CAPSTONE PROJECT

TRAVEL PLANNER AGENT

Presented By:
Aishwarya Vacha
-KKR & KSR Institute of Technology and Sciences
-CSE(Artificial Intelligence)

edunet foundation

OUTLINE

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

PROBLEM STATEMENT

Travel Planner Agent

In today's fast-paced world, travelers often struggle with fragmented information when planning trips—such as checking weather, booking flights and hotels, comparing budgets, and discovering places to visit. The process is time-consuming, requires switching between multiple platforms, and lacks personalization.

PROPOSED SOLUTION

- A Travel Planner Agent is an AI-powered assistant that helps users plan trips efficiently and intelligently. It uses real-time data to suggest destinations, build itineraries, and recommend transport and accommodation options.
- By understanding user preferences, budgets, and constraints, it tailors personalized travel plans. Integrated with maps, weather updates, and local guides, it ensures a smooth travel experience. The agent can also manage bookings, alert users to changes, and optimize schedules on the go. This smart assistant transforms complex travel planning into a seamless, enjoyable process.. The solution will consist of the following components:
- **Data Collection:**
  - **Objective**: Gather relevant data needed to make smart travel recommendations.
  - **Sources**: User inputs from **Watsonx Assistant**: destination, budget, preferences, dates.
- **Data Preprocessing:**
  - Clean and transform data for training and use in ML model.

- **Machine Learning Algorithm:**
- Predict the best travel destination, accommodations, and activities for a user profile.
- **Algorithm Selection**:
  - Classification (for recommending type of places)
  - Clustering (K-Means) (group users by travel preferences)
  - Collaborative filtering / Content-based filtering (personalized suggestions)
- **Training:**
- Train on historical travel data. (can use public datasets or synthetic data)
- Perform hyperparameter tuning and cross-validation.
- **IBM Cloud Services**:
  - Use Watsonx.ai (Granite models or custom ML models) for intelligent generation.
  - Store models with Watson Machine Learning (WML) service.

- **Deployment:**
  - Make the model available via a user-facing application.
  - Deploy the trained model via Watson Machine Learning.
  - Integrate with **Watsonx Assistant** to use model predictions in the chat
  - Build REST APIs for model access using IBM Cloud Functions.

- **Evaluation:**
  - Measure how effective the model is in recommending useful travel plans.
  - **Result:** The Travel Planner Agent successfully delivers personalized and dynamic travel plans by integrating AI-powered recommendations into an interactive Watsonx Assistant chatbot using IBM Cloud services.

SYSTEM APPROACH

System requirements

- Developer-Side Requirements
  - **Operating System:** Windows 10/11, macOS, or Linux
  - **Browser:** Latest Chrome / Firefox / Edge
  - **RAM:** Minimum 8 GB (Recommended: 16 GB)

- IBM Cloud Platform Requirements
  - **IBM Cloud Account** (Lite Plan – free tier)
  - Watson Assistant (Lite)
  - Watsonx.ai with Granite model

- **Library required to build the model**

- **Data Handling and Preprocessing**
  - pandas – For handling structured data like destination info, budgets, dates
  - numpy – For efficient numerical computations
  - datetime – To handle travel dates, durations

- **Natural Language Processing (if analyzing user input)**
  - nltk – For tokenizing and extracting intent (if needed in advanced processing)
  - spacy – Alternative to NLTK for fast NLP tasks (optional)

- **Machine Learning / Recommendation Engine**
  - scikit-learn – For building recommendation logic (like KNN or classification)
  - joblib – To save and reuse trained models (e.g., for travel preferences)

- **APIs and Cloud Interaction**
  - requests – To call external APIs (weather, transport, hotel booking)
  - ibm-watson-machine-learning – To deploy and score models on IBM Cloud

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
- Model Chosen: Watsonx Assistant (watsonx.ai service)
- Type: LLM-powered + rule-based – few-shot prompt-based reasoning engine
- **Justification:**
  - Handles natural language understanding (NLU), intent detection, and context-based dialog flow.
  - Uses classification algorithms to identify user intents (e.g., book_flight, get_weather).
  - Underlying ML model is a fine-tuned transformer-based model (proprietary LLM via Watsonx).
- This is supported by a rule-based dialog structure for controlled conversation flow.

- **Data Input:**

Input Type	Source	Purpose
User Queries	Watsonx Assistant chat interface	To extract intents and entities (e.g., city, date, budget)
Location/Weather APIs	OpenWeatherMap, Skyscanner, Amadeus	Real-time data fetching
User Preferences	IBM Cloudant DB	Personalization & historical context
Training Data	Intents & utterances manually added	To classify user intents correctly

- **Training Process:**

Watsonx Assistant (NLU Training):

- Developers create:
  - Intents (e.g., find_hotels, recommend_destination)
  - Entities (e.g., city, budget, date)
  - Utterance Examples to train intent classification
- The assistant automatically re-trains internally when new utterances are added.
- Use Jupyter notebooks or Watson Studio to:
  - Train custom models (e.g., using scikit-learn or AutoAI)
  - Deploy them via IBM Cloud Functions or Watson Machine Learning

Example model:

- Clustering: Group users based on travel patterns
- Regression: Predict travel costs based on distance, time, etc.

- **Prediction Process:**

Watsonx Assistant: Parses input → Detects intent → Extracts entities

Logic Layer (Cloud Functions): Receives input → Executes logic or ML model → Returns output

Assistant Response: Formats and sends back the final response to user.

