

Agentic AI & Gen AI with Cloud-V2 (By Ratnesh Kumar Singh)

Tools



 Langflow

 agno
Pure AI Agents

 crewai

 opik



n8n

 Streamlit

AutogenAI

 gradio



 FastAPI

 docker



amazon EC2

 BENTOML



S3

ANTHROPIC



Grok

 Gemini

Module 1

Introduction to Agents

In this module, you'll explore the fundamentals of AI agents, understanding what they are and how they function. You'll dive into the differences between Agentic AI, AI Agents, and Generative AI. The module will also introduce you to multi-agent systems and various frameworks used to build them. By the end, you will have a strong grasp of agent-based AI concepts, preparing you to work with agentic AI frameworks in real-world applications.

Topics	
Understanding Agents	What are Agents?
Agentic AI Concepts	Agentic AI vs AI Agents, Agentic AI vs Generative AI
Multi-Agent Systems & Frameworks	What are Multi-Agents?, Agentic AI Frameworks

Module 2

Pydantic - Data Validation

In this module, you'll learn how to use Pydantic for efficient data validation and parsing in Python. You'll start with installation and understanding models and fields. Then, you'll explore core validation techniques, including working with JSON, data types, and validators. Finally, you'll dive into advanced concepts like validation decorators and monitoring Pydantic with Logfire. By the end, you'll be equipped to integrate Pydantic seamlessly into your projects for robust data validation.

Topics	
Getting Started with Pydantic	Installing, Models, Fields
Core Validation & Data Handling	JSON, Types, Validators, Dataclasses
Advanced Validation & Monitoring	Validation Decorator, Monitor Pydantic with Logfire

Module 3

Langchain

In this module, you'll dive into Langchain, an essential framework for building AI-powered applications. You'll begin with an introduction to its core components and modules. Next, you'll explore data ingestion and text-splitting techniques to preprocess documents effectively. Finally, you'll learn about embeddings from OpenAI, Ollama, and Hugging Face, and how to store and retrieve vectorized data using FAISS and ChromaDB. By the end, you'll have a strong foundation for working with Langchain in real-world AI applications.

Topics	
Introduction to Langchain	Introduction to Basic Components and Modules in Langchain
Data Ingestion & Processing	Data Ingestion with Document Loaders, Text Splitting Techniques (Recursive Character, Character, HTML Header, Recursive JSON)
Embeddings & Vector Stores	Introduction to OpenAI Embedding, Ollama Embeddings, Hugging Face Embeddings, VectorStores-FAISS, VectorStore and Retriever - ChromaDB

Module 4

LCEL (Langchain Expression Language)

In this module, you'll explore Langchain Expression Language (LCEL) for building AI-powered workflows. You'll start by working with open-source models using the Groq API. Next, you'll learn how to construct LLMs, prompts, and structured output chains using LCEL. Finally, you'll deploy LCEL components as APIs using Langserve, making them accessible for real-world applications. By the end, you'll have the skills to create and deploy LCEL-based AI solutions efficiently.

Topics	
Getting Started with LCEL	Getting Started with Open Source Models Using Groq API
Building LCEL Chains	Building LLM, Prompt, and Stroutput Chains with LCEL
Deployment & API Integration	Deploy Langserve Runnable and Chain as API

Module 5

LangGraph Introduction

In this module, you'll explore LangGraph, a framework for building AI-powered workflows using graph-based structures. You'll begin with an introduction to its core concepts, including simple graphs and LangGraph Studio. Next, you'll dive into key components like chains, routers, and agents with memory. Finally, you'll learn how to deploy LangGraph-based applications. By the end, you'll have a solid understanding of LangGraph and its practical applications in AI development.

Topics	
Getting Started with LangGraph	Introduction, Simple Graph, LangGraph Studio
Core Components & Agents	Chain, Router, Agent, Agent with Memory
Deployment Essentials	Intro to Deployment

Module 6

State & Memory in LangGraph

In this module, you'll dive into managing state and memory in LangGraph. You'll start by understanding state schemas and how multiple schemas can be utilized. Then, you'll explore memory optimization techniques, including state reducers and message filtering, to efficiently handle data in AI workflows. By the end, you'll have a solid grasp of state and memory management, enabling you to build scalable and efficient LangGraph applications.

