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AI-Powered Tour Planner using Multi-Agent System

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Abstract: ***This paper presents a comprehensive AI-Powered Tour Planner that automates and personalizes travel itinerary creation using an intelligent multi-agent architecture integrated with cloud automation. The system leverages Azure Foundry AI Agents and Amadeus APIs to streamline end-to-end travel planning—from flight searches and hotel bookings to itinerary recommendations. Azure Logic Apps orchestrate API communication and workflow automation, ensuring seamless interaction between user inputs, AI-driven logic, and external travel data sources. The frontend layer combines Flask for the conversational interface and React for visualization, enabling real-time interaction with structured travel data. This research highlights the power of multi-agent systems, cloud orchestration, and API-driven architectures in revolutionizing modern tourism applications.***
Keywords: AI Agents, Amadeus API, Azure Logic Apps, Flask, React, Cloud Automation, Tour Planning, Multi-Agent System.

I. INTRODUCTION

The rapid evolution of Artificial Intelligence (AI) and cloud computing has transformed the travel and tourism industry. Traditional tour planning involves manual searching across multiple booking platforms, which can be time-consuming and inefficient. To address this issue, an AI-Powered Tour Planner system is proposed. The system employs a multi-agent framework that intelligently coordinates between specialized AI agents to automate various stages of tour planning, including flight search, hotel booking, and itinerary generation. Azure Foundry AI Agents form the core of this architecture, while Azure Logic Apps act as middleware to handle automation and API workflows. The system also integrates Amadeus APIs for flight and hotel data, ensuring real-time and accurate information retrieval.

II. PROBLEM DEFINITION AND OBJECTIVES

Manual tour planning often leads to fragmented workflows, human error, and time inefficiency. The proposed AI-based Tour Planner addresses these issues by leveraging automation, intelligent agents, and cloud orchestration. The primary objectives of this research include:

1) Automating tour planning using AI-driven workflows.
2) Integrating real-time travel APIs (Amadeus) for accurate booking data.
3) Utilizing Azure Logic Apps for cloud-based automation and error handling.
4) Developing a conversational AI interface using Flask.
5) Creating a scalable frontend dashboard using React for data visualization.

III. LITERATURE REVIEW

Several studies have explored AI-driven systems in tourism and travel management. Earlier works focused on rule-based recommendation systems, which lacked flexibility and contextual awareness. Modern advancements in AI, particularly the rise of intelligent agents and natural language processing, have enhanced automation capabilities in this sector. For instance, cloud platforms like Microsoft Azure now enable seamless integration between AI services and external APIs. Amadeus API's structured travel data further improves the efficiency of itinerary planning. This research builds upon prior works by combining multi-agent intelligence with cloud automation to create an adaptable tour planning system.

IV. PROPOSED SYSTEM ARCHITECTURE

The proposed architecture consists of three primary AI agents—Booking Agent, Tourist Finder, and Tour Planner. Each agent is responsible for a specific domain within the planning process. The Booking Agent handles flight and hotel search tasks, the Tourist Finder suggests local attractions based on preferences, and the Tour Planner consolidates the itinerary. The Azure Foundry AI Agent serves as a communication hub, invoking Azure Logic Apps through HTTP triggers. Logic Apps manage Amadeus API calls for flight and hotel data retrieval and ensure secure and consistent workflow execution.