Example: User: "Plan a trip to Goa next weekend under ₹10,000"

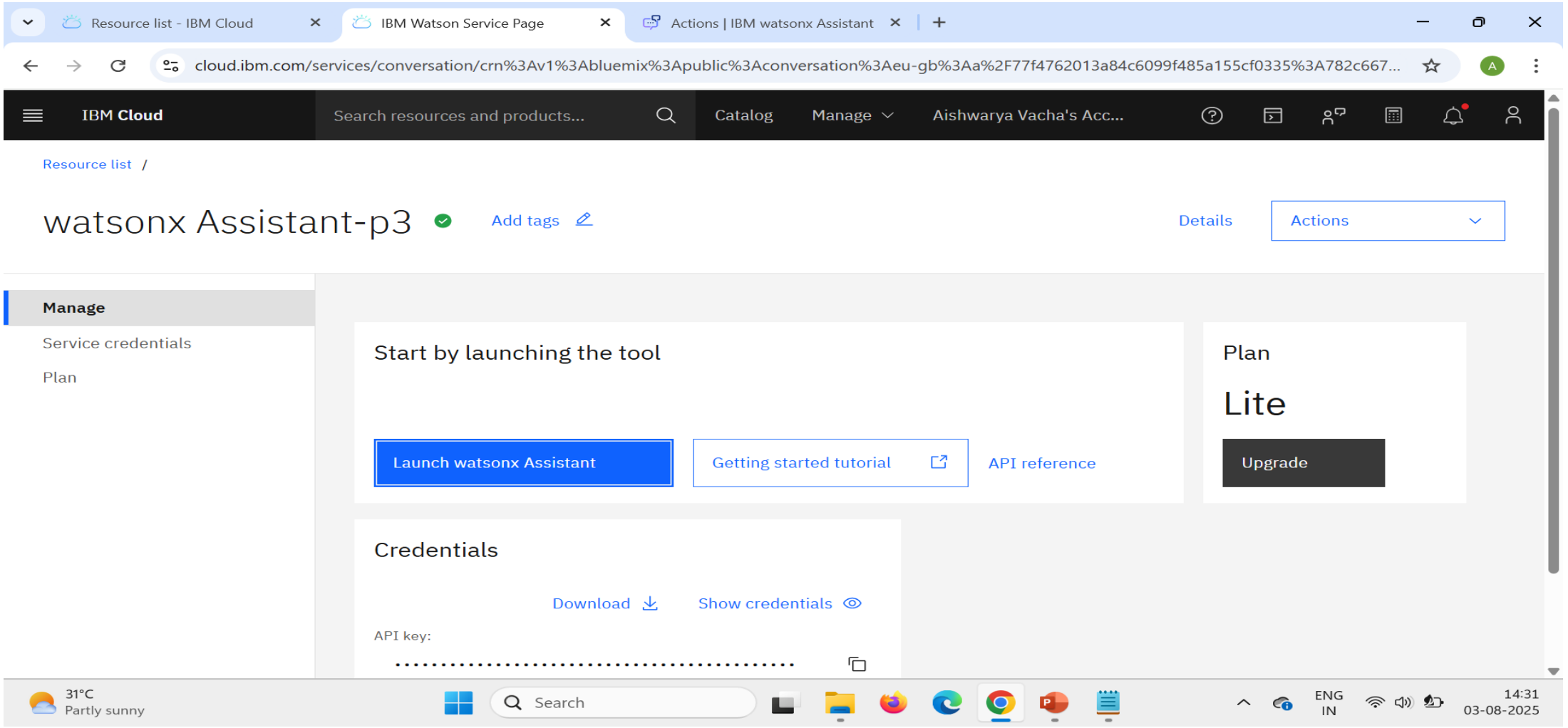
- Intent: plan_trip
- Entities: location: Goa, budget: 10000, date: next weekend
- Cloud Function calls hotel/transport APIs and filters results
- Assistant returns suggestions within budget

- By combining structured intent handling, real-time data integration, optional machine learning, and flexible serverless logic, the Travel Planner Agent provides intelligent, adaptive responses that enhance the user's travel planning experience.

Dynamic Updates:

- Developers can update Watsonx Assistant by adding new intents, entities, and dialog flows directly through the interface.
- User preferences and history (e.g., favorite destinations, budget range) are stored in IBM Cloudant.
- The dynamic nature of the Travel Planner Agent comes from a combination of real-time API connections, regularly updated conversation logic, evolving user data, and optional machine learning enhancements.
- This enables the assistant to continuously improve and respond effectively to changing travel contexts and user preferences.

