

BUILDING AN INTERACTIVE TOURISM CHATBOT FOR NELLORE LOCATION

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ABSTRACT

Smart Tourism Information Chatbot tailored for the city of Nellore. Leveraging the Rasa framework, the chatbot aims to enhance the tourism experience by providing real-time information on attractions, events, and historical sites. The methodology involves data collection, Rasa NLU and Core model training, seamless integration with Nellore's tourism data, and iterative UI design for optimal user interaction. The user-friendly interface prioritizes intuitive navigation, conversational interactions, and personalized responses. Usability testing and continuous refinement ensure the chatbot effectively meets user needs, contributing to the advancement of smart tourism solutions in Nellore. With the increasing influx of visitors, there is a critical need for an intelligent and user-friendly system that offers instant access to relevant information about local attractions, accommodations, and events. Leveraging the capabilities of the Rasa framework, an open-source conversational AI platform, this project focuses on developing a chatbot tailored specifically for Nellore's tourism needs.

Introduction

The primary objective of our project is to develop an interactive tourism chatbot specifically tailored for Nellore, a culturally rich city nestled in the southern part of Andhra Pradesh, India. Our aim is to revolutionize the tourism experience in Nellore by leveraging cutting-edge technology to provide tourists with instant access to valuable information, personalized recommendations, and real-time assistance throughout their journey in the city.

At the core of our project lies the aspiration to enhance the overall tourist experience in Nellore. By creating a user-friendly chatbot equipped with advanced functionalities, we seek to address the common challenges faced by tourists, such as the lack of access to comprehensive and real-time information about local attractions, accommodations, dining options, transportation services, and more. Through the chatbot, we envision empowering tourists with the knowledge and guidance needed to make informed decisions and optimize their time spent exploring the diverse offerings of Nellore. Furthermore, our project aims to promote the cultural heritage and natural beauty of Nellore by showcasing its hidden gems and lesser-known attractions to a wider audience. By highlighting the city's rich history, religious significance, architectural marvels, and scenic landscapes, we aim to attract more visitors and contribute to the growth of the local tourism industry.

CONVERSATIONAL AI

Conversational artificial intelligence (AI) refers to technologies, such as chatbots or virtual agents, that users can talk to. They use large volumes of data, machine learning and natural language processing to help imitate human interactions, recognizing speech and text inputs and translating their meanings across various languages.

Conversational AI combines natural language processing (NLP) with machine learning. These NLP processes flow into a constant feedback loop with machine learning processes to continuously improve the AI algorithms.

COMPONENTS OF CONVERSATIONAL AI

Conversational AI has principle components that allow it to process, understand and generate response in a

natural way.

Machine Learning: It is a sub-field of artificial intelligence, made up of a set of algorithms, features, and data sets that continuously improve themselves with experience. As the input grows, the AI platform machine gets better at recognizing patterns and uses it to make predictions.

Natural language processing: Natural language processing is the current method of analyzing language with the help of machine learning used in conversational AI. Before machine learning, the evolution of language processing methodologies went from linguistics to computational linguistics to statistical natural language processing. In the future, deep learning will advance the natural language processing capabilities of conversational AI even further.

Unstructured data transformed into a format that can be read by a computer, which is then analyzed to generate an appropriate response. Underlying ML algorithms improve response quality over time as it learns. These four NLP steps can be broken down further below:

Input analysis: If the input is text-based, the conversational AI solution app will use natural language understanding (NLU) to decipher the meaning of the input and derive its intention. However, if the input is speech-based, it'll leverage a combination of automatic speech recognition (ASR) and NLU to analyze the data.

Dialogue management: During this stage, Natural Language Generation (NLG), a components of NLP.

Reinforcement learning: Finally, machine learning algorithms refine responses over time to ensure accuracy.

HOW DOES A CHATBOT WORK?

To understand how a chatbot works, we must first consider the three core mechanisms driving the technology. The three mechanisms that require your attention are rules-based processes, AI-driven decision-making, and live agent intervention. Depending on a chatbot's mechanism, its functionality will be slightly different.

