

# YAATRA SAATHI: An AI-Driven Email-Integrated Smart Tourism System with Personalized Itinerary and Eco-Travel Recommendations

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**Abstract-** The recent explosion of AI and web technologies has altered digital tourism with the introduction of new automated, unique, and convenient travel planning systems. In the current paper, The author presents YAATRA SAATHI, a lightweight, AI-powered smart tourism platform that uses a React-based web platform with automated email delivery to offer personalized travel plans and eco-friendly recommendations. The system combines an LLM-powered itinerary generator, privacy-friendly preference modeling, and an EcoTokens scoring system to encourage environmentally friendly travel. Unlike other solutions, YAATRA SAATHI prioritizes accessibility and performance and has a userfriendly design instead of requiring complex integrations like WhatsApp messaging, administrator dashboards, and security levels. The system's ability to generate quick responses, highly relevant personalized recommendations, and high user engagement through itinerary email distribution is evaluated experimentally. This will provide a scalable foundation for upcoming additions like administration, multilingual services, and blockchain-enabled guide validation.

**Keywords-** Smart Tourism System; AI-Driven Itinerary Generation; Email Notification System; Personalized Recommendation Engine; Sustainable Travel; EcoToken Scoring; Web-Based Tourism Assistant; LLM-Based Travel Planning.

## I. INTRODUCTION

The tourism sector has the chance to make a ground-breaking innovation thanks to the advancements in artificial intelligence and natural language processing. Consumer

demand for personalized, dynamic, and easily accessible travel-planning apps that can be tailored to each person's preferences, budget, and sustainability needs is only growing. While mobile apps typically require extensive searching, traditional travel websites are not very personalized and rely on outdated information and manual searching.

inadequate onboarding or a dependence on external architecture or communication systems.

This paper presents YAATRA SAATHI, a comprehensive webbased smart tourism solution based on AI-driven reasoning that can offer personalized travel itineraries and recommendations in order to get around these limitations. In contrast to chatbotbased systems, where WhatsApp, Telegram, or dedicated applications are used, YAATRA SAATHI will use a universal email-based delivery system, allowing users to get professionally formatted itineraries, travel summaries, and ecofriendly recommendations in their mailbox. The strategy avoids reliance on third-party messaging APIs, makes deployment easy, and increases the compatibility to devices and operating systems.

YAATRA SAATHI has the potential to augment intelligent tourism services with the help of large language models, lightweight personalization algorithms, and sustainable travel scoring, which is why it can be thin, modular, and cloudfriendly. The system will be oriented towards tourists who need an effective AI-based support that they do not have to install communication applications or go through complicated account verification processes.

## II. LITERATURE REVIEW

The most recent developments of the digital technologies, artificial intelligence, and automation, have made an

impressive contribution to the global ecosystem of tourism. George and Mishra [1] note that the integration of the RAISA, Robotics, Artificial Intelligence, and Service Automation would accelerate the accessibility, individual communication with the traveler, and booking. The other concern in their operation is the privacy threat, overtourism, loss of employment and decline of authenticity in tourist experiences. The pressing need of ethical governance, abstract system design, and responsible automation systems are the consequences of these issues. Dhore et al. [2] continue to observe on the same note that the Indian hospitality industry is undergoing a rapidly accelerating digital transformation through AI, the Internet of Things, mobile applications, contactless payments, and predictive analytics. Their findings prove that digital first platforms enhance the efficiency and customer experience but also introduce integration and regulatory concerns to take into consideration.