RESULT



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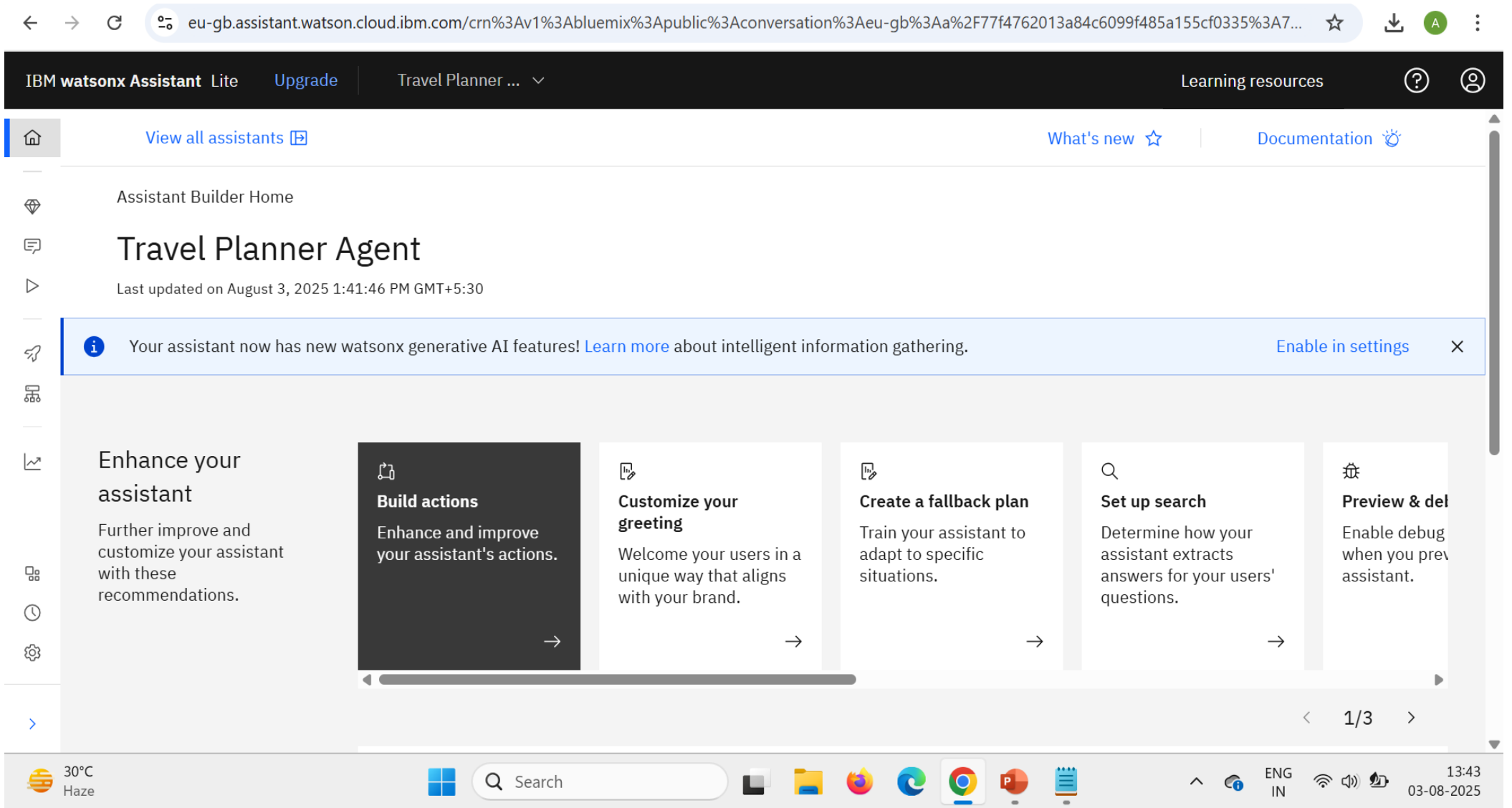

