ARTIFICIAL INTELLIGENCE IN TOURISM: ENHANCING PERSONALIZATION THROUGH CONTACTLESS INTERACTION

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Abstract

The integration of Artificial Intelligence (AI) and biometric technologies is rapidly transforming the tourism industry, with a strong shift toward personalization, contactless interaction, and enhanced traveler safety in the post-pandemic era. This paper explores how mobile applications, AI-driven recommendation systems, and biometric solutions such as facial recognition, fingerprint scanning, and digital identity verification are enabling seamless and intelligent travel experiences. Contactless services like automated check-in, smart room access, digital passports, and biometric boarding at airports not only improve operational efficiency but also reduce physical contact, reinforcing perceptions of safety among travelers. Additionally, contactless payments, especially abroad, and automated baggage systems are redefining convenience in international travel. This study examines the role of AI in fostering greener tourism through paperless processes, while also addressing challenges such as data privacy, system interoperability, and cost of implementation. It further highlights the barriers to adoption among elderly travelers, individuals with disabilities, and populations in low-tech regions, proposing inclusive strategies to bridge these digital divides. By analyzing biometric data collection practices at borders, hotels, and tourist attractions, the paper critically evaluates the balance between innovation and ethics. Ultimately, the research states AI's potential to deliver highly personalized, efficient, and sustainable tourism experiences while outlining the infrastructural and societal considerations needed for widespread adoption.

Keywords: **Artificial Intelligence in Tourism, Contactless Travel, Biometric Technology, Smart Tourism.**

Introduction

The tourism industry has experienced profound changes in recent years, driven by advances in Artificial Intelligence (AI), biometric technologies, and the urgent need for contactless solutions accelerated by the COVID-19 pandemic. As travelers increasingly seek safe, efficient, and personalized experiences, AI-powered mobile applications and biometric systems have become central to reshaping service delivery across hospitality, transportation, and destination management. Contactless check-in processes, smart room access, and biometric boarding at airports are rapidly becoming the new standard, enabling seamless travel experiences while minimizing physical contact and reducing health risks. Moreover, the integration of digital passports, automated baggage handling, and contactless payments abroad has streamlined international travel, enhancing convenience and security. These innovations also contribute to environmental sustainability by supporting paperless transactions and greener travel practices. Despite these advances, barriers remain in adopting such technologies, especially among elderly travelers, individuals with disabilities, and communities in low-tech regions, highlighting the need for inclusive strategies to bridge the digital divide.

Biometric data collection at borders, hotels, and tourist attractions presents new opportunities and ethical challenges, particularly in balancing privacy concerns with enhanced personalization and operational efficiency. This paper explores the transformative role of AI and biometric technologies in creating adaptive, safe, and environmentally conscious tourism experiences, while addressing the social, technological, and ethical dimensions critical to widespread adoption.

Objectives

The main objective of this study is to explore how Artificial Intelligence (AI) is enhancing personalization in the tourism industry through the implementation of contactless technologies. Specific goals include:

1. To examine how AI-powered solutions (e.g., mobile apps, biometric check-ins, digital passports) are transforming the tourism experience.

2. To evaluate the role of AI in improving traveler safety and convenience, especially in a post-pandemic context.
3. To analyze the environmental and operational benefits of contactless, paperless travel systems.
4. To identify barriers to adoption among elderly populations, persons with disabilities, and travelers from low-tech regions.
5. To explore ethical concerns surrounding biometric data collection in tourism (airports, hotels, and attractions).

Literature Review

The integration of Artificial Intelligence (AI) in tourism has attracted increasing academic attention over the past decade, particularly as the industry moves toward contactless and personalized services. Various studies have explored the technological, strategic, and experiential dimensions of AI adoption in travel and hospitality.

Tsaih and Hsu (2018) proposed a conceptual framework linking AI learning with organizational strategies and business processes to support smart tourism development. Their model incorporates variables such as smart destinations, smart business ecosystems, and AI technologies to build intelligent systems that enhance the tourist experience. The study emphasizes the need to simplify complex AI functions into practical cognitive processes that can drive innovation in the tourism sector.

Building on applied uses of AI, Zlatanov and Popesku (2019) examined emerging applications in the travel and hospitality industry, focusing particularly on AI-based customer service tools such as Facebook chatbots and automated travel bots. Their study highlights how AI and robotic automation create new operational opportunities and help deliver efficient, personalized services, ultimately improving customer satisfaction and productivity.

