CAPSTONE PROJECT

TRAVEL PLANNER AGENT

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OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Algorithm & Deployment
- Result (Output Image)
- Conclusion
- Future Scope
- References



PROBLEM STATEMENT

Project - Travel Planner Agent

Problem Statement: Planning a trip involves numerous complex and time-consuming tasks, including researching destinations, comparing transportation and accommodation options, creating itineraries, estimating budgets, and ensuring alignment with user preferences such as travel dates, budget constraints, interests, and special requirements. These tasks often require navigating multiple platforms and manually curating information, which can overwhelm users and lead to suboptimal travel experiences.

The goal of this project is to develop an intelligent **Travel Planner Agent** that automates and simplifies the travel planning process. The agent should be capable of understanding user preferences through natural language input, gathering relevant travel information in real-time, optimizing itineraries based on time, cost, and user interest, and presenting a comprehensive, personalized travel plan.



PROPOSED SOLUTION

✓ Agentic Al Workflow: Travel Planner Agent using IBM Watsonx.ai

Step 1: Define Agent Goals and Capabilities

- i) Specify the agent's high-level goals: understand user intent, plan trips, optimize for preferences and constraints.
- ii) Define core capabilities: reasoning, tool use (APIs), task decomposition, and interaction with users.

Step 2: Set Up Foundation Model and Tooling in Watsonx.ai

- i) Use Watsonx.ai or fine-tuning to configure a Granite LLM to interpret travel-related queries.
- ii) Enable tool usage by connecting the agent to external APIs (e.g., flights, hotels, maps) as callable functions.

Step 3: Equip Agent with Planning and Reasoning Loop

- i) Implement a task planner loop: interpret user input \rightarrow plan sub-tasks (e.g., find flights, filter hotels, map itinerary).
- ii) Enable reflective reasoning: allow the agent to assess if its plan meets user constraints and revise if needed.

Step 4: Enable Tool Use and Interaction via Modular Services

- i) Deploy callable tools (e.g., hotel search, budget calculator) using IBM Cloud Functions or REST APIs.
- ii) Use Watson Assistant for natural language interaction, routing key tasks to the reasoning agent.

Step 5: Deploy, Monitor, and Enable Learning Loop

- i) Deploy the agent in an environment where it can execute, observe results, and refine plans autonomously.
- ii) Monitor performance using Watsonx.governance or cloud monitoring tools, and retrain as needed with new user data.



SYSTEM APPROACH

The **Travel Planner Agent** leverages an agentic AI paradigm powered by IBM Watsonx.ai to autonomously understand user inputs, retrieve relevant travel data, and generate optimized, personalized itineraries. This section outlines the system requirements, development methodology, and necessary libraries and tools used to build the intelligent agent.

1. System Requirements

a. Hardware Requirements

Processor: Minimum 4-core CPU (8-core+ recommended for training)

RAM: 16 GB (32 GB+ for large-scale inference or local fine-tuning)
Storage: 50 GB free disk space (or more if storing large datasets)
Internet Access: Required for accessing IBM Cloud and external APIs

b. Software Requirements

Operating System: Linux, Windows, or macOS (Linux preferred for deployment)

Cloud Platform: IBM Cloud (Watsonx.ai, Watson Assistant, Cloud Functions)

Browser: Chrome, Firefox, or Edge for using Watsonx.ai interface

2. Development Methodology

a. Modular Design

NLP Module: Handles user input understanding using Watsonx.ai's LLMs (e.g., Granite).

Planner Module: Decomposes the user goal into subtasks (e.g., find flights, hotels).

Tool Invoker: Executes external API calls based on plan requirements.

Response Generator: Synthesizes final itinerary and communicates with the user.



ALGORITHM & DEPLOYMENT

Algorithm: Intelligent Travel Planner Agent

1. Input Acquisition

Receive user input via Watson Assistant (e.g., "Plan a trip to Tokyo in December under \$2000").

2. Intent Recognition and Entity Extraction

Use Watsonx.ai foundation model (e.g., Granite) to extract:

Destination

Travel dates

Budget

Preferences (e.g., nature, food, museums)

3. Task Planning

Agent creates a subtask list:

Search for flights within date range and budget.

Search for accommodations near key locations.

4. Tool Invocation / API Calling

Call external APIs using IBM Cloud Functions or backend services:

Flights: Amadeus API

Hotels: Booking.com API

Activities: Google Places API

5. Itinerary Optimization

Rank and sort options based on:

User preferences

Cost, distance, availability

Time constraints and travel flow

6. Feedback & Reflection Loop

Ask user for feedback or changes (e.g., "Do you prefer budget hotels or mid-range?").

Re-plan if preferences change.

Deployment

Here's how the system can be deployed using IBM Cloud services for scalability and robustness:

1. Model Hosting (IBM Watsonx.ai)

Use Watsonx.ai Prompt Lab to host and test prompt-based or fine-tuned LLM.

For advanced orchestration, deploy custom agents using Python SDK and connect tools through API endpoints.

2. API & Backend Services (IBM Cloud Functions or Code Engine)

Create modular cloud functions for:

Flight search API calls

Hotel search

Budget calculator

Activity recommendation

Use IBM Code Engine for containerized microservices.

3. Conversational Interface (Watson Assistant)

Connect Watson Assistant to frontend (web or mobile).

Route user queries to Watsonx.ai or backend tools using webhooks.