Topics	
Understanding State Management	Introduction, State Schema, Multiple Schemas
Memory Optimization	State Reducers, Trim and Filter Messages

Module 7

UX and Human in Loop with LangGraph

In this module, you'll explore techniques to enhance user experience and integrate human feedback in LangGraph workflows. You'll start with real-time streaming and breakpoints to control execution flow. Then, you'll dive into editing states dynamically and incorporating human feedback. Finally, you'll learn advanced debugging techniques like time travel for reviewing past states. By the end, you'll be able to build interactive, user-friendly AI applications with LangGraph.

Topics	
Enhancing User Experience	Streaming, Breakpoints
Human Feedback & State Control	Editing State and Human Feedback, Dynamic Breakpoints
Advanced Debugging	Time Travel

Module 8

LangGraph Deployments

In this module, you'll learn how to deploy LangGraph applications efficiently. You'll start with fundamental deployment concepts and the process of creating a deployment. Then, you'll explore how to connect and interact with your deployed LangGraph applications. By the end, you'll have the skills to deploy and manage LangGraph solutions in real-world environments.

Topics	
Deployment Basics	Deployment Concepts, Creating a Deployment
Integration & Access	Connecting to a Deployment

Module 9

Agno - Light Framework

In this module, you'll explore Agno, a lightweight framework for building AI agents. You'll start by understanding its core components, including agents, teams, models, and tools. Next, you'll learn how Agno handles data storage using chunking, vector databases, and embeddings. You'll dive into workflows, agent observability, and UI features, enabling you to build and monitor intelligent agent systems effectively. You will also understand web search agents that retrieve and process online information. Then, you'll delve into financial agents designed for analyzing market trends and financial data. Finally, you'll learn about RAG (Retrieval-Augmented Generation) agents, which enhance LLM capabilities with external knowledge retrieval.

Topics	
Core Concepts & Components	Agents in Agno, Teams, Models, Tools, Knowledge
Data Handling & Storage	Chunking, VectorDBs, Storage, Embeddings
Workflows & Observability	Workflows, Agent Observability, Agent Playground, Agent UI
Agno Projects	Web Search Agents, Financial Agents, RAG Agents

Module 10

Agentic RAG

In this module, you'll dive into Agentic RAG (Retrieval-Augmented Generation) techniques, which enhance AI models with dynamic retrieval capabilities. You'll begin with adaptive RAG, learning how to implement it locally and with services like Cohere. Then, you'll explore controlled RAG approaches like Agentic RAG and C-RAG, including their local implementations. Finally, you'll discover self-optimizing RAG methods that leverage vector databases for smarter knowledge retrieval. By the end, you'll be able to build advanced RAG-powered AI agents.

Topics	
Adaptive Retrieval-Augmented Generation	Adaptive RAG, Adaptive RAG with Cohere, Adaptive RAG in Local
Controlled & Contextual RAG	Agentic RAG, C-RAG, C-RAG in Local
Self-Optimizing RAG	Self RAG, Self RAG in Local, Self RAG with VectorDB

Module 11

LangSmith

In this module, you'll explore LangSmith, a powerful tool for managing AI workflows. You'll start with an overview of its key features and role in AI development. Next, you'll learn how to set up LangSmith and navigate its user interface to utilize core functionalities. Finally, you'll dive into data integration, preprocessing, and workflow pipelines, ensuring a seamless AI development process. By the end, you'll have a strong foundation in using LangSmith to streamline AI projects.