Similarly, Ivanov and Webster (2019) introduced the RAISA (Robotics, Artificial Intelligence, and Service Automation) framework, analyzing its influence across sectors such as hotels, museums, restaurants, and tourism information centers. The study discussed how self-service technologies and chatbots impact service quality and tourist experience, while also noting customer attitudes and practical challenges in RAISA implementation.

Ferras et al. (2020) explored the intersection of open innovation and AI in tourism, identifying AI as a transformative force in improving customer engagement through tools like cognitive interfaces, social media integration, and smartphone-based experiences. Their findings suggest that AI enables highly personalized tourist activities based on individual traits, enhancing both satisfaction and emotional connection with destinations. The study also emphasized that these technologies make personalized tourism more accessible, even for low-budget travelers.

Samala et al. (2022) conducted a systematic analysis of robotics and AI applications in tourism, pointing to both benefits and limitations. While AI enhances service delivery and simplifies travel planning by replacing traditional intermediaries, it still lacks the emotional depth that experiential tourism demands. Technologies such as virtual reality, chatbots, and AI-based language translators were found to improve convenience and accessibility, though the absence of human touch remains a concern.

Methodology

This study incorporates a qualitative, exploratory research designbased solely on secondary datasources. The approach is desk-based and focuses on synthesizing existing literature, industry reports, and web-based resources.

Artificial Intelligence in the Tourism Industry

Tourism is a multi-dimensional industry composed of several key components, each of which contributes to the overall travel experience: transportation, accommodation, attractions, food and beverage, and travel services. With the rise of digital transformation, especially in the aftermath of the COVID-19 pandemic, Artificial Intelligence (AI) has become increasingly embedded within each of these components, enabling a shift toward personalized, contactless, and data-driven service delivery.

Components of Tourism
Attraction
1. Enhanced visual search

Tourists would be able to use their smartphone cameras to take pictures of destination landmarks, artworks, or other attractions. Computer vision algorithms can then identify these objects and provide detailed information, historical context, or related tourist recommendations. This feature would enhance the exploration experience, making it more interactive and informative for the tourists.

2. AR & VR Experiences

Augmented and virtual reality combine with AI to create immersive, interactive experiences in attractions. AR overlays historical reconstructions or digital annotations onto real-world artifacts, while VR offers virtual tours useful for remote visitors or planning in advance. Studies such as those byPranicevic(2021) demonstrate how AR/VR can enrich cultural tourism while protecting heritage sites.

According to an AIMultiple article, the top AI-enabled AR software vendors today are Apple ARKit and Google ARCore. Apple ARKit leverages AI to provide advanced features such as object labelling, motion capture, and multiple face tracking. Similarly, Google ARCore uses AI for motion capture, object detection, and recognition which enhance the AR experiences. These AI-powered features enhance the realism and functionality of AR applications, making them more engaging and useful for a variety of purposes, from gaming and entertainment to education and tourism.

3. Real-time Crowd Monitoring & Safety

AI-enabled computer vision and crowd analytics help manage visitor flow by detecting congestion and adjusting operations dynamically. Platforms focused on crowd detection (e.g., Morella in Spain) show how multimodal AI systems can identify unusual crowd behaviors and support safer, smoother experiences.

4. Contactless Entry via Biometric Authentication

Attractions are adopting biometric systems like facial recognition or QR based check-ins for touch-free admissions. These reduce physical contact and streamline entry. For example, digital life reports note that mobile keys and touchless access are increasingly preferred, especially among mid-aged travelers, enhancing both safety and convenience.

5. Inclusive & Multilingual Access

AI-powered real-time translation tools and smart guides lower language barriers and improve accessibility. Platforms like Cuseum's digital assistants can tailor museum exhibit descriptions in multiple languages, making cultural spaces more inclusive.

Accommodation

1. Automated and Contactless Check-In/Check-Out

Hotels increasingly offer self-service kiosks or mobile apps for check-in/check-out. Technologies like NFC (Near Field Communication), facial and voice recognition, and QR codes enable guests to bypass the front desk entirely. These systems speed up service, reduce operational costs, and boost guest safety by limiting direct interactions. During the COVID-19 pandemic, demand for such systems surged, with many hotels permanently adopting them for efficiency.