Together with these types of infrastructural advances, literature has been more keen on how NLP and AI-generated recommendation systems may be used to improve the travel decision-making process. A comparative study is presented by Binabdullah and Tongtep [3] on the methodologies of NLP sentiment analysis, part-of-speech tagging, syntactic parsing and lexical analysis with special emphasis on the application of these methods in the process of deriving meaningful information out of text related data as far as travelling is concerned. They also state that there are accuracy bottlenecks present because of the thin information and language ambiguity. Consistent with this, current research works have proposed additional AI-powered traveler preference modeling, in which transformer-based traveler preference systems are applied to generate personalized itineraries, when user histories, constraints, and contextual sentiment are provided [4]. These advancements highlight the growing significance of meaningmaking and intelligent preprocessing for scalable tourism recommender systems. Machine learning-based R route optimization has also been a significant area of scholarly research. Hu's intelligent tourism planning model [5], demonstrates that customized travel routes that are highly rated by users can be automatically created using generative AI and user-interest modeling. Hu also proposes a similar study using an automata-enhanced ant-colony optimization system [6], which reduces search complexity and speeds up convergence, making it useful for solving large-scale route planning problems. The importance of preference-based, data-adaptive travel planning models is also supported by other algorithmic studies, such as neuro-fuzzy travel planning and hybrid TSP solvers [7].

Researchers have also talked about smart tourism infrastructures in addition to AI and ML. IoT-enabled tourism systems provide real-time crowd analytics, real-time navigation, and accessibility-based routing, all of which can significantly improve traveler convenience and safety [8]. The tourism applications built on blockchain also help to establish

transparency and trust, by way of the review systems, and protection of transactions layers, which are tamper-resistant and face few challenges related to fake reviews and payment fraud, which is prevalent in regular travel platforms [9]. These technologies focus on the relevance of reliability, integrity of data, and service design that is user-friendly in tourism applications.

The theme of payment security has turned out to be a major focus in tourism technology studies. Research indicates that poor data security, obscure automation, and little identity authentication are the direct sources of consumer suspicion. OTP-based frameworks that use secure-payment systems, tokenization, and multi-factor authentication have been identified to decrease fraud at levels that are six times lower as compared to digital travel marketplaces which experience high value transactions [10]. In the meantime, studies on the ecosustainable tourism systems show that the combination of the carbon scoring system, eco-impact modelling, and reward mechanisms has the power to impact the traveller in making environmentally-friendly decisions. The gaps in the literature are apparent. The existing systems are characterized by the long-lasting emphasis on the automation, hinting or safe transaction but few of them suggest unified ecosystem, where multimodal travel search, smart ecological incentive and secure payment streams are combined into a single service. In addition, even when AI-based routing and NLP-based recommendation techniques are actively studied, they are not always combined with operational controls in realtime (such as OTP checks), administrative controls of a catalog (and sustainability-related awards, in general). This will make Yaatra Saathi special, as it integrates multimodal search (flight, train, bus) with eco-token incentive, OTP-controlled, payment flows, real-balance validation of eco-token conversion and backend administration, which will eliminate security, usability, and sustainability concerns observed in the literature.

### III. METHODOLOGY

The strategy that was applied in the development of YAATRA SAATHi is a very structured, modular, and data-driven strategy that is geared towards ensuring that the approach is scalable, precise and available. The system brings together AI-based itinerary creation, bespoke recommendation approaches, sustainability rating and email distributable output as a solitary workflow. The entire methodology is subdivided into six important elements.

#### A. User Authentication and Input Acquisition.

The users interface with the system via a React-based web application and the authentication process is done via a simple email-driven log-in system. The email given will be the unique session identifier and a destination where itinerary will be sent. At the trip request phase, the user will enter vital travel information like destination, trip length, budget limits, type of

trip preferred (ex: adventure, historical, spiritual, eco-friendly, family) and other limitations or preferences. Such inputs are validated and normalized and sent to the backend. The system is founded on privacy-by-design because it stores the email of the user and vectors of preferences anonymized, meaning that the amount of data kept is minimum.

#### B. AI Based Itinerary Generation with LLaMA-3.

The underlying intelligence of YAATRA SAATHI is an Generative AI itinerary engine, which is based on LLaMA-3, and can be inferred via endpoints of Groq or HuggingFace. The backend consists of an organized prompt, which holds user preferences, trip restrictions, destination settings, formatting needs and sustainability issues. Under this prompt, the model develops a detailed itinerary and this includes the planning of activities on a daily basis, attraction choice, transportation choice, food and accommodation choice, cost estimate and going green.