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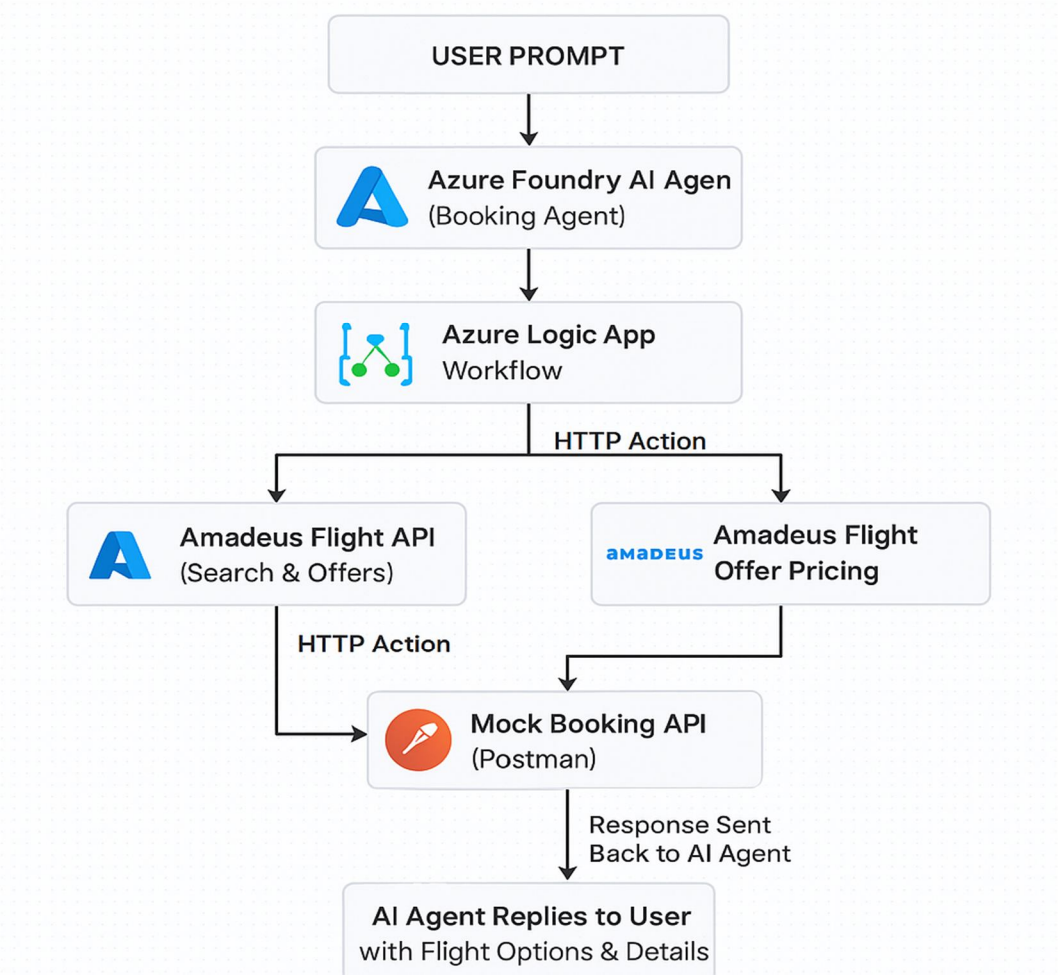


Fig. 1. High-Level System Architecture of AI-Powered Tour Planner

A. Technical Pipeline Architecture

The technical pipeline demonstrates how the AI Agent interacts with Azure Logic Apps, Amadeus APIs, and the Flask-React frontend. The flow begins with the user input, which the AI Agent processes and determines the appropriate Logic App to invoke. The Logic App sends HTTP requests to Amadeus APIs and returns structured responses to the AI Agent, which then displays them via Flask and React UI components.

[Placeholder for Fig. 2 - Technical Pipeline Architecture Diagram]

V. IMPLEMENTATION

The implementation is divided into backend and frontend layers. The backend comprises Azure Logic Apps and Amadeus API integration, while the frontend includes a Flask-based chatbot and a ReactJS dashboard. Each Logic App handles specific tasks: flight search, hotel search, and offer pricing. Data is exchanged using JSON objects, ensuring compatibility between different components. The Flask application hosts the AI chatbot, which interprets user prompts and communicates with the AI Agent through RESTful APIs. The React frontend visualizes booking data and itineraries with dynamic filtering options.

[Placeholder for Screenshots: Flight Search Logic App, Hotel Offer Response, Booking Confirmation]

VI. RESULTS AND DISCUSSION

The AI-Powered Tour Planner demonstrated efficient performance across multiple test cases. The system successfully retrieved and displayed flight and hotel data from Amadeus APIs. Integration testing confirmed the reliability of Logic App workflows and their ability to process API responses with low latency. The chatbot interface provided intuitive interaction, while the React dashboard offered a clean visual representation of travel itineraries.

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VII. CONCLUSION AND FUTURE SCOPE

This research successfully showcases how AI agents and cloud automation can transform tour planning. The combination of Azure Foundry AI Agents, Amadeus APIs, and Logic Apps creates a scalable and efficient framework for automated travel booking. Future enhancements include integrating secure payment gateways, real-time notifications, and advanced personalization using machine learning to recommend destinations based on user history.

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SYSTEM ARCHITECTURE

The system architecture integrates multiple cloud components and APIs for seamless automation:
- The user interacts via a front-end interface (Flask + React).
- Azure Foundry AI Agents process the user query.
- Azure Logic Apps orchestrate workflows and API calls.
- Amadeus APIs fetch real-time data for flights, hotels, and tourist attractions.
- The AI agents interpret data and present optimized results back to the user.

