**Agentic AI training – Capstone Project Submission**

**Submission Date:** 23rd October 2025

**Team Members: Team Titan**

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**Project Title:** WanderMind – Autonomous AI Travel Planner

**Objective / Problem Statement:**Travelers often struggle to plan a complete trip that includes sightseeing, accommodations, and travel options. Travel companies aim to provide a personalized itinerary that meets user preferences and offers a seamless experience.

**Key Components Used:**

* **Framework:** 
  + **LangGraph –** used to build a modular, graph-based orchestration of autonomous agent workflows.
  + **Streamlit** is used for the front-end interface to interact with the planner.
* **Agent Type:**
  + **Fully Autonomous Multi-Tool Agent:** The user provides a text-based travel request (e.g., *“Plan a 5-day trip to LA for 2 people during Christmas”*). The system cleans and structures this input, then autonomously fetches and curates flight, hotel, and attraction data to produce a complete, optimized itinerary which is downloadable in PDF format.
* **Nodes:** The system is implemented as a LangGraph node-based agent, where each node represents a self-contained processing step in the travel planning pipeline.
  + **fetch\_user\_data –** Parses raw text input into structured trip details (destination, dates, travelers, preferences).
  + **get\_attr\_details –** Uses the AttractionTools retriever to fetch attraction data for the destination.
  + **get\_top\_attr\_details –** Invokes an OpenAI model (via structured output schema) to identify the best attractions based on user data and retriever results.
  + **get\_flight\_details / get\_top\_flight\_details –** Retrieves and ranks flight options using the Amadeus API.
  + **get\_hotel\_details / get\_top\_hotel\_details –** Fetches and filters hotel listings via SerpAPI.
  + **get\_itinerary –** Aggregates curated flight, hotel, and attraction details into a unified travel plan and generates a final PDF using ReportLab.
* **Tools:**
  + **Amadeus API →** Real-time flight information.
  + **SerpAPI (Google Search API) →** Hotel data retrieval.
  + **LangChain + OpenAI Models →** Language understanding, summarization, and RAG-based reasoning.
  + **ReportLab →** Dynamic generation of the final itinerary PDF.
  + **Markdown2 →** For rendering textual outputs in structured, formatted blocks.
* **Vector DB:**
  + **ChromaDB –** Used for storing and retrieving attraction-related embeddings to enhance the RAG process.
* **Agent Workflow Summary:**

**A diagram of a computer program

AI-generated content may be incorrect.**

* + **Input Parsing:** User provides a natural-language travel request which is processed by fetch\_user\_data to form a structured data dictionary.
  + **Parallel Data Retrieval:** get\_attr\_details, get\_flight\_details, and get\_hotel\_details run concurrently. Each node gathers relevant data using APIs or local retrieval.
  + **Filtering and Ranking:** get\_top\_\*\_details nodes select top recommendations based on quality, cost, and relevance.
  + **Itinerary Compilation:** get\_itinerary combines the curated details into a multi-day travel plan, including flights, accommodations, and attractions.
  + **Final Output:** A professionally formatted PDF itinerary is generated using ReportLab.
* **Optional Features Implemeted:**
  + **Dynamic PDF Generation:** Converted the final itinerary (in markdown) into a polished PDF using ReportLab. Markdown is first parsed into HTML with markdown2 and BeautifulSoup, then rendered with styled headings, lists, and paragraphs. The PDF is generated in-memory (BytesIO) and instantly downloadable via Streamlit’s UI, providing a smooth end-to-end experience.
* **Outcomes / Key Learnings:**
  + Developed proficiency in LangGraph, agent orchestration, and modular workflows.
  + Hands-on integration of multiple APIs (Amadeus, SerpAPI) within a unified agent pipeline.
  + Experience with RAG workflows and Chroma vector stores.
  + Learned to balance LLM reasoning with deterministic data pipelines for reliability.
  + Built a real-world, end-to-end AI system capable of autonomous planning and content generation.

**Future Enhancements:**

* **Voice-Based Trip Requests:**Add speech-to-text input so users can describe their travel plans verbally instead of typing.
* **Real-Time Availability Checks:**Connect to live APIs for instant validation of flight and hotel availability before confirmation.
* **Interactive Map Visualization:**Embed maps within the UI to visualize hotels, attractions, and travel routes for better context.
* **Collaborative Trip Mode:**Allow multiple users to co-plan a trip by merging preferences and generating a shared itinerary.

**Demo Video Link:**