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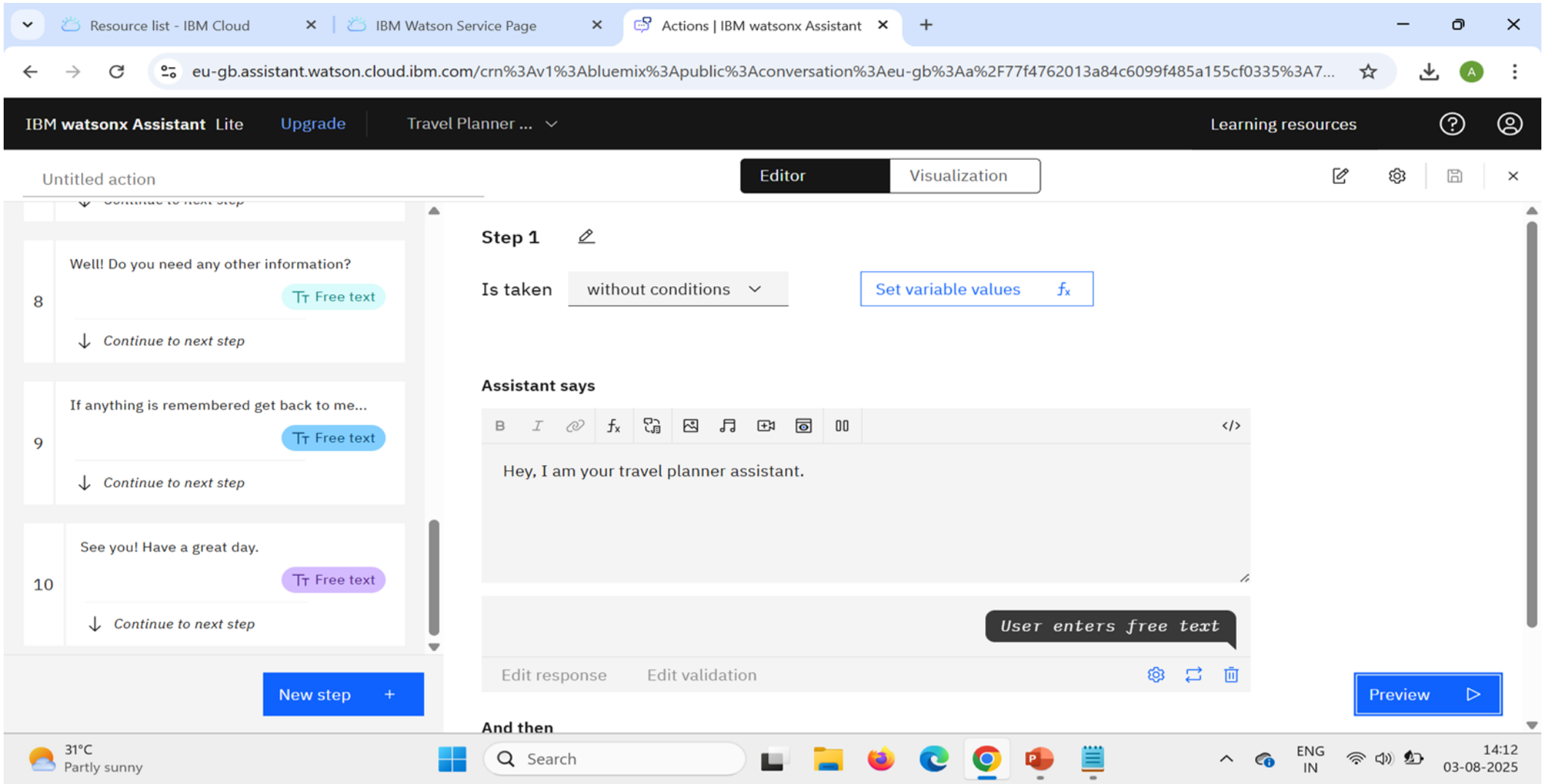

