Agentic AI, RAG & Multi-Agent Systems

Duration: 40 hours

Course Overview

This training program is designed to:

- Build understanding of Agentic AI concepts, architecture, workflows, and real-world business use cases
- Enable participants to design and develop ReAct, Reflex, Planning & Multi-Agent systems
- Learn to integrate LangChain, LangGraph, AutoGen for complex agentic workflows
- Implement Agentic RAG using vector databases and dynamic retrieval logic
- Build task-oriented chatbots and autonomous research agents using open-source LLMs (Groq, Llama, Mixtral, etc.)
- Understand safety, governance, hallucination mitigation, and ethical practices

Course Prerequisites

- Strong programming skills in Python
- Familiarity with virtual environments, pip/conda, notebook environments
- Basic understanding of LLMs, prompt engineering, embeddings & vector DBs
- Experience and access of APIs (OpenAI / Groq / Gemini / Local LLMs)
- Optional but beneficial: Git, Docker, and basic cloud fundamentals

Learning Outcomes

After successful completion, participants will be able to:

- Architect & build multi-agent systems with role-based collaboration
- Implement ReAct reasoning, tool calling, and memory-augmented conversation
- Create Agentic RAG pipelines for enhanced retrieval & decision making
- Build production-grade AI agents using LangChain, LangGraph & AutoGen
- Integrate vector DBs (Chroma, Pinecone, Weaviate, PGVector) for retrieval tasks
- Apply safety, privacy, governance & Responsible AI guidelines
- Deploy task-automation chatbots integrated with UIs and enterprise workflows

Course Agenda

Module 01: Introduction to Agentic AI

- What is Agentic AI?
- Evolution: Rule-based → Generative AI → Agentic AI

- Characteristics of Agentic AI systems
- Generative AI vs Agentic AI (comparison matrix)
- Real-world use cases & enterprise applications
- Architectural limitations: hallucination, prompt dependency, tool reliability
- Governance considerations :
    - Data security, access control, logging
    - Responsible AI frameworks
    - Safety guardrails & enterprise approval workflows

Module 02: Architecture of Agentic AI Systems

- Reflex Agents
- ReAct Agents (Reasoning + Acting)
- Planning Agents (Planner + Executor)
- Multi-Agent Systems (collaborative agent teams)
- Agent lifecycle & workflow orchestration
- Solution Architecture examples
    - Tools, memory, RAG, orchestration
    - Hallucination mitigation
    - Critic agent, self-reflection, model consensus, verification agents

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Module 03: Agentic Frameworks Overview

- LangChain fundamentals
- LangGraph introduction — graph-based agent orchestration
- AutoGen framework
- Tools, memory, function calling & control logic
- Ethical considerations & risks

Module 04: Building Chatbots with Agentic AI

- Using Llama-2 / Groq / Open-Assistant / Mixtral
- Multi-turn conversation management with LangChain
- Agent memory, persona & conversation style
- UI Integration: Gradio / Streamlit
- Hands-On Lab: Build a task-specific chatbot

Module 05: Working with AutoGen

- AutoGen architecture & building blocks
- ReAct pattern implementation

- Multi-agent collaboration & negotiation
- RAG + function calling inside AutoGen
- Lab: Multi-agent communication simulation & role assignment

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Module 06: Multi-Agent Systems

- Agent collaboration & task delegation
- Intent detection → agent routing → execution
- Enterprise use cases
- Reference architecture blueprint
- Failure handling & fallback models

Module 07: Agentic Retrieval-Augmented Generation (RAG)

- Refresh: classical RAG pipeline
- What is Agentic RAG?
    - Retrieval + validation + synthesis
    - Dynamic decision-making
    - Tool-driven reasoning & self-checking
    - Vector DB integration (Chroma, Pinecone, Weaviate, PGVector)
    - Project: Research Analyst Assistant + Self-Verification Agent

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Module 08: Ethical & Responsible AI

- Bias detection & mitigation
- Transparency & observability
- Safeguards & unintended outcome avoidance
- Prompt injection defense & cybersecurity considerations
- Enterprise governance & compliance frameworks