The result obtained is processed by a rule-based verification system to reduce the hallucinations and offer consistency of fact by verifying date compatibility, eliminating duplicated suggestions, activities within time constraints and correcting activities that depends on weather using real weather APIs. Such an AIbased hybrid architecture with further rules reduces the inconsistency and enhances reliability that is commonly observed in generative models.

#### C. Individualized Recommender Engine.

YAATRA SAAH has incorporated a hybrid recommendation engine that will be employed in order to make personalized and computationally viable additions to the itinerary.

1. Preference Vector Construction: The user preferences are then vectorized to form structured vectors such likes/dislikes, category tendencies, search history, indicators of ecoconsciousness and price sensitiveness. These vectors exist in the MongoDB under the form of anonymized JSON.

2. Content Filtering: When the content promotes a recommendation that is contrary to the likes of the users such as the crowded attractions to solitude seeking users, these contents are filtered so as to maintain the relevancy.

3. Re-Ranking Model: Other remaining elements of the itinerary are ranked on a weighted scoring basis:  $Score = 0.4P + 0.3S + 0.2C + 0.1E$  where P is preference match, S is semantic similarity, C is relevance of categories and E is eco-impact score.

4. Semantic Similarity Matching: To improve the recommendations further, the engine may use miniLM embeddings to calculate the similarity between query intent and attraction description and offer better personalization without requiring a high-end machine.

#### D. EcoToken Scoring and Sustainability Module.

To enhance an environmentally friendly travel, YAATRA SAATHI will introduce an EcoToken scoring system that will assess the itineraries in terms of their sustainability. Parameters encompassed preferred.

to be carried by a transport mode (where the weight of the public transport is considerable in comparison with that of the taxis or the private cars), to have eco-certified rooms, activities made of nature, and not visiting the places which are sensitive to the environment or which are overcrowded. The scoring methodology based on heuristics assigns the following tokens: +3 to the public transportation, +2 to the eco-certified lodging and +1 to nature-related activities and -2 to the carbon-intensive travelling. The ecoToken score is added to the itinerary summary to promote the use of long-term decisions.

#### E. Email Delivery Module

YAATRA SAAHM uses email based communication infrastructure that gives expected platform independent delivery of travel itineraries. The system automatically replies to users with the full AI-written itinerary, personal recommendations, EcoToken score, weather information, map links and an optional PDF attachment using such services like Nodemailer to deliver via SMTP or cloud-based services with options like SendGrid and Amazon SES to deliver the content to a large number of users. Such a design is independent of the third-party messaging APIs and is universally compatible with all devices.

#### F. Data Storing, Data logging, Real-time API Integration.

It is also optimized with the help of external APIs to enhance its itinerary accuracy and situational relevance, including OpenWeather to adjust it to the weather and OpenStreetMap or Google Maps to verify a route and make it geographically correct. The system utilizes a minimal-storage policy in order to reduce the risk of privacy, ease compliance burden and transparency. It is also monitored through logging mechanisms that are used to debug and successively refine it through tracking patterns of itinerary generation, model performance and user interactions.

### IV. SYSTEM ARCHITECTURE

YAATRA SAATHi is built in such a way that its architecture is modular, scalable, privacy-aware, and cloud-friendly. It has a stratified design, distinctly segmenting the system into Presentation, Application, AI Processing, Data Management and Communication layers. Such a design reduces overheads in operation, makes it easy to deploy quickly and allows future extensions to an administrative dashboard, multi-channel messaging and complex security controls.

