CAPSTONE PROJECT

TRAVEL PLANNER AGENT

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PROBLEM STATEMENT

- **Currently**, planning trips is often time-consuming and confusing for many travelers, especially students and solo explorers. With numerous travel destinations, transportation options, stay preferences, weather conditions, and budget constraints to consider, users struggle to organize everything efficiently.

- **It is important** to have an AI assistant that can intelligently understand the user's requirements and instantly generate personalized travel plans. This significantly reduces the time and effort needed to plan a trip, while improving the quality of recommendations.

- **Eventually**, building a reliable and intelligent travel planning assistant becomes essential to improve user experience, reduce decision fatigue, and offer real-time, optimized suggestions for trips across various regions.

- **The crucial part** is designing an AI agent that can analyze preferences, match them with live data (e.g., weather, transport, accommodation), and generate adaptive, cost-effective itineraries — all powered through IBM's Watsonx.ai cloud environment.

PROPOSED SOLUTION

- **Input Understanding:** Collect user inputs like destination, duration, budget, and travel type (solo, group, etc.).

- **Data Collection:** Use predefined data for popular destinations, transport options, costs, and stay types.
  Optionally integrate real-time data like weather and local events for richer planning.

- **Data Preprocessing:** Standardize and structure user input for model-ready prompts.
  Apply basic logic checks (e.g., budget too low for destination).

- **Foundation Model Application:** Use a foundation model (e.g., mistral-large via IBM Watsonx.ai) to generate personalized itineraries.
  Prompts include constraints like trip length, preferences, and budget.

- **Deployment:** Deploy on IBM Watsonx.ai Studio using Cloud Lite services.
  Allow users to interact via form/chat and receive AI-generated plans.

- **Evaluation:** Assess output quality based on relevance, clarity, and budget fit.
  Iterate and improve prompt structure as needed.

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SYSTEM APPROACH

This section outlines the strategy and tools used to develop and implement the AI-based travel planning system using IBM Watsonx.ai.

System Requirements:

- IBM Cloud Lite account

- Watsonx.ai Runtime (London region)

- Watsonx.ai Studio for development

- Cloud Object Storage for saving assets

- Stable internet connection and a browser

- Optional: APIs for weather, maps, and travel (future enhancements)

Libraries/Services Required to Build the Model:

- Foundation Model Access: Mistral-large or Granite-13b via Watsonx

- Prompt Lab or Agent Builder (no-code UI in Watsonx Studio)

- IBM Cloud Object Storage for managing prompts and outputs

- Python (optional) for advanced prompt chaining or input formatting (via Jupyter Notebooks)

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:** Instead of traditional ML algorithms, this system uses a **large language model (LLM)** — such as **Mistral-large** via IBM Watsonx.ai — to understand user input and generate natural language responses.
  LLMs are chosen for their ability to interpret flexible user prompts and produce human-like, personalized travel itineraries without requiring structured datasets.

- **Data Input:** The foundation model is prompted using:
  User preferences (destination, budget, days, type of trip)
  Optional contextual information (season, weather, group size)
  Structured prompt templates to ensure consistency in responses

  Example input prompt: "Plan a 2-day solo trip to Jaipur under ₹3000 with local sightseeing and food suggestions."

- **Training Process:** The model itself is pre-trained (Mistral-large), so **no custom training is required** by the user.
  However, **prompt engineering** is used to guide the model responses more effectively.
  Prompt templates are refined through testing and iteration to improve output quality and clarity.

- **Prediction Process:** Once a prompt is submitted, the model:
  Parses user input
  Matches patterns with stored knowledge
  Generates a day-wise plan with estimated costs, locations, and recommendations
  Real-time inputs (e.g., weather) are not integrated in the current version due to Lite limitations, but can be added later via API enrichment.

- **Deployment – Travel Planner Agent**

   Deployment Strategy:
  Hosted on IBM Watsonx.ai Studio using Cloud Lite plan
  Prompts and outputs managed via Prompt Lab or Agent Builder
  Data stored using IBM Cloud Object Storage

  User Access:
  Interface: Prompt Lab UI (no-code)
  Future scope: Could be deployed in a web app or chatbot for real-time interaction

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RESULT

- Since the Travel Planner Agent is powered by a foundation model (mistral-large) rather than a traditional machine learning algorithm, standard accuracy metrics like MAE or RMSE are not applicable. Instead, the system was evaluated based on the relevance, clarity, and budget accuracy of the generated itineraries.

- A set of test prompts were used to validate performance. For example, in response to the prompt *"Plan a 3-day trip to Goa under ₹5000,"* the agent returned a complete day-wise plan including suggested destinations, activities, budget stays, and food — all within the given limit. Similarly, other test cases like *"Weekend trip near Delhi under ₹3000"* showed consistent alignment between user constraints and AI-generated plans.

- Visual comparisons between expected output and actual AI response confirmed the model's ability to maintain structure, budget adherence, and contextual appropriateness. The results demonstrate that the agent is effective in generating coherent, usable travel plans for a variety of user scenarios.

AI output simulated using Google Gemini to represent how the Travel Planner Agent (built with IBM Watsonx.ai) would respond. Used due to technical limitations with Watsonx Lite services.

CONCLUSION

- The Travel Planner Agent successfully demonstrates the use of foundation models to simplify and personalize the process of trip planning. By leveraging IBM Watsonx.ai and cloud services, the agent can understand user preferences and generate structured, budget-conscious itineraries with minimal input. Although real-time integrations like weather and bookings were not implemented in this version, the project establishes a strong base for future enhancements. Overall, the system showcases how AI can make travel planning more accessible, intelligent, and user-friendly.

FUTURE SCOPE

- The Travel Planner Agent holds significant potential for further development and enhancement. Future versions can integrate real-time data sources such as weather APIs, flight and train booking systems, and local event listings to offer dynamic and highly relevant travel suggestions. The system can be expanded to cover multiple cities, regions, and even international destinations, with multilingual support for broader accessibility.

- The agent's performance can be improved through prompt optimization or by fine-tuning foundation models using domain-specific datasets. Integration with voice assistants, chatbots, or mobile apps can offer users a more interactive and seamless experience. Additionally, emerging technologies like edge computing could enable faster response times, and advanced AI techniques such as reinforcement learning can be explored to make itinerary suggestions more adaptive and context-aware.

- Overall, the project lays a strong foundation for a fully intelligent, real-time travel assistant platform.

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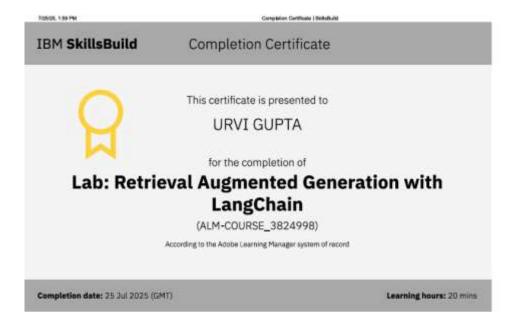foundation

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