Example: Hilton Honors app allows automated check-ins upon arrival; Henn-na Hotel in Japan features fully robotic reception and housekeeping.

2. Keyless Room Entry and Mobile Access

Guests can unlock their rooms using their phones, RFID-enabled bracelets, or biometrics, improving convenience and security.Eliminates lost key issues and enables seamless access to amenities and spaces.

Example: Marriott Bonvoy and Accor offer mobile key features in their loyalty apps, enabling room access through encrypted Bluetooth or NFC.Some hotels use facial or fingerprint recognition for guests to unlock their doors.

3. Enhanced Personalization with AI

AI analyzes guest profiles (preferences, booking history, feedback) to dynamically personalize room settings, offers, and communications. Dining, activities, wellness services, and even room settings can be customized in real time. Unified AI-driven platforms aggregate guest inquiries from multiple channels and provide immediate, context-aware responses, increasing satisfaction and upselling opportunities

Examples: AI systems adjust the room temperature or lighting preferences according to guest profile. Personalized welcome messages, customized amenity suggestions, and push notifications for events or discounts. Chatbots (e.g., Edwardian Hotels' Edward) handle guest queries and requests 24/7.

4. Operational Benefits and IoT Integration

AI-driven IoT devices proactively maintain hotel infrastructure, reducing downtime and costs.Internet of Things (IoT) enabled room link devices (thermostats, lights, TVs) to central AI systems. AI-driven predictive maintenance identifies device issues before they disrupt service.AI manages lighting and resource use based on occupancy and guest behavior, improving sustainability.

Examples: Rooms that auto-adjust climate/lighting based on occupancy or time of day. Smart minibars or shower systems that track usage. Housekeeping robots assigned by AI based on guest presence/absence.

5. Contactless Service Delivery

Guests can order room service, book amenities (spa, gym, etc.), and pay via mobile or voice interface, minimizing staff interactions and supporting hygiene. Services like room service, laundry, or amenity requests are managed via apps, online menus, or voice assistants (e.g., Alexa for Hospitality).

Examples: QR code-based ordering for room service. Voice-controlled in-room devices to request towels or control ambiance for the guest.

Transportation

1. Smart Ticketing and Biometric Boarding

Travelers use mobile devices for digital tickets and boarding, eliminating the need for paper or manual verification.AI enables seamless travel with contactless ticketing (QR codes, NFC, digital wallets) and biometric identification at airports, rail stations, and bus terminals for the passengers.Airports deploy facial recognition, fingerprint, and iris scanning to streamline security and automate immigration, enhancing both safety and throughput.

Examples: Delta Air Lines uses facial recognition for check-in, security, and boarding at select US airports. Indian Railways and Heathrow Airport have trialed biometric (fingerprint, facial) ticketing.

2. AI-Driven Navigation and Travel Planning

Machine learning powered apps recommend personalized itineraries, travel routes, and real-time updates based on user preferences, location, and real-time conditions.AI platforms analyse the data of past trips, social media, and

trends. Based on the data it suggest routes, attractions, and real-time itinerary adjustments. Machine learning models offer travelers optimal routes, predict disruptions, and suggest alternatives, improving punctuality and reducing stress

Examples: Google Maps and Moovit use AI to suggest optimal public transit or pedestrian routes considering user habits and live data. Airline and rail apps dynamically alert travelers to delays and propose alternative arrangements.

3. Autonomous and Connected Mobility

AI is integral to the development of autonomous shuttles and cabs seen in smart tourist cities. Dynamic route planning and demand forecasting help optimize public transportation efficiently. AI controls environmental impacton autonomous vehicles (self-driving shuttles, airport robots, driverless taxis) and coordinates intelligent transportation systems in smart cities.

Examples: Singapore's Changi Airport deploys autonomous baggage carts. Las Vegas tests self-driving shuttle services for tourists.

4. Contactless Payments and Service Access

Contactless payment solutions in taxis, trains, and other transport harness NFC and digital wallets for touchless transactions. Fares and services are paid for through mobile wallets (Apple Pay, Google Pay), NFC cards, or in-app purchases—reducing need for cash or ticket counters.AI and robotics support baggage drops and tracking without human intervention, speeding up flows at airports

Examples: London's Oyster card system. Cashless ride-hailing (Uber, Ola) and digital toll payments.