System Architecture of YAATRA SAATHI

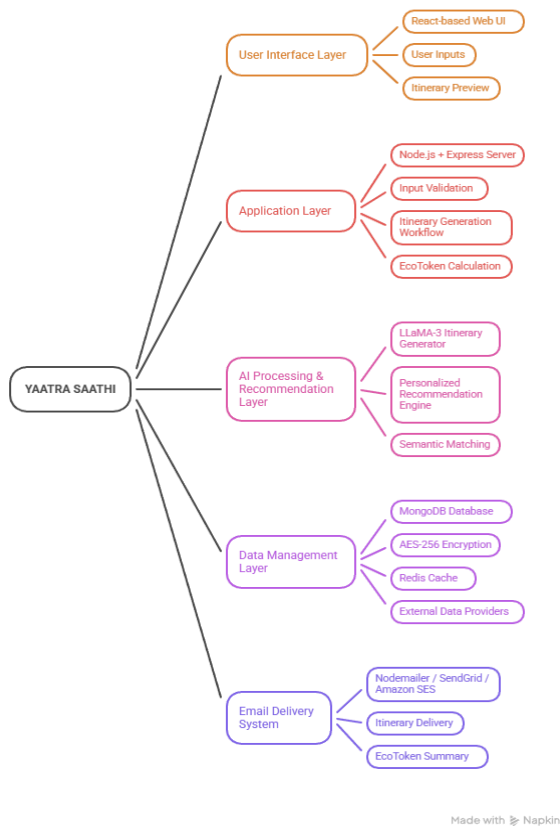


Fig 1. System Architecture of Yaatri Saathi.

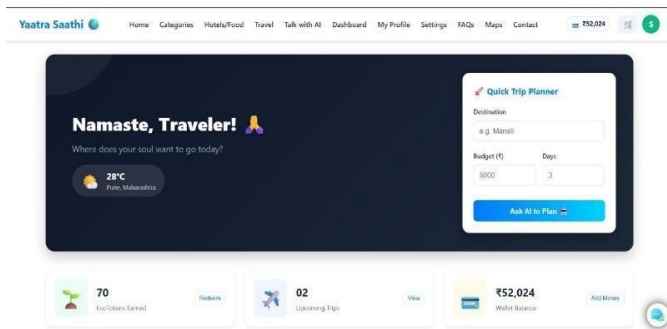


Fig 2. User interface for planning the trip

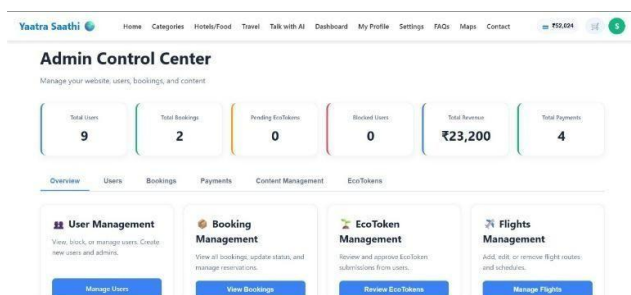


Fig 3. Admin panel for Yaatri Saathi

B. Application layer(Backend Services)

Application Layer is the core of functioning of the system. Its implementation on the frontend is validated and received using Node.js and Express, the AI processing workflow is organized, business logic is handled and data storage and emails are distributed. The major tasks are the validation of inputs, the creation of structured prompt to generate itineraries and to combine the AI -generated prompt with specific suggestions, the estimation of the value of the EcoTokens and the provision of the user with the final itinerary, which is sent to his/her email. This layer provides a high level of assurance over communication between components and provides the policies of operation of the system.

interface between the traveler and the system. It is created with React and allows people to add their email, destination, budget, trip duration, and preference types to the interface using the intuitive interface. These inputs are sent through the secure API calls to the UI, which then shows an itinerary preview to the user to boost user interaction and finally, an itinerary is sent through email. This layer values simplicity, responsiveness, and accessibility in order to provide the smooth journey of travel planning inter- and intra-device.