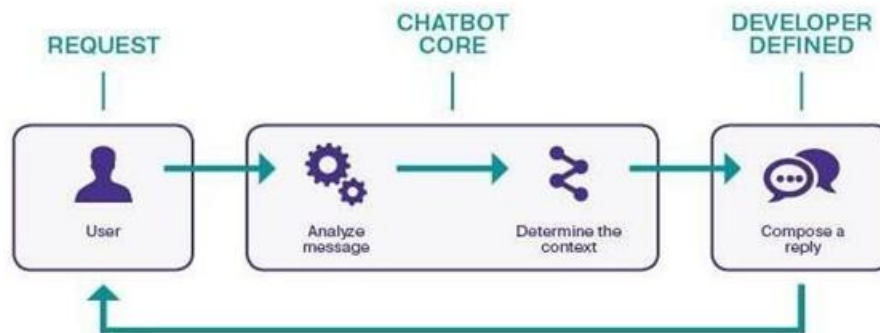


Fig.1. Chatbot Working

Step 1: Rules-based processes work

Rules-based chatbot software performs pre-programmed behaviors based on “playbooks” you create on the user interface’s backend module. Like a digital assistant, rules-based chatbot technology can behave in a certain way based on click activities and simple event triggers like a “yes” or a “no” input. It may also detect a specific keyword or combination of phrases (but only when there is an exact match). For instance, you could program a rules-based chatbot to answer not only if someone chooses “black” or “white,” but also if they say “I want a black item” – the chatbot’s backend module will match the term black with a preconfigured rule.

Step 2: AI-driven decision-making work

Artificial intelligence chatbots employ AI and natural language processing (NLP) technology to recognize sentence structure, interpret the knowledge, and improve their ability to answer questions. Instead of relying on a pre-programmed response, AI chatbot first determine what the customer or user is saying. Then, once they have figured out what user is looking for, the chatbot provides an answer that it believes is correct based on the available data. The machine learns the “right” response over time by analyzing correct and erroneous responses.

With AI-driven decision-making mechanisms, a chatbot can be extremely effective, provided they have a

thorough understanding of your organization, its customers, and its context. This functionality is primarily used by large enterprises like e-commerce as well as other high- volume businesses that demand scale.

Step 3: Live agent interaction work

Live chat is a type of chat system that sits on the webpage or in your mobile application and works as a consumer's window to your support team and contact center. Using this mechanism, chatbots incorporate routing capabilities to assign discussions in real-time.

Literature Review

The Evolution of Chatbots in Tourism: A Systematic Literature Review.

Authors: **Davide Calvaresi, Roland Schegg, Ahmed Ibrahim**, Year: **2022**

Although the concept of conversational agents dates back to the 60s, modern CBTs still mirror certain aspects of that original vision. While chatbots reached a remarkable degree of automation and efficiency (e.g., ordering meals and booking flights), handling sophisticated conversations has not been mastered yet. Indeed, misunderstandings and lack of user-chatbot alignment may generate distress, frustration, and skepticism on a given chatbot or on the technology itself. For example, the Henn-na Hotel (Japan) is known for having a futuristic staff mainly composed of robots. Nevertheless, in 2015 they had to "fire" of their robotic workforce. The project failed to reduce costs and employees' workload. Moreover, a number of tourists reported those bots as annoying and incapable to process even simple requests.

More complex chatbots perform an in-depth analysis of both provided data and the human interlocutor's profile. Advanced AI-based NLPs are not limited to understanding what the user is saying, but also strive to understand tone, mood, etc., enabling ML-based predictions. However, to have good results with ML approaches, a large amount of data are required. This process is laborious and, to date, human intense. A common objective is indeed to reduce the human implication in data extraction and pre-processing.

Chatbot technologies require considerable investments, which are a barrier for many medium-small enterprises (SMEs). However, for those who can afford the development of chatbots, providing simple menu-based solutions no longer confers a plus to the investors. Hence, the users' expectations (led and incited by technological advancements) go way beyond what only two years ago was considered cutting-edge technology. This study systematically elaborated the most relevant recent literature in studies' abstraction, demographic details, application scenarios, recipients, requirements, services realized and desired, technology, advantages, limitations, a open challenges, concluding with a discussion elaborated over the aggregated understanding provided by our investigation.

An overview of chatbot technology

Tourism-led and economic-driven nexus in Mauritius: Spillovers and inclusive development policies in the case of an African nation.

Authors: Rukmani Gounder

Year: 2020

This study investigates the dynamic linkages between tourism growth and economic growth in the African island nation of Mauritius using the spillover index framework based on the monthly data from 2003M11–2020M02. The Granger causality results reflect bidirectional static linkages between tourism-led economic growth (TLEG) and economic-driven tourism growth (EDTG). The dynamic spillover findings show a varying magnitude and direction of TLEG and EDTG hypotheses that are time-dependent. These relationships indicate distinct outcomes where tourism growth or economic growth is the net transmitter or recipient of shocks. The level of spillovers is influenced by economic events, climatic disasters and the coronavirus-19 pandemic crisis. Some inclusive and sustainable development policy implications are drawn for Mauritius and other tourism-dependent African countries.