5. Operational and Environmental Benefits

AI helps reduce congestion, match supply and demand, and lower emissions through intelligent transportation systems. AI algorithms enhance payment security and monitor for suspicious activities.AI helps transport providers predict demand, adjust schedules, reduce fuel consumption, and lower emissions through "smart" routing and maintenance.

Examples:Airlines use AI for predictive maintenance, reducing flight delays and minimizing environmental waste. Smart trains adjust speed to optimize energy use (Japanese Shinkansen).

Barriers of Artificial Intelligence in Tourism

The adoption of Artificial Intelligence (AI) in the tourism industry is transforming guest experiences, operations, and service design, but it also brings distinct challenges and barriers that affect businesses, travelers, and communities. These can be grouped into several core categories:

1. Data Privacy and Security

AI systems require vast amounts of personal and behavioral data to function effectively, raising significant privacy risks for travelers, who may not be aware of, or consent to, the extent of data being collected and analyzed. The risk of data breaches, unauthorized data use, or surveillance can damage consumer trust and lead to regulatory scrutiny. There is a need for robust data protection frameworks and transparent policies to ensure responsible data governance.

2. Ethical Considerations and Algorithmic Bias

AI algorithms trained on incomplete or skewed datasets may perpetuate or exacerbate biases related to race, age, gender, or socioeconomic status, leading to unfair service or pricing. Increasing automation can result in significant workforce reductions, particularly in service roles central to tourism human touch. Over-reliance on automated systems can diminish the personal, cultural, and authentic aspects of travel value. Lack of transparency in AI decision making makes it challenging for businesses and regulators to ensure fairness and accountability.

3. Technical and Infrastructural Barriers

Implementing and maintaining AI solutions requires significant investment, which can be prohibitive, especially for small and medium-sized enterprises (SMEs). Existing infrastructure may not be compatible with new AI technologies, complicating integration and increasing costs. Poor or fragmented data can reduce AI effectiveness, resulting in unreliable recommendations or operational errors; scaling AI systems to handle large, dynamic datasets is also a challenge.

4. Skills and Knowledge Gaps

Tourism businesses often lack access to the specialized talent and expertise needed to develop, implement, and maintain AI systems. Ongoing staff training is required to ensure effective adoption and use of AI tools.

5. Regulatory and Market Barriers

The fast pace of AI innovation is outstripping regulatory development, resulting in uncertainty and legal risks for organizations adopting AI. Certain traveller groupselderly, disabled, or those from low-tech regions may find fully digital or contactless services difficult to access, hindering inclusivity and equal participation.

6. Operational and Business Risks

AI systems can fail unexpectedly, producing inaccurate outputs or disruptions during critical customer interactions.When the cost of AI adoption outweighs perceived benefits, and businesses may resist investing in new technology.

7. Social and Environmental Concerns

The automation fueled by AI may alter job profiles, displace traditional roles, and reshape local economies posing challenges for communities reliant on tourism employment. Environmental impacts may arise if AI-driven tourism accelerates travel demand without sustainable planning.

Conclusion

Artificial Intelligence (AI) is fundamentally reshaping the tourism industry by enabling highly personalized, efficient, and seamless travel experiences through contactless interaction technologies. From AI-powered chatbots and personalized mobile applications to biometric-enabled check-ins and smart room access, these innovations have become critical in meeting travellers evolving demands for safety, convenience, and customization especially in a post-pandemic world. The integration of AI across the diverse components of tourism including accommodation, transportation, and attractions brings operational efficiencies, environmental benefits through reduced paper use and smarter resource management, and enhanced accessibility via multilingual AI assistants. However, these technological advances are accompanied by significant challenges. Data privacy concerns, ethical dilemmas related to biometric information, algorithmic bias, high implementation costs, and the risk of excluding vulnerable or digitally marginalized traveller groups demand careful governance, inclusive design strategies, and transparent practices.To fully realize the transformative potential of AI in tourism, stakeholders must prioritize ethical data stewardship, invest in upskilling the workforce, and develop technologies that balance automation with the preservation of authentic human experiences. Future research should continue to explore emerging AI trends such as generative AI, emotion recognition, and IoT-enabled environments, alongside robust investigations into social, cultural, and regulatory impacts. AI-driven personalization through contactless interaction offers a promising pathway to more adaptive, safe, and sustainable tourism; yet, it requires a collaborative, multidisciplinary approach to harness its benefits equitably and responsibly across the global travel ecosystem.

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