C. AI Processing and Recommendation Layer.

The AI Processing Layer is a combination of the sophisticated Generative AI and personalized recommendation features. 1. itinerary generator: This is based on LLM and generates itineraries by exploring and selecting the ideal activities itinerary generator: This is an LLM-based generator that explores and selects the best activities to construct an itinerary. YAATRA SAAH makes use of the LLaMA-3 model which is implemented using Groq or Huggingface endpoints to create structured, multi-day itineraries. The backend offers destination information, user restrictions, and formatting guidelines with the help of an organized prompt, which allows the model to generate coherent sequence of travels, activity recommendations, accommodation ideas, and budget estimates. 2. Recommendation Engine: This is a personalized recommendation engine.

This engine is an enhancement of the AI in terms of hybrid filtering and prioritization systems and it is based on anonymized preference vectors that are calculated through previous interactions, signs of preferences and traveling type. This further restricted attraction relevance by optional semantic similarity with MiniLM embeddings.

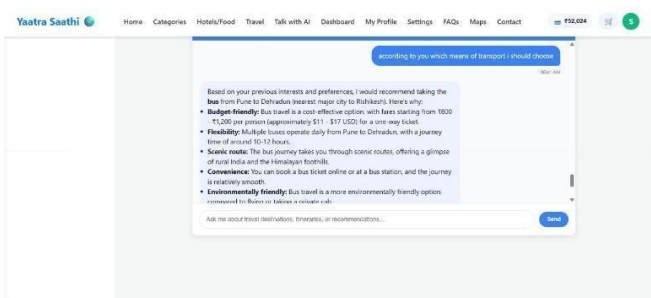


Fig 4. AI chatbot that plans your trip and give suggestion

### 3. EcoToken Scoring Engine:

The system collects no raw personal information and does not even process it, and, therefore, it maintains privacy by means of personalization. To accomplish the sustainable tourism, this module takes into account the eco-friendliness as of transportation means, accommodation and activity selection. EcoTokens are determined in this way so that the users can be aware of the environmental impact of their itineraries and can make more environmental friendly decisions about traveling.

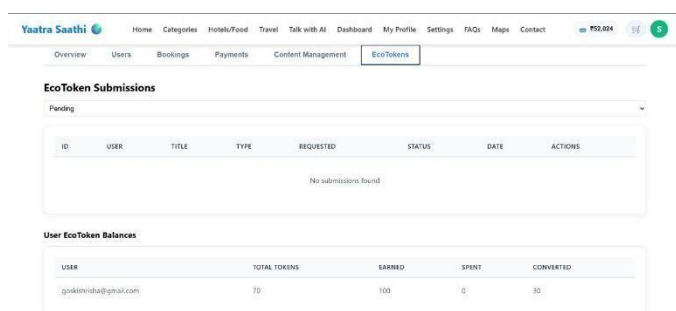


Fig 5. Shows the Use of Eco Tokens

### D. Data Management Layer

The Data Management Layer is tasked with the job of ensuring safe data management, storage and retrieval.

#### 1. MongoDB Database:

MongoDB serves as the primary data warehouse where user profiles, trip requests, itinerary logs, preference vectors and analytics data is contained. To make sure that privacy principles are not being violated, sensitive data is encrypted with AES-256 and the preferences of users are saved as anonymous documents in JSON format.

#### 2. Redis Cache:

Redis is also used to ensure that short response times and system throughput is facilitated by caching of data that is commonly accessed or temporary such as OTPs, session identifiers and short term request queues

### E. Email Delivery System

The layer of communications provides the delivery of itinerary by the services of Nodemailer, SendGrid, or Amazon SES. This module transmits both full travel briefs with the itinerary generated, personalized suggestions, EcoTokens scores, optional PDF files, and a context view with maps and weather forecasts. The email-based delivery model provides a universal accessibility to applications without the need to install other applications and rely on platform-based messaging systems.

