

36118 – Applied Natural

Language Processing

Assignment 2

***TravelMate***

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# 1. Introduction

The world is becoming increasingly more interconnected; with this, travel has become a vital component of an individual's personal and professional lives. The process of planning a trip, regardless of the duration, can be time-consuming and overwhelming. Multiple preferences need to be taken into consideration, such as the destination, budget, duration of the trip, accommodation type, number of people on the trip, and the activities they want to be completed whilst on the tip, and all of these components can result in individuals becoming too wrapped up in the details of a trip that they do not get to enjoy their travels to the fullest.

To address these travel challenges, we have created an application, ‘TravelMate’ that can reduce the overwhelming process of creating a travel plan. TravelMate will be able to create personalized travel plans that will be tailored to individuals' preferences, which include the destination of the trip, the number of people that will be traveling, the duration of the trip, the budget, preferred activities as well as preferred accommodation type such as a hotel, a hostel or an apartment. Using this application, individuals planning their travels can make informed decisions effortlessly, ultimately saving a significant amount of time and stress.

Through the world's interconnectedness, there is an increase in travel for individuals whose first language is not spoken in the country or place they wish to visit. This can create an exponential challenge when booking aspects of a trip, such as accommodation or planning activities in a foreign language. To combat this, the TravelMate application will allow users to select their desired language before planning their trip. This feature of the application will enable users to feel empowered in their travel planning and eliminate the uncertainty that can arise from the language barrier that may be present.

TravelMate is a comprehensive solution to modern-day travel planning. It aims to eliminate the stress and complexity of organizing travel plans. Through this application, users can focus on the excitement of their trip without having to be burdened by the finer details of their travel itinerary.

# 2. Project Objectives

There are four key objectives for this project:

1. **User-friendly Interface**: Develop a user-friendly input page for individuals to enter their desired trip details that includes simple questions such as “Where are you planning to go?”, “How many days will you stay?”, “How many people are going?”,” What kind of activities are you interested in?” (e.g., hiking, city tour, beach), “What type of accommodation do you prefer?” (e.g., hotel, hostel, apartment) and “What is your budget per person?” (in USD). Also, the application can be accessed on various devices such as smartphones, tablets, desktop computers, and laptops.
2. **Creation of personalized travel plans**: The multi-level prompting system refines the travel plans to their travel preferences creating a travel itinerary that is relevant to their desires. The application allows the user to ask follow-up questions based on the initial responses entered by the user. This will enable the user to further refine their travel plans and personalized travel itinerary.
3. **Real-Time Interactions:** Integrating Google’s generative AI to enable real-time alterations to travel specifications.
4. **Preferred Language:** For a more tailored and comfortable user experience, select the language in which you would want to interact with the application. Make sure that all prompts, instructions, and information are displayed in your preferred language.

# 3. Project Phases

There were five key phases of the project:

1. **Research and Development**

In the project's first phase, we looked to identify a potential application that would benefit the overall population. We would be able to make use of both a traditional natural language processing or machine learning method and a large language model method. Whilst researching and identifying our project, we needed to choose an application that would be beneficial to the community and was a product that was wanted and would be used.

1. **Design**

When designing the TravelMate application, it was important to keep the user at the forefront to ensure ease of use and a straightforward interface.  The primary goal of this application is to allow users to have a simplified way of creating a travel itinerary and to remove the complications that arise in travel planning. In the design phase, we look to find the easiest way a user would be able to interact with the application and reduce the number of steps that they need to take to create their personalized travel itinerary. The design of TravelMate also needed to be able to be adapted to different screen sizes and devices, therefore optimizing the user experience across all smartphones, tablets, desktop computers, and laptops.

1. **Implementation**

In this phase, the backend infrastructure of our application TravelMate was developed. We utilized natural language processing techniques as well as Google AI for API integration. This would allow users to receive the most up-to-date information for the period in which they wish to travel. Another key component of TravelMate that needed to be implemented was the ability of the application to have the user select their desired language for the travel plan to be created. For this to occur, there needed to be the implementation of a translation process within the application as well as its ability to make personalized travel itineraries.

1. **Testing**

The testing phase for TravelMate was essential to ensure the app’s functionality, usability, and reliability across devices. To ensure that the app could handle different combinations of trip inputs, such as destination, budget, and accommodations, we began with functional testing. After that, volunteer usability testing helped us find and address user experience problems like unclear instructions or unnecessary tasks. By testing the app on computers, tablets, cell phones, and other browsers, we also made sure it worked across devices. To improve the app for a flawless user experience, performance testing finally verified that it could control API response times and simultaneously handle user queries without lag or crashing.

