

Generative AI Course Content

1. Introduction to Generative AI
2. Python and Deep Learning Foundations (Hands on)
3. Transformers and Large Language Models
4. Prompt Engineering (Hands on)
5. Working with LLM APIs (Hands on)
6. Retrieval-Augmented Generation (RAG) (Hands on)
7. LangChain and LlamaIndex (Hands on)
8. Fine-Tuning and Customization
9. Multimodal Generative AI
10. Deployment and Responsible AI
11. Capstone Projects

Introduction to Generative AI

- AI, ML, Deep Learning, and Generative AI Overview
- Evolution of Generative Models, Use Cases and Ethics

Python and Deep Learning Foundations (Hands on)

- Python Essentials, NumPy, Pandas
- Neural Networks, PyTorch Basics

Transformers and Large Language Models

- Attention Mechanism, Transformer Architecture
- GPT, BERT, T5, Llama, Claude, and Gemini Model Families
- Tokenization, Embeddings, Context Windows

Prompt Engineering (Hands on)

- Zero-Shot, Few-Shot, Chain-of-Thought Prompting
- System Prompts, Structured Outputs, Prompt Templates
- Prompt Evaluation and Optimization

Working with LLM APIs (Hands on)

- OpenAI, Anthropic, Google Gemini APIs
- Streaming, Function Calling, Tool Use
- Cost, Latency, and Rate Limit Management

Retrieval-Augmented Generation (RAG) (Hands on)

- Embeddings and Vector Databases: FAISS, Pinecone, Chroma
- Chunking Strategies, Retrievers, Re-ranking
- Building Document Q&A Applications

LangChain and LlamaIndex (Hands on)

- Chains, Memory, Agents, Output Parsers
- Document Loaders, Indexes, Query Engines

Fine-Tuning and Customization

- Fine-Tuning Concepts, LoRA, QLoRA, PEFT
- Open-Source Models with Hugging Face
- Dataset Preparation and Evaluation Metrics

Multimodal Generative AI

- Text-to-Image: Diffusion Models, Stable Diffusion
- Speech, Audio, and Vision Language Models

Deployment and Responsible AI

- Streamlit and FastAPI Apps, Docker, Cloud Deployment
- Guardrails, Hallucination Handling, Bias, Safety, and Privacy
- LLMOps and Monitoring Basics

Capstone Projects

- Chatbot, RAG Application, Content Generation Tool, Portfolio