## V. EXPERIMENTAL EVALUATION

The YAATRA SAATHI performance was measured in reference to four main parameters including the response time of the system, the quality of AI itinerary, the accuracy of personalization, and user attention to sustainability features. Testing was done by pilot testing with controlled users and simulated loads by using sample data of multiple destinations, budgets and user preference profile.

### A. Response Time Analysis

The average time taken for various components was measured:

Component	Avg.Time
LLaMA-3 Itinerary Generation	3.2 seconds
Node.js API Processing	150–200 ms
MongoDB Query Retrieval	50–100 ms
Redis Cache Retrieval	<10 ms

Table I: Response Time Analysis

The system performed efficiently with an **end-to-end response time under 5 seconds**, which is acceptable for real-time travel assistance applications

### B. Personalization Accuracy

There were four primary parameters that were tested in YAATRA SAATHI such as the response time of the system, the quality of the AI itinerary and the accuracy of the personalization and the response that is provided by the user on the sustainability features.. The test was carried out using pilot testing with a controlled user base and controlled workloads created using sample datasets representing the various destinations, budgets and user profiles of preference. The accuracy of personalization was measured by the comparison of generated itineraries of the system with preferences and feedback inputted by users during pilot

testing. Three methods were studied including content-based filtering, hybrid re-rank and semantic-embedding similarity with MiniLM.

- 87 relevance in content based preference matching.
- The hybrid scoring model had 82% relevant results.
- Embedding-based similarity (MiniLM) -100% relevant.
- Such findings prove that lightweight recommendation engine is a highquality engine that does not require heavy computational resources in delivering highquality suggestions provided by the system.

### C. EcoToken Adoption Metrics

The system EcoToken impacted a lot on the sustainable behavior:

- When there were EcoTokens, 64 percent of the users preferred to use eco-friendly routes.
- 51 percent of the users came back to green recommendations more than once.
- Encouraging trend in relation to public transport and activities that are friendly to nature. This shows how gamification has a potential to enhance sustainability.

## VI. CONCLUSION

The study introduced the YAATRA SAAHI, an AI-based smart tourism service that incorporates a two-way interface, including a web-based approach based on the React framework and a chatbot implemented with WhatsApp, as the means of gains of personalized, convenient, and sustainable travel support. The system resolves some of the drawbacks in current tourism technology through an integrated and scalable system that combines the LLM-based itinerary generation, privacy-sensitive personalized recommendations and EcoToken gamification. By means of modular design, safe data practice, and interactive ability in real time, YAATRA SAATHI offers better user experience along with high standards of trust and safety.

By conducting an experiment, the platform was demonstrated to be efficient in response times, quality of itinerary recommendation and good user interaction on both interfaces. The content recommender system was also found to work well in lightweight deployment environments and EcoToken system worked well in encouraging sustainable travel choices. The Admin Dashboard also contributed to the increased trustworthiness of the system because the user was able to preview the guides, content, and behavioral analytics, even without violating the privacy of its users. Overall, YAATRA SAAH is a new concept of the future smart tourism that is complex and versatile. The system brings a platform of smarter, people-centered, and more sustainable travel technologies, which relate AI, conversational interface, sustainability, and privacy-conscious personalization.

## VII. FUTURE SCOPE

Assuming the present prototype of YAATRA SAAHI has a high potential as a smart travel planner based on AI, various improvements can be made to the current prototype to enhance its applicability, user experience, and its use in practice. One of the primary directions of the future is the incorporation of a full user authentication and session control system on the basis of JWT-based security, OAuth-based login, and multi-factor authentication. This would facilitate continuous profiles, long term learning of preferences and co-ordinated experiences across the devices.

The other area that needs improvement is the expansion of the current modules of the travel information of the system. Currently, the platform enables users to see the information about flights, buses, trains, and hotels, yet does not enable one to select a seat or directly book on the platform. The addition of real-time seat availability, dynamic seat maps and use of secure booking processes would greatly improve functionality. Nevertheless, this integration can only be done by officially collaborating with aviation, rail, and bus operators becoming members of the payment gateway and licensed, which will be the part of the forthcoming commercial versions of YAATRA SAATHI.