Adoption of AI-based chatbots for hospitality and tourism

Authors: Rajasshrie Pillai, Brijesh Sivathanu

Year: 2020

As per the results, the predictors of chatbot adoption intention (AIN) are perceived ease of use, perceived usefulness, perceived trust (PTR), perceived intelligence (PNT) and anthropomorphism (ANM). Technological anxiety (TXN) does not influence the chatbot AIN. Stickiness to traditional human travel agents negatively moderates the relation of AIN and AUE of chatbots in tourism and provides deeper insights into manager's commitment to providing travel planning services using AI-based chatbots. This study aims to investigate the customers' behavioral intention and actual usage (AUE) of artificial intelligence (AI)-powered chatbots for hospitality and tourism in India by extending the technology adoption model (TAM) with context-specific variables.

AI chatbot for tourist recommendations: A case study in the city of jeddah, saudi Arabia

Authors: Reem Alotaibi, Ahlam Ali, Haya Alharthi, Renad Almehamadi.

Year: 2020

Chatbots have gained increasing importance in today's research with available applications. They are flexible and can be applied in many application domains. In tourism, chatbots can recommend sights, hotels, activities, or even full travel plans. Smart guidance chatbot, which is a text-based application for the tourism sector in Jeddah city. To address this issue, this paper proposes "Smart Guidance", an AI text-based chatbot developed as a mobile application. It simulates a chat with users in a natural language, it also provides a two-way interaction and it is a single point of contact for all user communications.

We provide a use case in the city of Jeddah, Saudi Arabia. Jeddah is the second largest city in Saudi Arabia and tourists have various choices when it comes to moving around the city. The final evaluation of the chatbot showed that the bot could understand meanings and users' requests. Moreover, users found that the interaction is effective, and the responses are provided immediately. Users were satisfied and like the idea that they could express their needs in their natural language. Furthermore, users enjoyed the interaction and felt engaged. Chatbots can recommend sights, hotels, activities, or even full travel plans.

Authors: E. Adamopoulou, L. Moussiades

Year: 2020

The use of chatbots evolved rapidly in numerous fields in recent years, including Marketing, Supporting Systems, Education, Health Care, Cultural Heritage, and Entertainment. In this paper, we first present a historical overview of the evolution of the international community's interest in chatbots. Next, we discuss the motivations that drive the use of chatbots, and we clarify chatbots' usefulness in a variety of areas. Moreover, we highlight the impact of social stereotypes on chatbot design. After clarifying necessary technological concepts, we move on to a chatbot classification based on various criteria, such as the area of knowledge they refer to, the need they serve and others. Furthermore, we present the general architecture of modern chatbots while also mentioning the main platforms for their creation. Our engagement with the subject so far, reassures us of the prospects of chatbots and encourages us to study them in greater extent and depth. Minimal human interference in the use of devices is the goal of our world of technology. Chatbots can reach out to a broad audience on messaging apps and be more effective than humans are. At the same time, they may develop into a capable information-gathering tool. They provide significant savings in the operation of customer service departments. With further development of AI and machine learning, somebody may not be capable of understanding whether he talks to a chatbot or a real-life agent. Artificial Intelligence (AI) increasingly integrates our daily lives with the creation and analysis of intelligent software and hardware, called intelligent agents. Intelligent agents can do a variety of tasks ranging from labor work to sophisticated operations. A chatbot is a typical example of an AI system and one of the most elementary and widespread examples of intelligent Human-Computer Interaction.

Existing System

Existing systems in the travel industry provide a wide range of services and information for travelers, including destination guides, booking options for accommodations and activities, user reviews, and community forums. Integrating with these systems will enhance the proposed Interactive Nellore Tourism Chatbot by offering users a seamless travel experience with access to comprehensive and up-to-date information.

PROPOSED SYSTEM

The proposed system aims to revolutionize tourism engagement in Nellore through the development of an interactive tourism chatbot. This chatbot serves as a personalized virtual assistant, offering users a seamless interface to explore the rich tapestry of attractions and experiences that Nellore has to offer. By leveraging cutting-edge technology and integrating data from various sources, including local insights and user preferences, the chatbot provides tailored recommendations and information to travelers, enhancing their overall experience.

Key features of the proposed system include the provision of localized information about Nellore's attractions, such as beaches, historical sites, and cultural landmarks. Direct location links to tourist spots on maps facilitate easy navigation for users, ensuring they can efficiently plan and navigate their itinerary. Moreover, the chatbot continuously updates its database with the latest tourist information.

Through iterative deployment and improvement, the proposed system aims to evolve dynamically based on user feedback and interaction data. This iterative approach allows for the refinement of the chatbot's capabilities over time, ensuring that it remains relevant and effective in assisting travelers. Overall, the proposed system serves as a comprehensive and user-centric solution for enhancing tourism engagement in Nellore, empowering travelers to discover and experience the city's hidden gems with ease and confidence.