Diagrams

Figure 1: System Workflow Overview

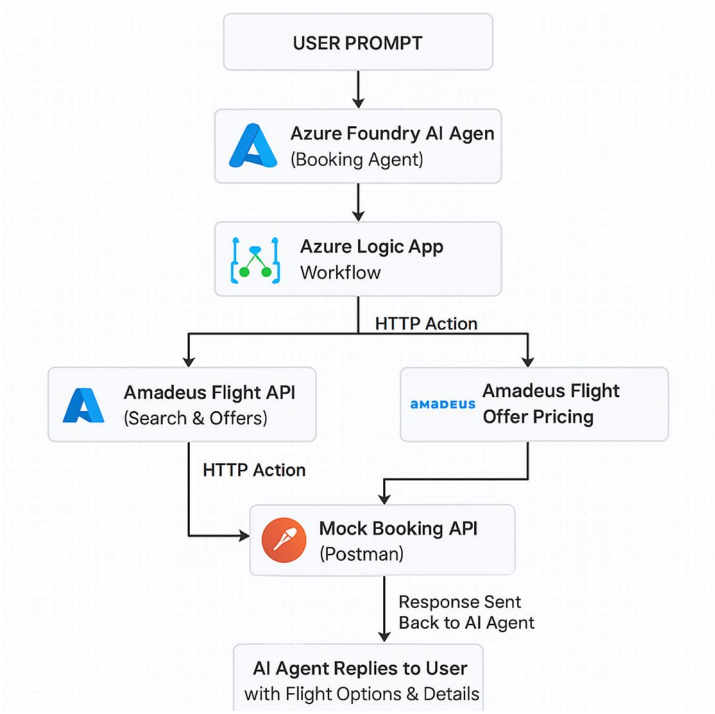


Figure 2: Technical Pipeline Architecture

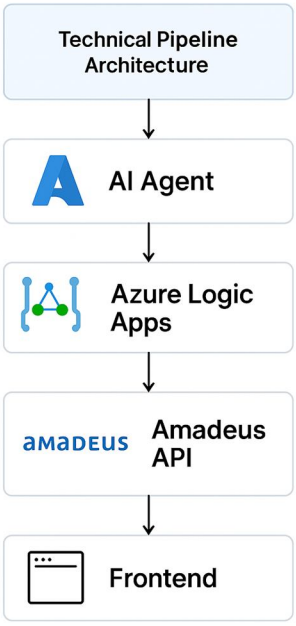


Figure 3: Multi-Agent Data Flow Diagram

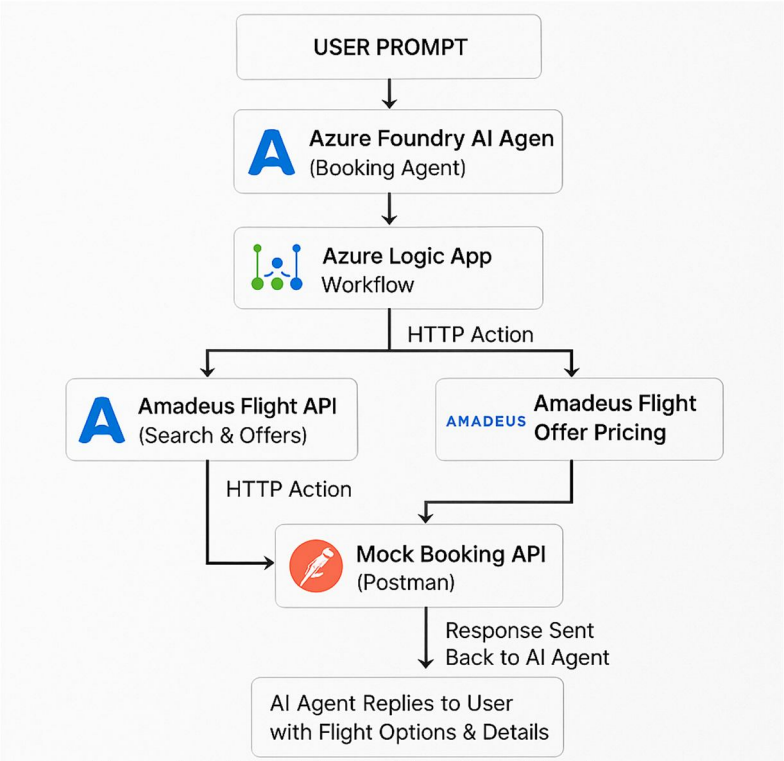
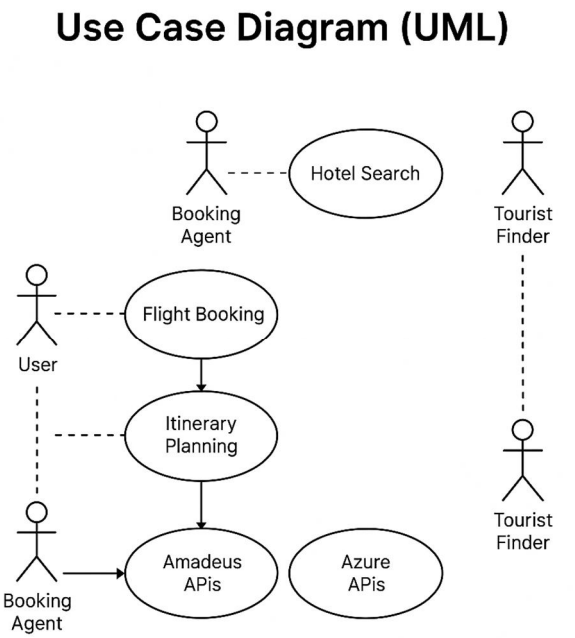