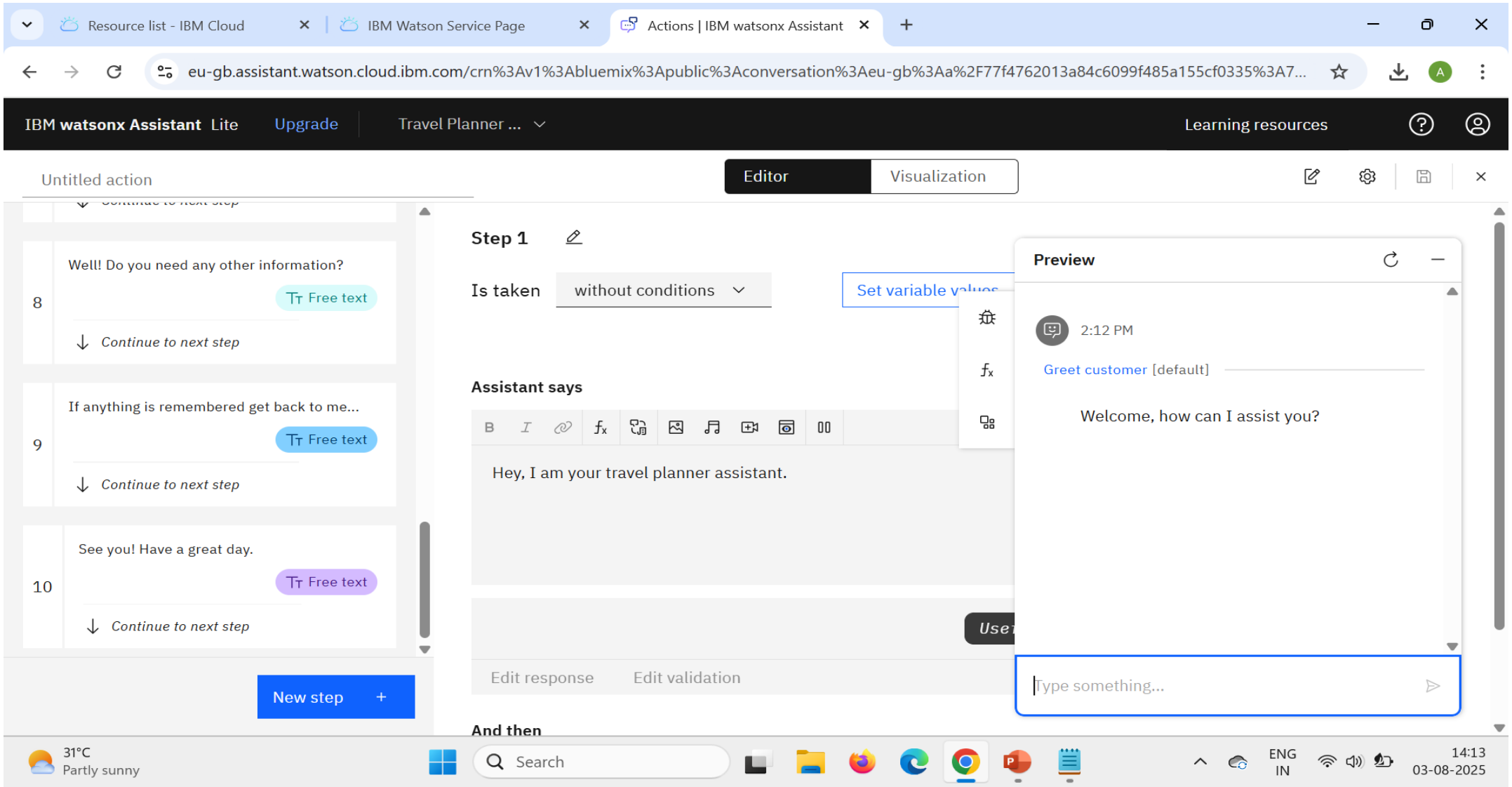

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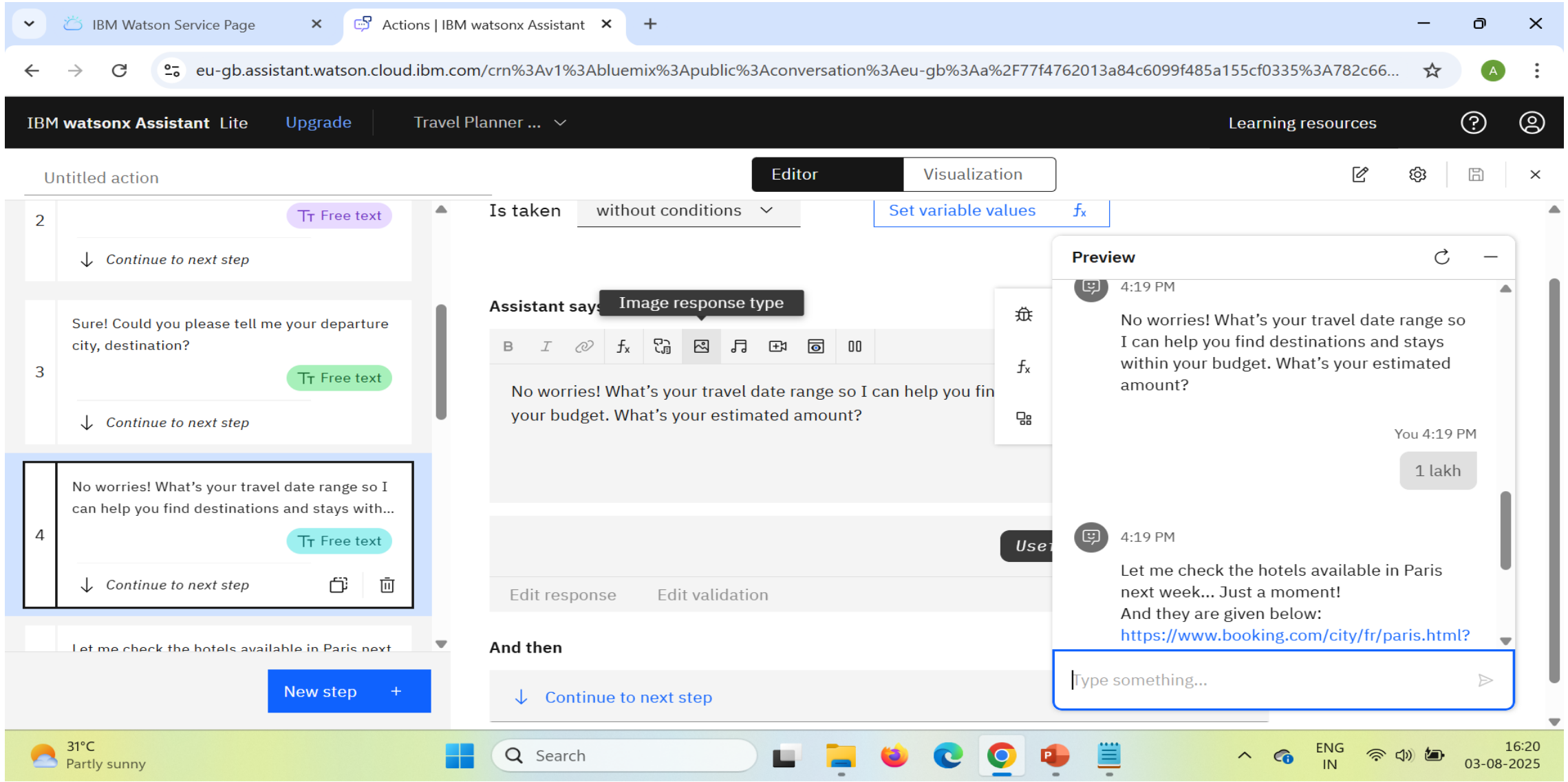