ADVANTAGES

Enhances tourism experience in Nellore through a Smart Tourism Information Chatbot by leveraging advanced technology, the chatbot provides users with instant access to valuable information, tips, and recommendations, enriching their overall tourism experience in Nellore.

Selection of top tourist attractions for memorable visits. The chatbot curates a list of the best tourist attractions in Nellore, helping users prioritize their itinerary and ensuring they don't miss out on must-see destinations, thereby maximizing the enjoyment of their visit.

Seamless navigation with direct location links to tourist destinations on maps. Integration with mapping services enables users to navigate to tourist spots effortlessly, eliminating the need for manual searching and ensuring a smooth and hassle-free exploration experience in Nellore.

24 Hours Availability, Access to localized information for a personalized travel experience. The chatbot's round-the-clock availability and access to localized information cater to users' needs at any time, empowering them to plan their trips according to their preferences and interests, regardless of their location or time zone.

A single destination offering exploration of diverse attractions by providing comprehensive information on various attractions such as beaches, historical sites, religious landmarks, waterfalls, accommodations, and dining options, the chatbot serves as a centralized hub for all travel-related inquiries, simplifying the planning process and enhancing convenience for users.

SYSTEM STUDY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus, the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

FEASIBLE STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan

for the project and some cost estimates. Preliminary investigation examines project feasibility, the likelihood the system will be useful to the organization. The main objective of the feasibility study is to test the Technical, Operational and Economical feasibility for adding new modules and debugging old running system. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are:

Economic Feasibility

Technical Feasibility

Operational Feasibility

The main objective of the study of the prospect is just to verify the technical, social as well as operational achievement to include additional features and to investigate the past working structure. Every device will be back to earth in the event that they are infinite energy and unremitting time. Perspectives exist in the concentration of attainability of some portion of the quick evaluation. During system analysis the feasibility study of the proposed system isto be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

METHODOLOGY

RASA FRAMEWORK

Rasa is an open-source framework for building conversational AI applications. It provides developers with the tools and libraries necessary to create sophisticated chatbots and virtual assistants that can understand natural language and engage in meaningful conversations with users.

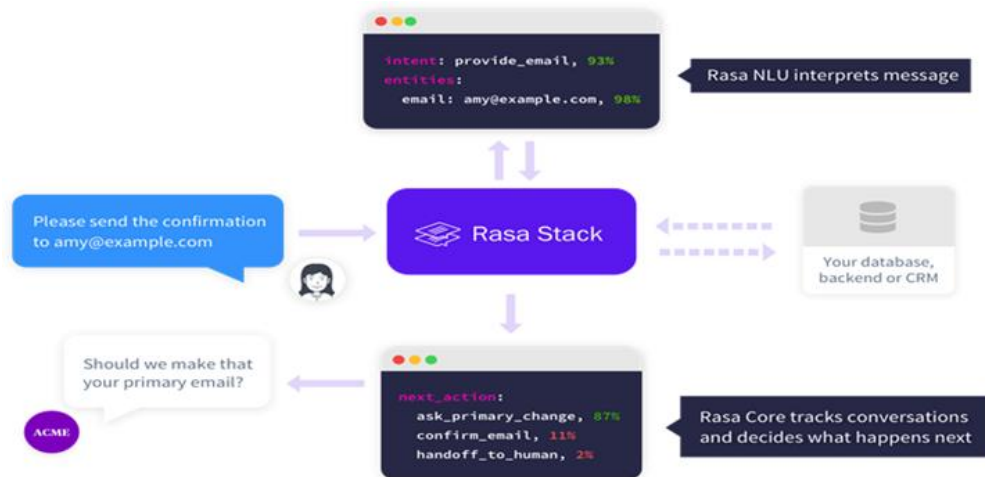


Fig.2. Chat bot using Rasa NLU

Natural Language Understanding (NLU): Rasa's NLU capabilities enable chatbots to interpret and understand user input expressed in natural language. It supports entity recognition, intent classification, and context management to accurately extract meaning from user messages.

Dialogue Management: Rasa's dialogue management system allows developers to design conversational flows and handle complex interactions with users. It supports state tracking, slot filling, and context switching to maintain coherent conversations and guide users through multi-turn dialogues.

Open-Source and Customizable: Rasa is an open-source framework, which means developers have access to its source code and can customize and extend its functionality according to their specific requirements. This flexibility allows for the creation of highly tailored chatbot solutions that meet diverse use cases and industry needs.