Figure 1: Architectural diagram of the AI-Powered Tour planner system

Figure 4: Use Case Diagram (UML)

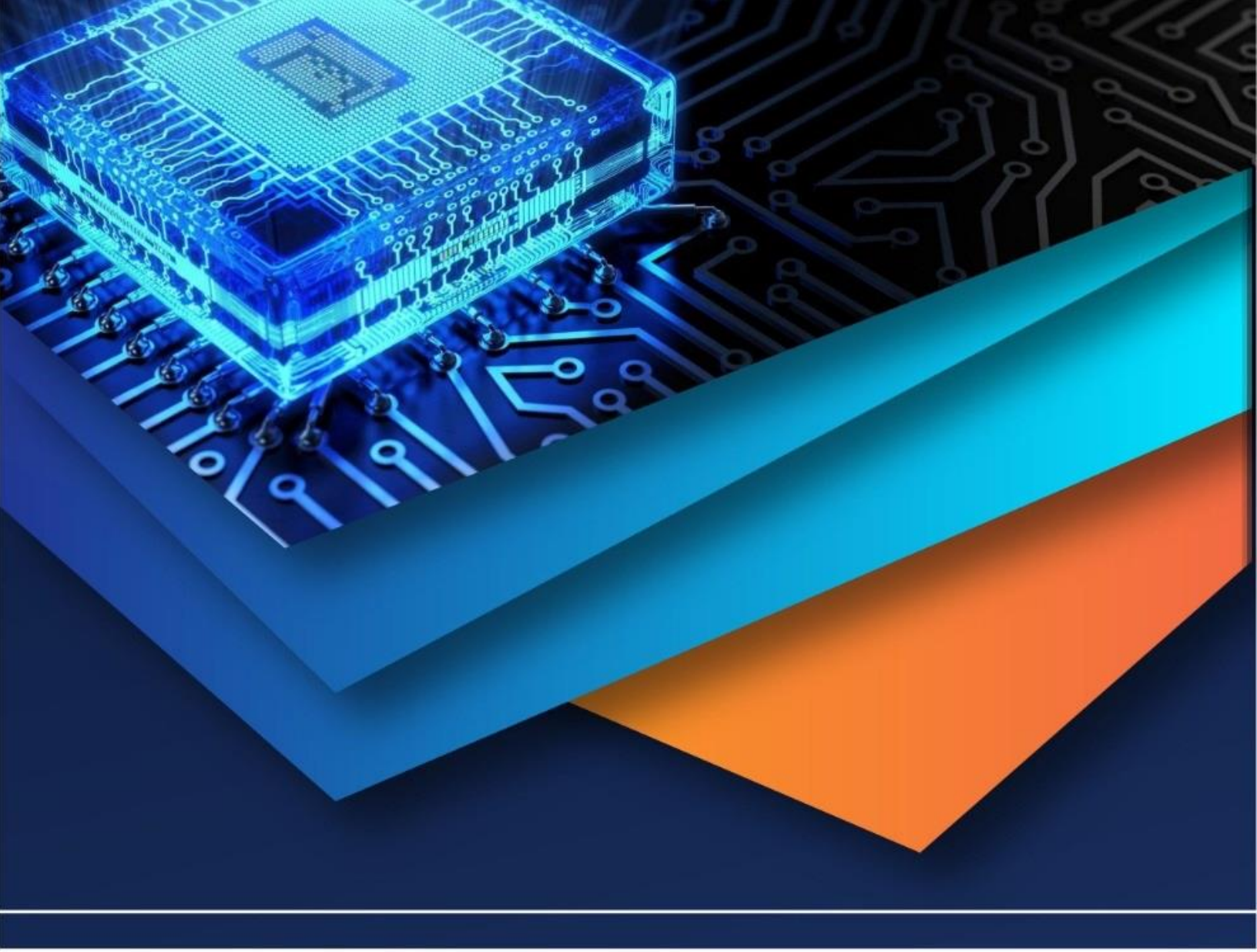


Conclusion

The AI-Powered Tour Planner revolutionizes the way users plan trips by automating major steps like searching, booking, and itinerary generation. By integrating Amadeus APIs with Azure Logic Apps and AI Foundry Agents, the system minimizes human

effort and increases accuracy and personalization. This project demonstrates how intelligent automation and cloud-based AI can enhance real-world travel experiences.

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