Topics	
Introduction & Setup	What is LangSmith? Overview and Key Features, LangSmith in the AI Development Workflow, Setting Up LangSmith: Installation and Configuration
Core Functionalities & UI	Exploring the User Interface and Core Functionalities, Understanding Workflow Pipelines in LangSmith
Data Handling & Integration	Data Integration in LangSmith, Preprocessing and Cleaning Data

Module 12

Designing Multi-Agent Systems with LangGraph

In this module, you'll learn how to design and implement multi-agent systems using LangGraph. You'll start by building agent nodes and defining their roles. Next, you'll explore communication protocols and coordination mechanisms that enable agents to work together effectively. Finally, you'll learn how to scale multi-agent systems and apply your knowledge to real-world use cases. By the end, you'll be able to create intelligent and scalable multi-agent architectures.

Topics	
Building Agent Nodes & Roles	Building Agent Nodes in LangGraph, Defining Tasks and Roles for Agents
Agent Communication & Coordination	Agent Communication Protocols and Coordination
Scalability & Real-World Applications	Creating Scalable Multi-Agent Systems in LangGraph, Building a Real-World Multi-Agent System

Module 13

CrewAI - Multi-Agent Platform

In this module, you'll explore CrewAI, a powerful multi-agent platform for building AI-driven workflows. You'll begin with an introduction to its key features and capabilities. Next, you'll learn about agent collaboration, communication, and workflow automation. You'll also discover how to customize CrewAI by managing data, implementing memory, defining roles, and using advanced tools. Finally, you'll integrate LangChain tools and monitor your CrewAI applications with Opik. By the end, you'll be ready to design and deploy scalable multi-agent systems.

Topics	
Introduction & Core Features	Definition and Overview, Key Features and Capabilities
Agent Collaboration & Communication	Crew Collaboration Framework, AI-Agent Communication, Workflow Automation in CrewAI
Customization & Advanced Capabilities	Customizing CrewAI, Managing Data Across Agents, Role-playing, Memory, Tools, Focus, Guardrails
Integration & Monitoring	Using LangChain Tools, Monitor your CrewAI applications with Opik



Module 14

LangFlow - Low Code Tool

In this module, you'll explore LangFlow, a low-code tool for building LLM applications with ease. You'll begin with an introduction to its key features and use cases. Then, you'll learn how to set up your LangFlow environment and navigate its UI. Finally, you'll dive into core concepts such as nodes, chains, and prompts before building your first LangFlow application. By the end, you'll be able to create and deploy LLM-powered workflows effortlessly

Topics	
Introduction & Use Cases	What is LangFlow? Overview and Use Cases, Key Features of LangFlow for LLM Applications
Setup & UI Navigation	Setting Up Your LangFlow Environment, Understanding LangFlow UI and Workflows
Core Concepts & Quick Start	Key Terminologies in LangFlow (Nodes, Chains, Prompts), Quick Start: Creating Your First LangFlow Application

Module 15

Building Blocks of LangFlow

In this module, you'll dive into the foundational elements of LangFlow. You'll begin by understanding core concepts like nodes, chains, and how LLMs integrate with LangFlow. Next, you'll explore workflow customization, comparing pre-built and custom workflows while learning about commonly used nodes. Finally, you'll cover prompt engineering and how to seamlessly integrate LangChain with LangFlow. By the end, you'll have the knowledge to build and optimize intelligent workflows efficiently.

Topics	
Core Concepts & Integration	Nodes and Chains: Core Concepts, Understanding LLMs and Their Integration with LangFlow
Workflows & Customization	Pre-built vs. Custom Workflows, Exploring Commonly Used LangFlow Nodes
Prompt Engineering & LangChain Integration	Prompt Engineering Basics in LangFlow, LangChain Integration: Using LangFlow with LangChain

Module 16

Integrating LangFlow with Third-Party Tools

In this module, you'll learn how to integrate LangFlow with various third-party tools and services. You'll start by connecting LangFlow with different data sources like SQL, CSV, and NoSQL databases, along with external REST APIs. Next, you'll explore model integrations, including OpenAI, Hugging Face, and vector databases for embeddings. Finally, you'll delve into workflow automation and chatbot development using LangFlow. By the end, you'll be able to build intelligent, automated applications with seamless integrations.

