mean = 3.15) suggests that tourists may not yet fully trust or utilise AI-based systems in their travel experiences. This points to a potential gap in exposure, awareness, or the reliability of AI interventions in tourism [41]. However, the inclusion of Sustainability Awareness ($\beta = 0.285$) and Eco-Friendly Options ($\beta = 0.239$) as significant predictors highlights a shift towards environmentally conscious tourism, indicating that tourists are increasingly prioritising sustainability in their travel decisions [42].

The findings reinforce the need for tourism services to balance technological innovation with sustainability initiatives. Despite a moderate level of satisfaction (mean = 3.45), addressing these factors could significantly improve the overall tourist experience. Future research could explore the role of AI in fostering sustainable tourism practices and examine tourists' evolving trust in AI technologies.

## Conclusion

The study affirms that artificial intelligence (AI) has become integral across all major functions of the tourism industry, including forecasting, customer interaction, personalisation, and sustainability enhancement. AI tools significantly

contribute to accurate forecasting of tourist behaviour, demand, and revenue projections using diverse datasets (e.g., operational, governmental, and social media data), albeit facing challenges like data noise and accuracy concerns. Intelligent robotics and automation technologies are enhancing operational effectiveness in tourism and hospitality sectors, especially in overcoming language barriers, managing human resources, and improving service quality. AI-driven systems, particularly chatbots, virtual assistants, and recommendation engines, provide personalised travel experiences, improve service delivery, and elevate customer satisfaction through behaviour analysis and real-time data. AI applications support sustainable tourism through resource optimisation, eco-friendly recommendations, waste reduction, and virtual alternatives that minimise ecological footprints. The industry is transitioning from human-centric to technology-augmented models, integrating AI into destination management, marketing, and strategic planning processes. Augmented Reality (AR), Virtual Reality (VR), and the Internet of Things (IoT) are increasingly incorporated into travel services, enhancing pre-travel decision-making and in-travel experiences. VTAs enable real-time support, itinerary planning, booking integration, and multilingual services—representing a critical innovation in smart tourism facilitation.

Customer Satisfaction Drivers:

- Information Availability ($\beta = 0.485$) is the strongest determinant of tourist satisfaction.
- Mobile App Convenience ($\beta = 0.379$) and AI Usefulness ($\beta = 0.413$) significantly enhance user experience.
- Sustainability Awareness ($\beta = 0.285$) and eco-friendly options ($\beta = 0.239$) also contribute positively to satisfaction.
- The regression model explains 58.3% of the variation in tourist satisfaction ($R^2 = 0.583$), indicating strong influence of AI-related variables.

A surge in scholarly publications and commercial implementations reflects a rising momentum toward embedding AI in tourism ecosystems. VOS viewer analysis highlights six dominant research clusters, with "AI", "sustainable development", and "tourism" acting as thematic intersection points, revealing strong interdisciplinary linkages.

**Future scope**
The field of artificial intelligence (AI) research in the travel and tourism sector has a broad potential and is developing quickly. As AI technologies advance, new avenues for study and innovation are being made possible by their incorporation into the tourist industry. How AI-powered recommendation systems and deep learning may increase client loyalty and happiness. Travellers from across the world may benefit from natural language processing, multilingual assistance, and virtual tour integration with AR and VR. AI tools for regulating overtourism or under tourism and predicting visitor behaviour. AI helps with energy consumption, trash management, and smart transportation, all of which support sustainable tourism. Emotional AI finds its applications in brand management and customer support. There are issues related to safety, ethics, and regulations that arise when implementing autonomous technologies in the travel industry. AI plays a role in monitoring sustainability indicators and motivating passengers to change their behaviour, while also creating inclusive AI solutions for travellers with visual impairments. constructing safe artificial intelligence systems and comprehending travellers' worries about data usage.

**Conflict of Interest**
The authors declare that they have no conflict of interest.

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