

# Project Report: AI-Powered Puerto Rico Travel Planner

**1. Introduction** The AI-Powered Puerto Rico Travel Planner is an interactive web application that assists users in planning their trips to Puerto Rico. The system leverages natural language processing (NLP), machine learning, and API integrations to recommend travel destinations based on user preferences.

## 2. Project Objectives

- To develop an AI-driven travel planner that recommends destinations based on user interests.
- To integrate real-time weather forecasting for better trip planning.
- To provide an interactive and user-friendly web interface using Streamlit.

## 3. Technologies Used

- **Programming Language:** Python
- **Machine Learning Model:** Sentence Transformer (all-MiniLM-L6-v2)
- **Vector Search Engine:** FAISS (Facebook AI Similarity Search)
- **Web Framework:** Streamlit
- **APIs:** OpenAI API for NLP, OpenWeather API for weather forecasts
- **Data Storage:** Local text-based dataset

**4. System Architecture** The system follows a multi-step process:

1. **Data Ingestion:** Loads data related to landmarks, municipalities, and historical information.
2. **Embedding Creation:** Converts textual descriptions into numerical embeddings using Sentence Transformer.
3. **FAISS Indexing:** Stores embeddings for fast similarity searches.
4. **User Input Handling:** Captures user interests and travel dates.
5. **Recommendation Generation:** Matches user input to relevant travel destinations.
6. **Weather Forecasting:** Retrieves real-time weather data for selected locations.
7. **Trip Planning & Finalization:** Allows users to build and finalize their travel itinerary.

## 5. Key Features

- **Personalized Recommendations:** Users can specify their travel interests (e.g., beaches, historical sites, adventure tourism), and the system provides tailored suggestions.
- **Interactive Selection:** Users can add destinations to their visit list with a single click.
- **Weather Information:** The system fetches weather forecasts to help users plan accordingly.
- **Finalized Travel Itinerary:** Users can review their final trip plan before confirming.
- **Reset and Modify Options:** The system allows users to reset their selections and modify their trip plan as needed.

## 6. Implementation Details

- **Data Processing:**
  - The system loads textual data from structured files containing information about Puerto Rico's landmarks and municipalities.
  - Sentence embeddings are generated using the all-MiniLM-L6-v2 transformer model.
- **Search & Ranking Mechanism:**
  - FAISS is used to index and retrieve the most relevant locations based on similarity search.
  - The system ranks the locations based on the closest matches to the user's interests.
- **User Interface (UI):**
  - Built using Streamlit, providing an intuitive and interactive experience.
  - Users input travel preferences, view recommendations, and finalize plans within a dynamic web UI.
- **Weather API Integration:**
  - OpenWeather API is used to fetch real-time weather conditions for recommended locations.

## 7. Challenges and Solutions

- **Handling Missing Data:** Ensured all text data was correctly loaded and indexed before user interactions.
- **FAISS Index Empty Error:** Added validation checks to ensure embeddings were created before searching.
- **User Interaction Flow:** Improved UI responsiveness by implementing dynamic buttons for adding destinations.

**8. Conclusion and Future Enhancements** The AI-powered Puerto Rico Travel Planner successfully provides an intelligent and interactive way to plan trips. Future enhancements could include:

- Integration of **real-time flight and hotel booking APIs**.
- Addition of **user reviews and ratings** to refine recommendations.
- **Multi-language support** for broader accessibility.
- Expansion of the dataset to include **more detailed descriptions and images**.