4. Machine Learning-based: Rasa leverages machine learning techniques to improve the performance and accuracy of its NLU and dialogue management components. It supports training models on custom datasets and fine-tuning pre-trained models to adapt to specific domains and user interactions.

5. Integration Capabilities: Rasa offers seamless integration with popular messaging platforms, such as Facebook Messenger, Slack, and Telegram, allowing chatbots to reach users across multiple channels. Additionally, it provides APIs and SDKs for integrating with external systems and databases to fetch and process relevant data during conversations.

6. Community Support and Resources: Rasa has a vibrant community of developers, contributors, and users who actively participate in forums, discussion groups, and online communities. The community provides support, guidance, and resources for developers getting started with Rasa and building advanced conversational AI applications.

7. Scalability and Performance: Rasa is designed to be scalable and performant, capable of handling large volumes of user interactions and scaling to meet the needs of enterprise-grade deployments. It supports deployment options such as containerization, cloud hosting, and on-premises installations for optimal performance and reliability.

8.Documentation and Learning Resources: Rasa provides extensive documentation, tutorials, and learning resources to help developers get started with building chatbots and mastering the Rasa framework. This includes step-by-step guides, code examples, and best practices for designing, training, and deploying conversational AI applications.

SYSTEM ARCHITECTURE

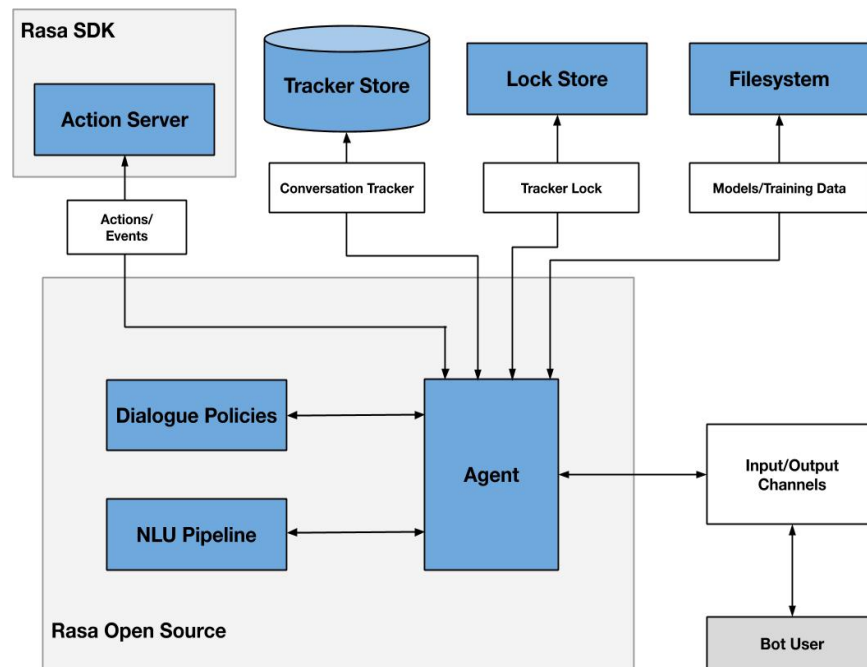


Figure.3. Rasa Architecture Overview

Rasa's system architecture revolves around two main components: the Rasa Core and the Rasa NLU (Natural Language Understanding). Rasa Core handles dialogue management, orchestrating conversations by predicting the next action based on the dialogue history. On the other hand, Rasa NLU processes user messages, extracting intents and entities to understand the user's input. These components interact with each other through defined APIs, enabling developers to create conversational AI applications that can understand user inputs and respond appropriately, forming the backbone of Rasa's chatbot and virtual assistant capabilities.

Rasa's architecture is designed for building conversational AI applications. Here are the key components:

1. Natural Language Understanding (NLU):

The NLU component processes user messages, handling intent classification (what the user wants) and entity extraction (relevant details). It translates user input into structured data that the chatbot can understand.

2. Dialogue Management:

Dialogue management decides the next action based on context. It uses dialogue policies to determine how the chatbot should respond. For example, if a user asks about the weather, the system triggers an action to fetch weather information.

3. Rasa SDK and Custom Connectors:

The Rasa SDK allows developers to define custom actions for the chatbot. Custom connectors enable communication with external platforms (e.g., web, messaging apps).

4. Tracker Store:

The tracker store maintains conversation history, storing user messages, chatbot responses, and context. This data

is crucial for maintaining context-aware conversations.