**5. Deployment**

For deployment, TravelMate was launched using Streamlit Cloud, a platform suited for hosting Python-based applications. Following codebase optimization and environment variable security (including safeguarding the Google API key), we deployed the project live by pushing it to GitHub and connecting it to Streamlit Cloud. Post-deployment testing made sure that the application ran without issues on several devices and web browsers. TravelMate's automated scaling features from Streamlit gave users confidence that it could handle growing traffic, and the deployment method is both future-proof and efficient because future changes can be quickly incorporated using GitHub. Below is the location of the project on GitHub:

[SuyashTapase/TravelMate\_NLP\_AT2\_Group9 (github.com)](https://github.com/SuyashTapase/TravelMate_NLP_AT2_Group9)

Streamlit Application Link:

[TravelMate · Streamlit](https://travelmate.streamlit.app/)

# 4. Data Sources

The data source for the TravelMate application comes from Application Programming Interface (API) integration. The APIs that are used to create personalized travel itineraries are sourced through Google generative AI. Using APIs as a data source, the TravelMate application can take real-time availability and prices for accommodation and provide the user with specific places within their budget and during the period of their trip. The use of API integration in comparison to an ordinal data source of CSV document is the ability for the APIs to provide the most relevant and up-to-date information without a person needing to go into the dataset and reset the features every time that there is a change. This would not have been a feasible operation without the use of APIs for data to be searched.

# 5. Core Features

**Multi-Language Support:**

* Users have the option to select from several languages, including English, Hindi, French, Spanish, German, and Italian, for their interactions with the app.
* The app automatically translates both the questions posed by the user and the responses received, ensuring a smooth experience in the chosen language.

**Interactive User Interface:**

* The app features a clean and straightforward user interface where individuals can input their trip details, prompting the generation of a comprehensive travel plan.
* Users can also ask follow-up questions related to their travel plans for additional information or clarification.

**Dynamic Chat History:**

* The app maintains a record of all questions asked and responses given, enabling users to easily review past interactions and information.

**Integration with Google Generative AI:**

* The app utilizes Google Generative AI to produce personalized travel plans and itineraries based on the information provided by the users.

**How the Multi-Language Feature Works**

**Language Selection:**

* The application includes a language selection dropdown menu located in the sidebar, allowing users to choose their preferred language from English, Hindi, French, Spanish, German, or Italian.

**Translation Process:**

* When a user inputs details in their chosen language, the application translates that input into English before sending it to Google’s AI.
* After the AI generates a response in English, the application translates that response back into the user’s selected language.

**Translation Library:**

* The application employs the **deep\_translator** library, specifically utilizing GoogleTranslator, to facilitate accurate translations between different languages.

# 6. NLP Techniques used with justification

**Language Translation (Deep Learning-based Translation)**

Library used: deep\_translator

The user’s input questions and the AI's answers are translated between multiple languages using GoogleTranslator, which likely utilizes significant neural machine translation models such as the Transformer model.

Justification: This technique allows users to interact with the application in their native tongue, enhancing accessibility and customization. The ability of AI responses to be translated both ways guarantees that non-English speaking users may easily plan their travels.

**Natural Language Generation**

Library used: google.generativeai

The Generative Pre-Trained Transformer (GPT) model is used to generate natural language responses based on user queries.

Justification: NLG enables the chatbot to craft trip plans, and detailed itineraries, and answer follow-up questions in human-like language. It processes user-provided trip details and offers coherent, contextually relevant responses, making the interaction conversational and intuitive.

**Named Entity Recognition**

Named Entity Recognition is most likely what AI uses to detect important components in user questions, like locations, spending limits, and activities.

Justification: With the ability to identify objects like locations, durations, and activities, the AI can make precise and customized travel suggestions. NER assists in comprehending the context and producing replies that speak to certain entities.

**Contextual Understanding**

The AI model maintains a session context where it keeps track of prior chat history and is referred to for generating responses. This is a more complex type of context handling that is frequently found in GPT and BERT models.

Justification: Preserving the chat session's context helps the model answer follow-up questions based on past chats. It ensures continuity in the conversations, leading to more logical and insightful answers over time.

# 7. Project Findings

During the development and testing of TravelMate, we discovered that using generative AI made travel planning much easier for users. The application's ability to understand what users say allows them to get detailed and personalized travel plans quickly, without the hassle of doing a lot of research on their own. With Google’s Gemini API, users can ask questions and get immediate answers, making the planning process feel more like a conversation. This real-time interaction was very effective, helping users create travel itineraries that fit their needs perfectly.  
  
We also found that the multi-level prompting system was very helpful for users. This feature allowed them to provide their travel details step by step and adjust as needed. Users liked being able to specify their preferences for activities or accommodations and receive updated plans based on those changes. Overall, combining natural language processing, real-time AI responses, and an easy-to-use interface showed that AI can not only speed up travel planning but also make it more personalized and enjoyable for everyone.