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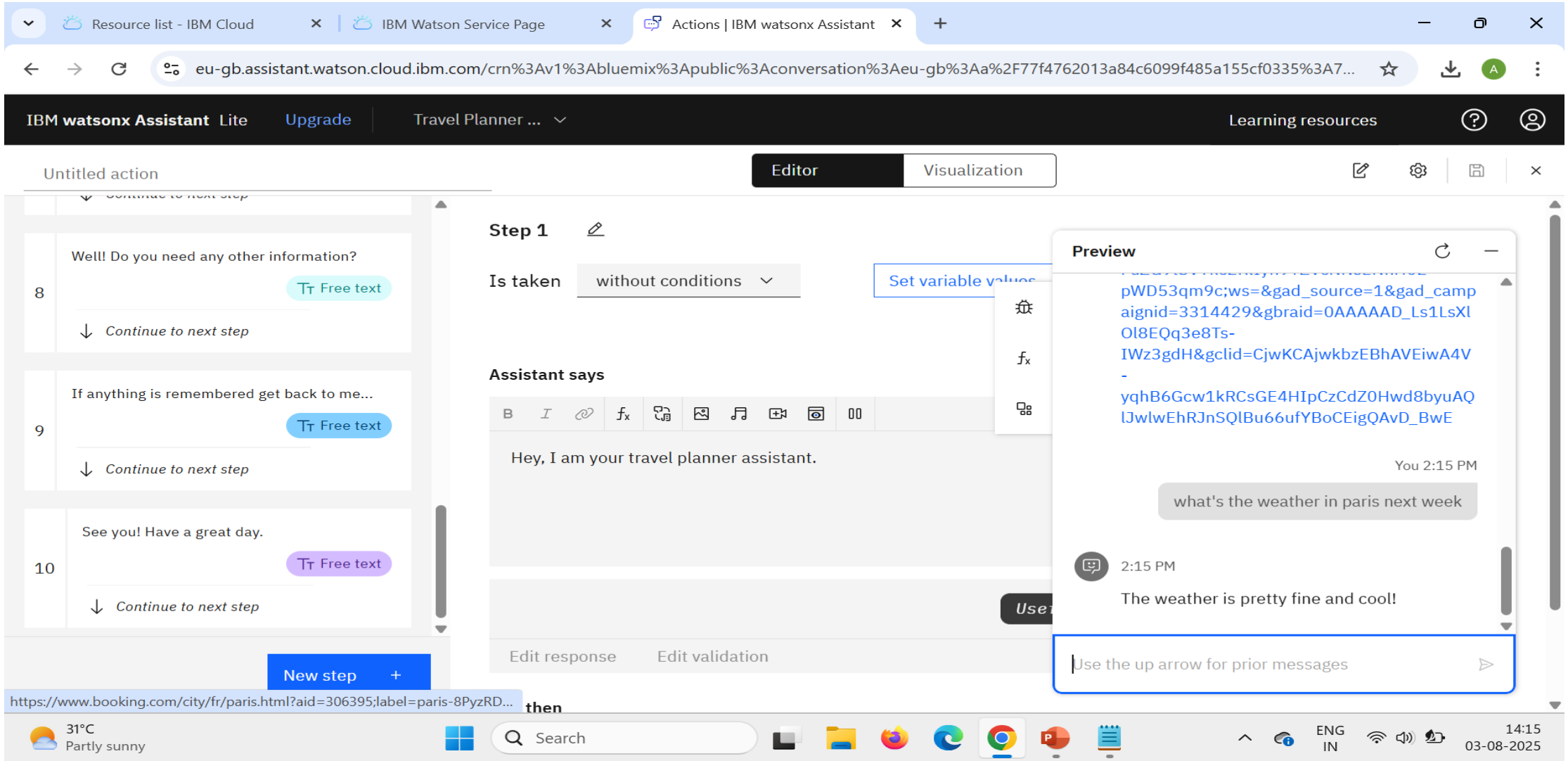

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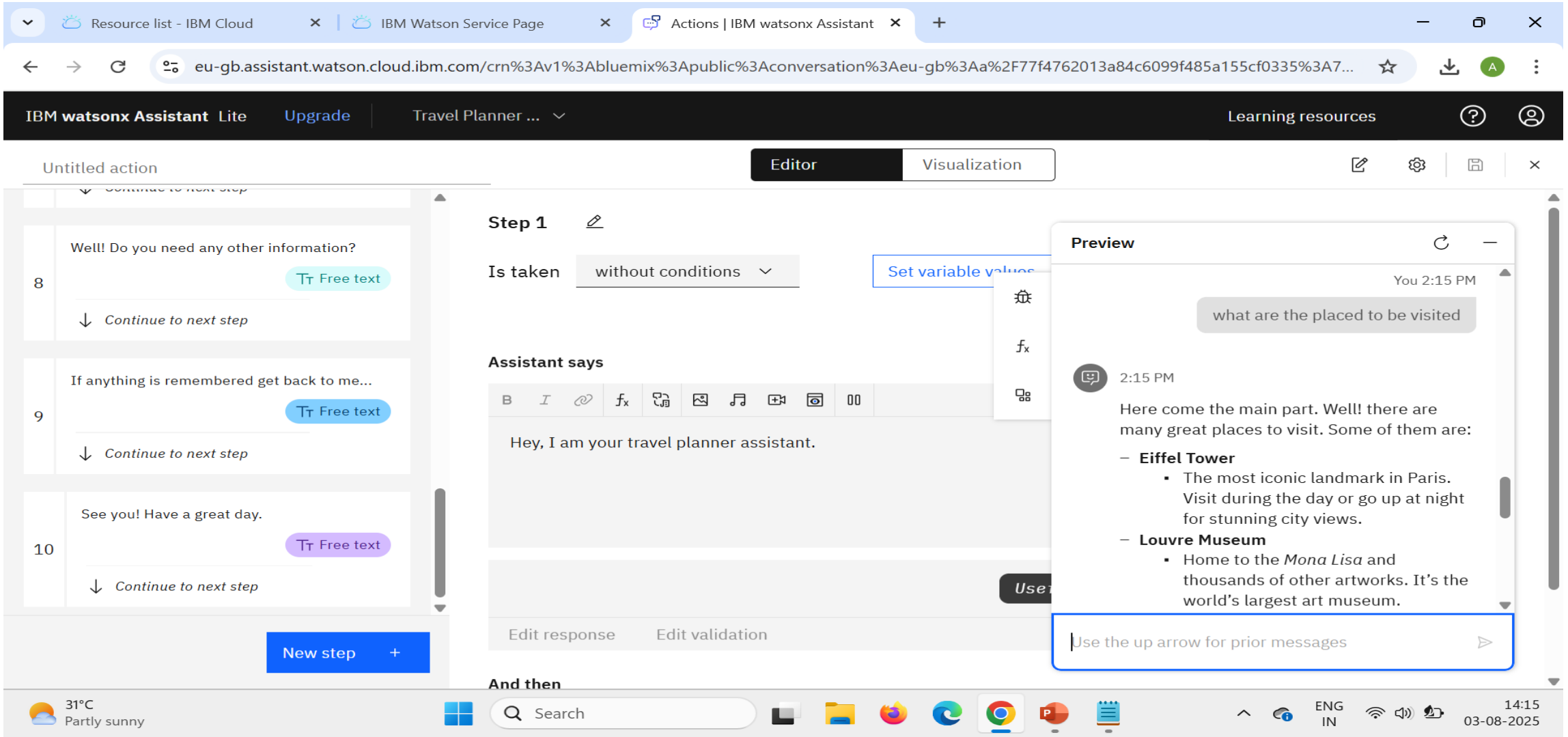