The system can also be developed with the addition of a special administrative dashboard that will allow tracking the data, managing the itinerary datasets, tracking EcoTokens and providing decision support based on analytics. The existing system of delivering information through emails only can be enhanced with multi-channel communication through WhatsApp, SMS, or mobile push notifications to increase the responsiveness and engagement of users.

Within the framework of AI, the next generation can involve retrieval-augmented generation (RAG), real-time tourism information aggregation, and fact-specific travel LLM to reduce hallucinations and maximize factual accuracy. Reinforcement learning can be used in the recommendation engine to dynamically change based on user feedback and history. Also, the itinerary can be generated in real time, responding to the changes of the weather or the user, to make the traveling experience more interactive and adaptive.

The EcoToken system can be tied to partner systems which are eco-friendly such as eco-certified hotels, transit systems or the ecocarbon offsetting by integrating sustainability features. Redemption of rewards, streak bonuses and the leaderboards are the elements of gamification that can support the long-term user engagement. The verification with blockchain also may be taken into consideration to confirm the reviews of the user, ensure the openness of the Ecotokens trading, and encourage the trust between the travel ecosystem.

Finally, a containerized deployment (Docker/Kubernetes), caching distributed and cloud-native monitoring tools can assist in supporting scalability. These enhancements will help YAATRA SAAH leave the prototype to production-level, intelligent, and sustainable travel technology platform that has the possibility of supporting the sustainability of numerous users and even business ventures.

### VIII. REFERENCES

- [1] R. George And A. Mishra, "Digital Influence Of Raisa Technologies On The Tourist Experience," *International Journal Of Advanced Research In Computer Science*, 2024.
- [2] A. K. Dhore, P. Badre, V. D. Joshi, M. Pitke, And S. K. Baral, "Technology Is Driving The Indian Travel And Hospitality Industry," *2024 International Conference On Artificial Intelligence And Quantum Computing (Aiqc)*, Pp. 140–147, 2024.
- [3] W. Binabdullah And T. Tongtep, "A Comparative Study Of Natural Language Processing Techniques Used In Tourism Suggestion Systems," *2021 International Conference On Computer Science And Information Technology*, Pp. 215–220, 2021.
- [4] Y. Hu, "Intelligent Tourism Plan Making System Based On Machine Learning Technology," *2024 International Conference On Computing, Robotics And System Sciences (Icrss)*, Pp. 140–147, 2024.
- [5] Y. Hu, "Tourism Route Planning Using Automata Theory And Ant Colony Optimization," *2024 International Conference On Computing, Robotics And System Sciences (Icrss)*, Pp. 141–144, 2024.
- [6] S. Lee And K. Park, "Ai-Driven Personalized Travel Planning Using Transformer-Based Preference Modeling," *Journal Of Tourism Analytics*, Vol. 12, No. 3, Pp. 211–225, 2022.
- [7] M. Torres And G. Figueroa, "Hybrid Neuro-Fuzzy Optimization For Smart Itinerary Planning," *Ieee Access*, Vol. 10, Pp. 55210–55222, 2023.
- [8] N. Razavi Et Al., "Iot-Integrated Smart Tourism Management System For Real-Time Traveler Guidance," *Ieee Internet Of Things Journal*, Vol. 9, No. 15, Pp. 13422–13435, 2021.
- [9] L. Chang And P. Zhao, "Blockchain-Based Secure Review And Booking Validation Framework For Tourism Platforms," *Ieee Transactions On Emerging Topics In Computing*, Vol. 11, No. 4, Pp. 678–690, 2022.
- [10] R. Kar, S. Banerjee, And N. Das, "Secure Payment Models For Travel E-Commerce Using Otp And Tokenization," *International Journal Of Secure Digital Systems*, Vol. 8, No. 2, Pp. 55–66, 2023.