DATASET

For a tourism chatbot, the dataset would typically consist of various types of information related to tourism in Nellore. Here's an explanation of the dataset components:

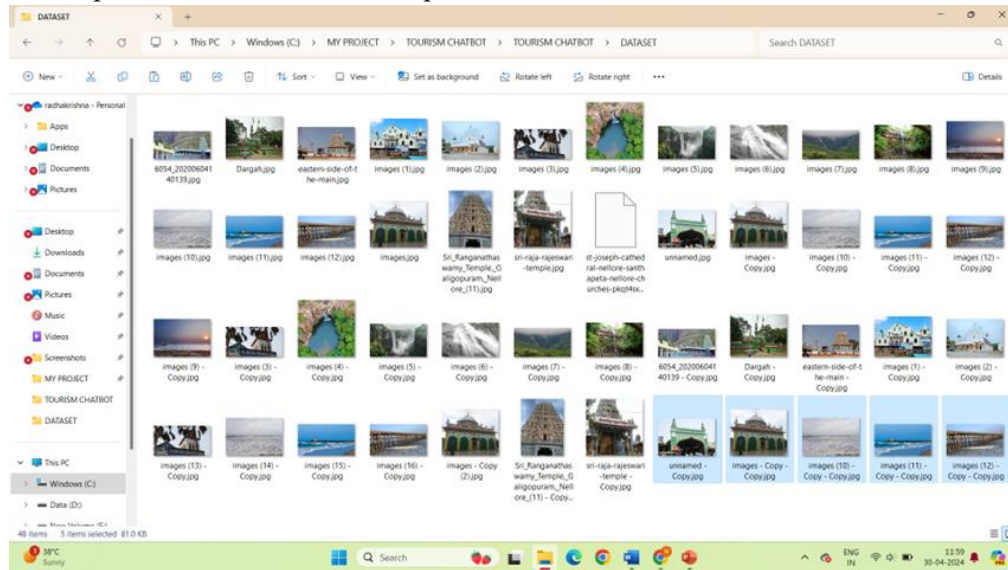


Fig.4. Trained images in the dataset

1. Attractions Data:

This includes information about different tourist attractions in Nellore such as beaches, historical sites, religious landmarks, waterfalls, museums, parks, etc. Each attraction entry may contain details like name, description, location opening hours, admission fees, contact information, and images.

2. Accommodations Data:

This dataset provides details about accommodations available in Nellore, including hotels, resorts, guesthouses, and homestays. Information may include the name of the accommodation, address, contact details, room types, facilities, price range, and ratings.

3. Dining Options Data:

This dataset covers restaurants, cafes, eateries, and food stalls in Nellore. It includes details such as the name of the establishment, cuisine type, address, contact information, menu items, price range, and ratings.

4. Events and Activities Data:

This dataset lists upcoming events, festivals, and activities happening in Nellore. It includes event names, dates, locations, descriptions, contact information, and possibly ticketing details.

5. Reviews and Ratings Data:

This dataset contains best reviews and ratings for attractions, accommodations, and dining options in Nellore, along with corresponding user details and timestamps.

6. Local Transportation Data:

Information about local transportation options such as buses, taxis, trains, and car rentals can help travelers navigate within Nellore. This dataset includes transportation providers, routes, schedules, fares, and contact details.

MODULES

1. Data Collection and Preparation:

This module involves gathering relevant data about Nellore's tourism, including information about attractions, accommodations, dining options, and local events. Data sources may include official tourism websites, government portals, travel guides, and user-generated content platforms. Once collected, the data needs to be organized, cleaned, and formatted for use by the chatbot. This ensures that the information provided to users is accurate, up-to-date, and relevant to their needs and preferences.

2.Ordering Collected Information:

After gathering data from various sources, the next step is to organize and prioritize it based on its importance and relevance to users. This involves categorizing attractions, accommodations, and other amenities into logical groups, such as by location, type, or popularity.

3.Preparing Questions and Answers:

This module involves crafting a set of questions and corresponding answers that the chatbot will use to engage with users. Questions may cover topics such as travel preferences, interests, budget, and itinerary planning. Answers should be informative, concise, and tailored to address the user's specific inquiries or requirements.

4.Training the Rasa Models:

Training the Rasa models is a crucial step in developing an effective chatbot. This involves feeding the prepared data into the Rasa framework to train the natural language understanding (NLU) and dialogue management models. During training, the models learn to recognize user intents, extract entities, and generate appropriate responses based on the input received. Iterative training and refinement are essential to improve the chatbot's accuracy.