Topics	
Data & API Integration	Connecting LangFlow with Data Sources (SQL, CSV, NoSQL), API Integration for External Services (REST APIs)
Model & Vector Database Integration	Using LangFlow with Vector Databases for Embeddings, LangFlow with OpenAI and Hugging Face Models
Workflow Automation & Chatbots	Automating Workflows Using LangFlow, Building Chatbot Applications with LangFlow

Module 17

n8n

In this module, you'll get a comprehensive understanding of n8n, a powerful workflow automation platform. You'll begin with the fundamentals, covering workflows, nodes, and core concepts. Then, you'll explore APIs, webhooks, and error-handling techniques to ensure robust automation. You'll also learn to build AI-powered chatbots using Retrieval-Augmented Generation (RAG). Next, you'll explore automation for content creation, such as generating blog posts with WordPress and also implement AI-driven transcription and summarization workflows using Notion. Finally, you'll dive into AI-driven automation, including building AI agent chatbots and integrating tools like WhatsApp, Telegram, and calendars. By the end, you'll have the skills to create scalable and intelligent workflow automations with n8n.

Topics	
Fundamentals & Core Concepts	Introduction and Workflows, Interface, Nodes, Core Workflow Concepts, Data in n8n
API, Webhooks & Error Handling	APIs and Webhooks, Useful Nodes, Error Handling, Debugging
AI & Automation in n8n	Build AI Agent Chatbot, Automations with LLMs, Tools Integrations (WhatsApp, Telegram, Calendar)
n8n Projects	Building Automated RAG Chatbots, Automate Blog Generation with WordPress, Automated Transcribe and Summarize with Notion

Module 18

Autogen

In this module, you'll get an introduction to AutoGen, an open-source framework for building and managing AI agents. You'll start with installation and core concepts, exploring how agents interact within goals, environments, and actions. You'll then move on to designing agentic systems, incorporating feedback loops and decision-making frameworks. Finally, you'll explore multi-agent collaboration and deployment strategies, ensuring scalability and performance monitoring. By the end of this module, you'll have a solid foundation in AutoGen and its applications in AI-driven automation.

Topics	
Getting Started with Autogen	Overview of Autogen Framework, Installation and Environment Setup
Core Concepts of Autogen	Agents, Goals, Environments, and Actions, APIs, Libraries, and Tools
Building Agentic Systems	Designing and Developing Agentic Systems, Framework for Agentic Decision-Making
Agent Interactions & Learning	Communication Between Agents, Implementing Feedback Loops, Agent Learning and Adaptation
Multi-Agent Collaboration	Multi-Agent Collaboration, Deployment, Monitoring Agent Performance

Module 19

Model Context Protocol (MCP)

In this module, you'll dive into the Model Context Protocol (MCP), a standardized way for AI systems to connect with tools and data. You'll begin by understanding its purpose and core architecture, along with the various server types MCP supports. From there, you'll learn how to practically implement MCP using Python, and explore real-world integration with providers like Anthropic. The final section explores key components like tools, resources, and prompt engineering within MCP, helping you build scalable, context-aware AI workflows that can plug into any LLM backend.

Topics	
Understanding MCP Fundamentals	What is MCP?, Core architecture of MCP, Different Types of MCP Servers
Working with MCP in Practice	Working with Python SDK , MCP with Anthropic, Building MCP with LLMs
MCP Components and Integration	Resources,Tools, Prompts

Module 20

Deploying AI Agents Stack & End-to-End Agentic AI Projects

This module covers the full deployment pipeline for AI agents, providing hands-on experience with essential DevOps tools such as GitHub Actions, Docker, and cloud platforms like AWS S3, ECR, EC2, and Bedrock. You'll also explore model serving with BentoML. After mastering these deployment concepts, you'll work on multiple end-to-end Agentic AI projects, applying these skills to real-world scenarios. By the end of this module, you'll be equipped to deploy, manage, and scale AI agents efficiently.

Topics	
CI/CD for AI Agents	GitHub Actions, Docker
Cloud Infrastructure	AWS S3, AWS ECR, AWS EC2, AWS Bedrock
Model Serving & Deployment	BentoML
End-to-End Agentic AI Projects	Multiple Agentic AI Project