# 8. Outcomes and value-added

TravelMate has made a big difference in how people plan their trips. It helps users save time and reduce stress by quickly creating personalized travel plans based on their preferences. With the application, users can easily enter details like where they want to go, how long they'll stay, and what activities they enjoy. The real-time interaction with AI allows them to adjust their plans on the spot, making the experience feel more supportive and tailored. Overall, TravelMate empowers travellers to make better choices effortlessly, ensuring they have a more enjoyable and satisfying travel experience.

A screenshot of a travel agency

Description automatically generated

This is the main page of our [TravelMate · Streamlit](https://travelmate.streamlit.app/), designed to simplify trip planning for users. When someone wants to plan a trip, they can easily fill out the provided fields based on their preferences. They'll enter their desired destination, the duration of their stay, the number of travelers, their preferred activities, accommodation type, and budget per person. Once the client submits this information, our TravelMate application will automatically generate a personalized travel plan tailored to their preferences, making the planning process seamless and enjoyable.  
  
TravelMate is a special application that can help you plan your trips in different languages. Clients can choose from English, Hindi, French, Spanish, German, and Italian. This makes it easier for people from different backgrounds to use the application and get personalized travel plans based on their preferences, regardless of their language.  
  
  
For instance, if someone wishes to visit the Maldives for 5 days with a companion, prefers to stay in a hotel, wants to engage in beach activities, and has a budget of $1000 per person, they can simply enter these details into the app. Once all the information is submitted, our TravelMate application will generate a customized travel plan that aligns perfectly with their preferences, providing them with a well-organized itinerary and helpful recommendations for their trip.

A screenshot of a white page

Description automatically generated

If a client selects Hindi as their preferred language from the available languages, the TravelMate application will generate the travel plan and itinerary in Hindi. This allows users to easily understand and navigate the trip details in a language they are comfortable with.

If clients have any additional questions or require further customization, they can simply submit their inquiries in the "Ask a Follow-Up Question" box. This feature allows for easy communication and helps ensure that all their travel needs are met.  
  
If a client requests additional travel plans in the follow-up question box, our application will generate a new plan based on their specific requirements. This feature allows clients to receive tailored itineraries that better suit their needs.  
  
A screenshot of a computer

Description automatically generated

If the Hindi language is selected, then the response will be like this:

A screenshot of a computer

Description automatically generated

# 9. Challenges

During the development of TravelMate, we encountered several challenges.

* 1. **Input Validation**: Ensuring that users entered full and accurate information (e.g., destination, budget) was crucial yet difficult. Missing or improperly formatted inputs resulted in errors or incomplete trip plans.
  2. **Real-Time Response Delays:** Generating responses rapidly while managing translation and AI processing results in occasional delays, impacting the user experience. Optimization was required to reduce wait times.
  3. **Context Management**: Keeping the context of the conversation when users asked follow-up questions was challenging. The AI sometimes loses track of past interactions, resulting in irrelevant or inaccurate responses.

# 10. Recommendations and next steps

To make the TravelMate app even better, we have a few recommendations for the next steps:

* 1. **Integrate Real-Time Data**: Link the application to real-time data sources (e.g., for accommodation pricing, and activity availability) to provide more precise and current trip planning information.
  2. **Reduce Response Time**: Keep optimizing the AI and translation processing pipelines to increase real-time response times, making the user experience smoother and more efficient.
  3. **Increase Multilingual Support:** Increase the number of languages available and concentrate on enhancing language localization—including adjustments for cultural context—to serve a larger worldwide audience.

These recommendations can further enhance the functionality, usability, and user experience of the application.

# 11. Ethics

Whilst completing any project it is important to consider the ethical implications of the application that is being created. The proper storage of the data that individuals enter is a vital aspect of the project, as it is important that people are unable to gain access to when the users are going to be away or the exact locations they will be traveling to on days. This is to ensure the safety of the TravelMate users. As there are APIs used for data sourcing, there is a possibility that there is bias in the recommendations through potential partnerships that are present in certain APIs. It is vital to ensure that the recommendations of the application don’t prioritize certain businesses and discourage others. There is the ability for individuals who require more accessible options on their travels to ask a follow-up question to cater for this, however, this is done after an original travel plan is created. This could negatively impact these individuals as they are shown an itinerary that they do not have the capability of completing, therefore taking away some of the excitement that was geared towards the trip. Overall, it is an important step to consider the ethical implications of this application not only before its creation, but also as it continues to evolve, and improvements are made upon its abilities.

# 12. Appendix

Code is deployed in GitHub and the path for the same is:

[SuyashTapase/TravelMate\_NLP\_AT2\_Group9 (github.com)](https://github.com/SuyashTapase/TravelMate_NLP_AT2_Group9)

The application can be used with the following streamlit link:

[TravelMate · Streamlit](https://travelmate.streamlit.app/)