5.Development of Website Platform Attached with Chatbot:

Integrating the chatbot into a website platform offers users a convenient and accessible way to interact with it. The website serves as the frontend interface where users can input their queries and receive responses from the chatbot in real-time. The chatbot backend handles the processing of user inputs, retrieval of relevant information, and generation of responses

Results

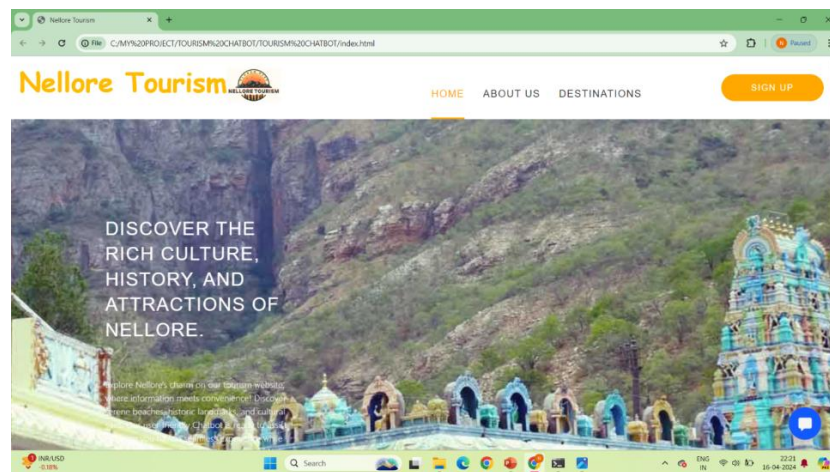


Fig.5. Tourism Chatbot-1

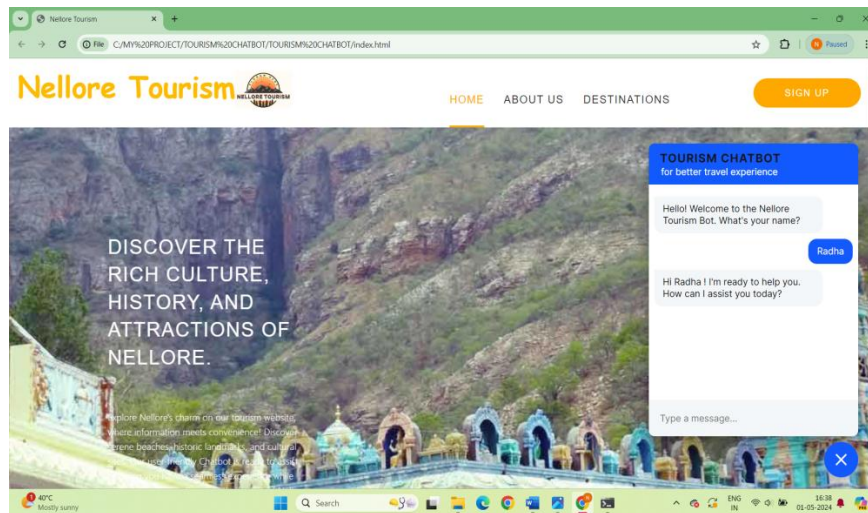


Fig.6. Tourism Chatbot-2

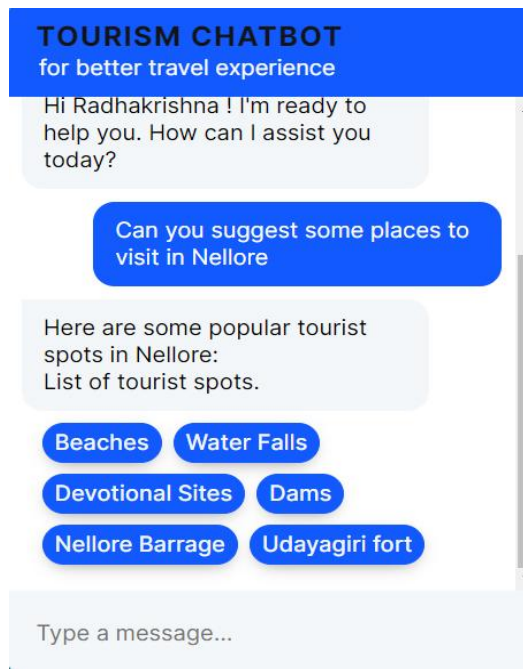


Fig.7. Interaction about Tourist places

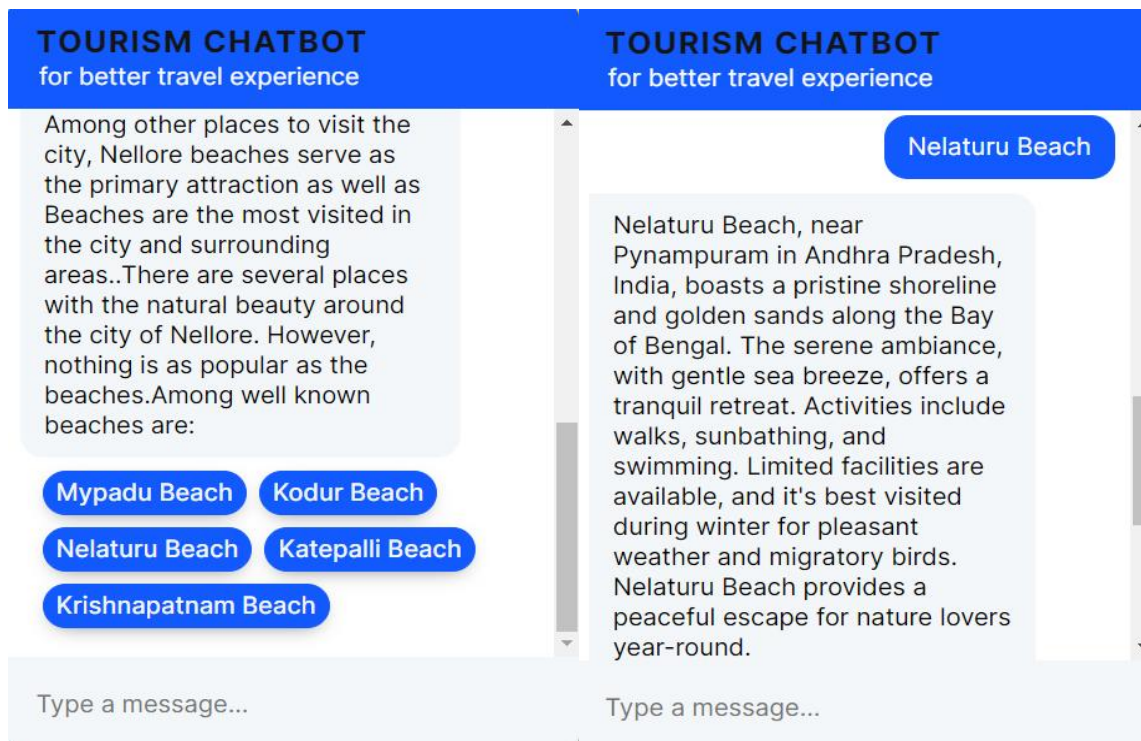


Fig.8. Interaction about beaches

CONCLUSION

In conclusion, the project "Building an interactive tourism chatbot for Nellore location" represents a significant advancement in enhancing the tourism experience in Nellore. By harnessing the power of conversational AI technology, the chatbot provides users with personalized recommendations, real-time information, and seamless navigation to explore the diverse attractions of Nellore.

The project's strengths lie in its user-friendly interface, comprehensive coverage of tourist attractions, and integration of advanced features such as direct location links and multilingual support. These aspects contribute to a more engaging and satisfying experience for travelers, empowering them to plan their trips efficiently and discover the hidden gems of Nellore with ease.

Furthermore, the iterative deployment and improvement approach ensures that the chatbot remains relevant and effective over time, adapting to evolving user needs and preferences. By continuously gathering feedback and refining its capabilities, the chatbot serves as a valuable tool for promoting local tourism, fostering community engagement, and driving economic growth in the region.

In summary, the project not only revolutionizes the way travelers explore Nellore but also showcases the potential of technology to enhance tourism experiences and empower visitors to discover new destinations with confidence and excitement.