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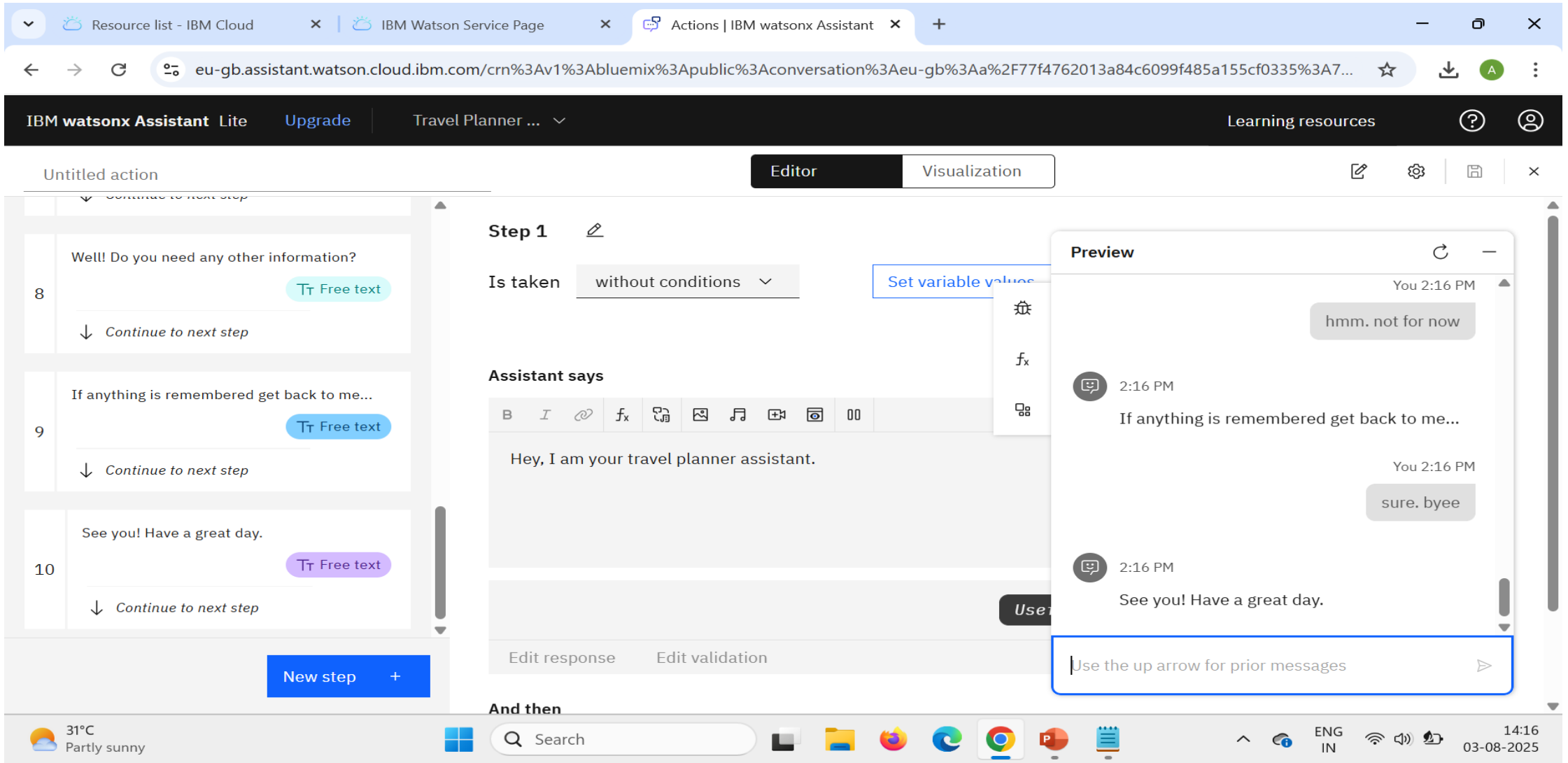


CONCLUSION

- The Travel Planner Agent, developed using IBM Watsonx Assistant and IBM Cloud services, successfully demonstrates how AI-powered conversational interfaces can simplify and enhance the travel planning experience.
- By integrating natural language understanding, real-time data access, and user preference tracking, the assistant offers personalized, accurate, and efficient support for travelers.
- This project showcases the effective use of Watsonx Assistant for intent recognition and dialog management, IBM Cloud Functions for backend logic and API integration, and IBM Cloudant for dynamic data storage.
- Optional enhancements like machine learning models and real-time APIs further enrich the agent's capabilities.
- Overall, the system reduces the manual effort typically involved in planning trips and delivers a smart, interactive experience.

FUTURE SCOPE

- The Travel Planner Agent presents a strong foundation for AI-driven travel assistance, and several enhancements can be incorporated to expand its functionality and user experience in the future:

- **Integration with Booking Platforms:**
  Enable direct booking of flights, hotels, and transport by integrating with real-world platforms like Skyscanner, Booking.com, or MakeMyTrip through their APIs.

- **Voice and Multilingual Support:**
  Extend the assistant with speech-to-text and text-to-speech capabilities using IBM Watson Speech Services. Add multilingual support to serve users in regional or international languages, improving accessibility.