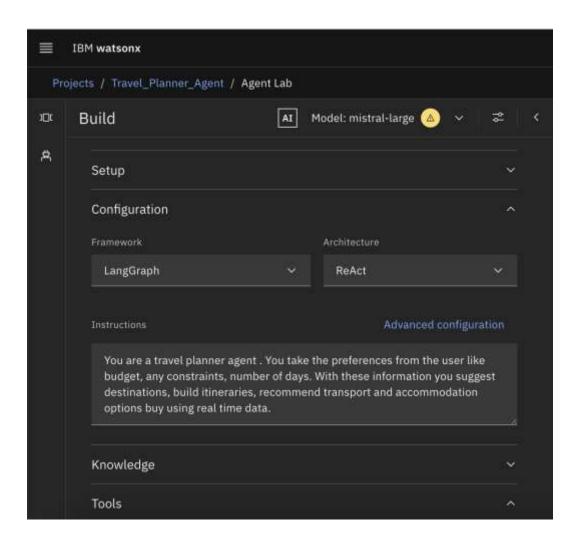
4. Monitoring & Governance

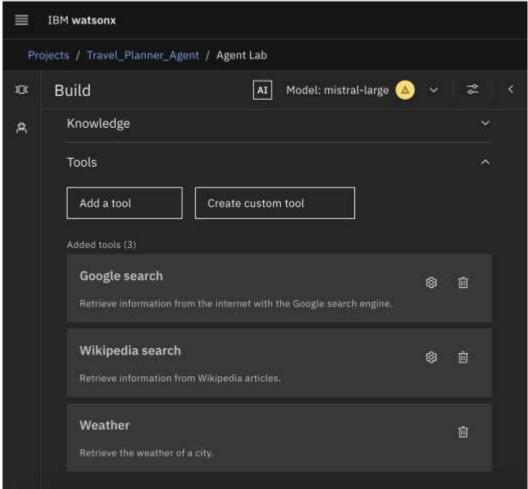
Use Watsonx.governance for model auditability, explainability, and risk assessment.

Monitor API usage and user behavior via IBM Cloud Monitoring and Log Analysis.



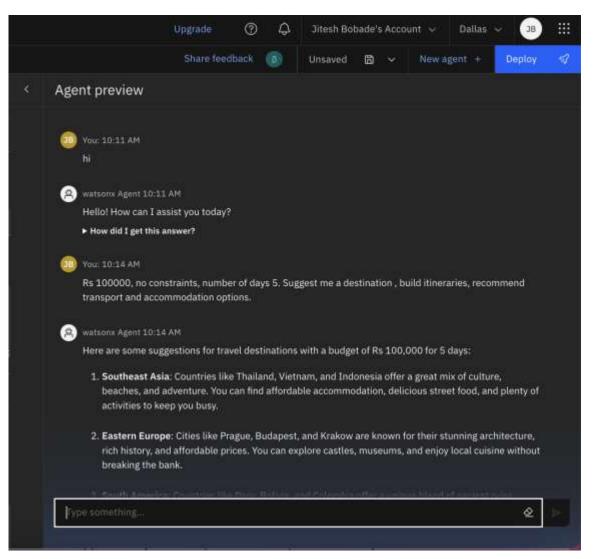
RESULT

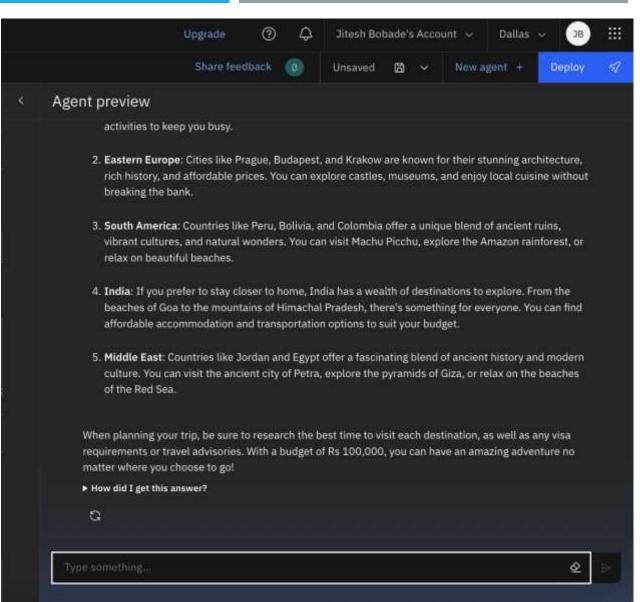






RESULT







CONCLUSION

The Travel Planner Agent project demonstrates the power of agentic Al in simplifying complex, multi-step tasks like trip planning. By leveraging IBM Watsonx.ai's foundation models and integrating external travel APIs, the system can autonomously understand user preferences, plan optimized itineraries, and interact naturally through a conversational interface. This intelligent, goal-driven approach not only enhances user experience but also showcases a scalable, modular Al solution that can be expanded to other domains requiring personalized planning and decision support.



FUTURE SCOPE

The Travel Planner Agent can be further enhanced by incorporating real-time dynamic data such as weather forecasts, local events, and travel advisories to improve itinerary relevance. Future versions could support voice-based interaction, multilingual capabilities, and integration with AR/VR for immersive travel previews. Additionally, integrating user behavior analytics and reinforcement learning can allow the agent to adapt over time, offering even more personalized and proactive travel recommendations.



REFERENCES

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