Future Work

Future work could focus on implementing advanced natural language processing (NLP) techniques to improve the chatbot's understanding of user queries and context. Additionally, integrating machine learning algorithms could enable the chatbot to dynamically adapt its responses based on user feedback and historical interaction data, enhancing its conversational capabilities. Furthermore, expanding the chatbot's knowledge base to include

up-to-date information on local events, promotions, and seasonal attractions would provide users with more comprehensive and relevant recommendations. Finally, exploring opportunities for voice-enabled interaction and integration with emerging technologies such as augmented reality (AR) could further elevate the user experience and position the chatbot as a cutting-edge tool for tourism promotion and exploration in Nellore.

Integration of Voice Interaction: Incorporating voice-based interaction capabilities into the chatbot allows users to interact with it using natural language, making the experience more intuitive and accessible, especially for users with disabilities or those who prefer spoken communication.

Integration with Social Media: Integrating the chatbot with social media platforms like Facebook Messenger or WhatsApp can expand its reach and accessibility, enabling users to access tourism information directly through their preferred messaging apps.

Real-time Updates and Notifications: Providing real-time updates on events, weather conditions, and special offers in Nellore can keep users informed and engaged, enhancing their overall experience and encouraging repeat visits.

Dynamic Tourist Information: Continuous updates of tourist information ensure that users have access to the latest events, promotions, and attractions, keeping them informed about the vibrant offerings of Nellore's tourism landscape and fostering a sense of excitement and discovery.

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