

Course outline on Agentic AI, incorporating concepts from both "*Understanding AI Agents: From Fundamentals to Implementation*" and "*Agentic AI Fundamentals and Practical Applications*" by Anupam Purwar. This outline aims to provide a comprehensive understanding from foundational concepts to practical implementation, with a focus on real-world applications and advanced topics.

# Agentic AI by Anupam Purwar

## Pre-requisites:

Basic Python Programming, Understanding of Machine Learning, Natural Language Processing (NLP) Basics, Mathematics and Statistics, and Familiarity with AI Tools.

## Course Structure:

### Module 1: Foundations of Conversational AI and Introduction to Agentic Systems

- Introduction to Conversational AI and its applications: Explore the landscape of conversational AI and its various uses.
- Types of Agents: Differentiate between traditional chatbots, voice assistants, and the emerging paradigm of AI agents.
- History of AI and its use in Conversational systems: A brief overview of AI's evolution leading to current agentic systems.
- Defining AI Agents: Understanding AI agents as programs where Large Language Model (LLM) outputs control workflow, enabling adaptability and external interaction.
- Levels of Agency: Introduction to Hugging Face's five levels of agency, from simple processors to multi-agent systems.

### Module 2: Advanced Natural Language Understanding (NLU) for Agentic AI

- Different NLU approaches: Delve into rule-based and machine learning-based NLU.
- Text Pre-processing using NLTK: Practical aspects of preparing text data for agent processing.

- Syntactic and Semantic Analysis: Understanding the structure and meaning of language for robust agent comprehension.

## Module 3: Large Language Models (LLMs) - The Core of Agentic AI

- Artificial Neural Networks: Foundations of neural networks relevant to LLMs.
- Transformer Architecture: In-depth understanding of the Transformer, the backbone of modern LLMs.
- What is LLM? Definition, capabilities, and limitations of Large Language Models.
- Pre-training Objectives: Explore pre-training techniques like masked language modeling.
- Fine-tuning LLMs for Specific Tasks: Customizing LLMs for agent-specific functionalities.
- Supervised Fine-tuning (SFT): Practical application of SFT in agent development.
- Reinforcement Learning from Human Feedback (RLHF): Enhancing agent performance through human guidance.

## Module 4: Architecture and Components of Conversational and AI Agents

- Rule-based Chatbots, Retrieval-based Chatbots: Traditional approaches to conversational systems.
- Generative Chatbots: Understanding the evolution towards more dynamic conversational agents.
- Transformer-based Models: Application of Transformer models in conversational agent design.
- Core Components of AI Agents: Detailed study of tools and actions, decision-making and planning, and autonomy within AI agents.
- Agent Architectures: Examination of various architectural patterns for building AI agents.

## Module 5: Prompt Engineering and Retrieval Augmented Generation (RAG) for Agentic Systems

- What is a Prompt? Fundamentals of prompt design for effective agent interaction.
- Principles of Prompt Engineering: Strategies for crafting effective prompts.
- Prompt Design for Different Tasks: Tailoring prompts for diverse agent functionalities.
- Retrieval Augmented Generation (RAG): Integrating external knowledge for enhanced agent responses and decision-making.

## Module 6: Building and Implementing AI Agents

- Environments for AI Agents: Understanding the operational environments for deploying agents.
- How to Build an Agent: Practical steps and considerations in constructing an AI agent.
- Different Types of Agentic Tools: Exploring data retrieval tools (like RAG systems), static tools with dynamic usage, and various decision-making tools (from simple to complex).
- Practical Value of AI Agents: Case studies and examples, such as AI-powered recruitment tools and social media management systems.

## Module 7: Advanced Agentic AI Concepts and Multi-Agent Systems

- Evaluating LLM Outputs and Mitigating Risks: Strategies for assessing agent performance and addressing potential issues.
- Decision-Making Processes in Agents: Deeper dive into how agents make decisions.
- Task Handling Capabilities: Understanding how agents manage and execute complex tasks.
- Technical Implementation of AI Agents: Practical considerations for developing and deploying agents.
- Multi-Agent Systems: Introduction to the concept and benefits of multiple AI agents working collaboratively.

## Module 8: Business Considerations and Future of Agentic AI

- Business Considerations for AI Agents: Discussing costs, Return on Investment (ROI), and other business implications.
- Agentic AI vs. Chatbots: A clear distinction and understanding of their unique capabilities.
- Future Trends in Agentic AI: Emerging technologies and the evolving landscape of intelligent agents.