- **Smart Itinerary Generation:**
  Implement AI-based itinerary generation based on user interests, trip duration, and real-time conditions. The assistant could dynamically build and modify plans based on weather or events.

- **Personalized Recommendations via Machine Learning:**

  Use collaborative filtering or clustering algorithms to recommend destinations and activities based on past preferences, search history, or similar traveler profiles.
- **Integration with Travel Insurance & Visa Services:**

  Offer assistance in acquiring travel insurance, understanding visa requirements, and generating checklists based on the chosen country.
- **Offline Access or Mobile App Support:**

  Package the assistant into a mobile app with offline planning features or cached data for users with limited connectivity during travel.
- **Emergency Assistance Feature:**

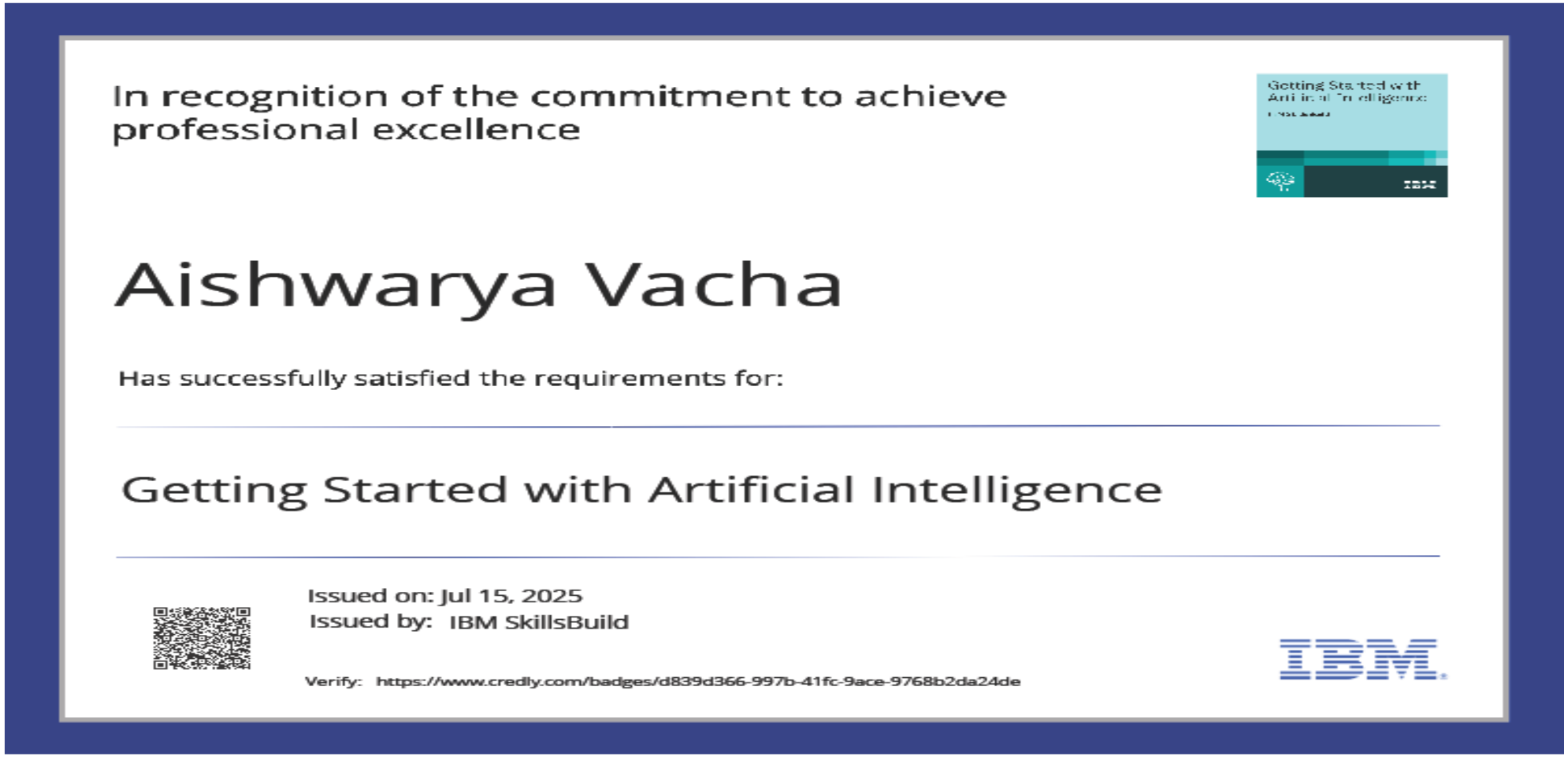
  Include a support module for emergency contact details, nearby embassies, hospitals, and local help services based on user location.

REFERENCES

- **IBM Watsonx.ai Documentation**
  https://www.ibm.com/cloud/watsonx-ai
  – Official documentation for using IBM Watsonx.ai and Granite LLMs for AI-powered applications.
- **IBM Cloud Functions (OpenWhisk) Documentation**
  https://cloud.ibm.com/docs/openwhisk
  Serverless platform used for backend logic and external API calls.
- **IBM Cloudant Documentation**
  https://cloud.ibm.com/docs/cloudant
  NoSQL database used to store user preferences and search history.
- **OpenWeatherMap API**
  https://openweathermap.org/api
  Used for retrieving real-time weather data for travel destinations.
- **Amadeus for Developers – Travel APIs**
  https://developers.amadeus.com/
  Offers APIs for flight booking, hotel offers, location search, and more.

IBM CERTIFICATIONS

Getting Started with Artificial Intelligence



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