GenAI

Unit 1 (8 Hours)

Introduction to Generative AI:

1. Transfer Learning
2. Language Modelling Basics (MLM and Self Supervised Learning, NSP, RTD)
3. Introduction to LLM

Introduction to representation Learning and Latent Space

How Chat GPT is trained.

Generative Model Types:

1. Variational Autoencoders (VAEs)
2. Generative Adversarial Networks (GANs)
3. Autoregressive models.
4. Diffusion Models
5. Energy Based Models
6. Normalizing Flows

Fundamental Building Blocks of GenAI:

1. Boltzmann Machines (BMs)
2. Restricted Boltzmann Machines (RBMs)

Evaluation Metrics for Generative Models

1. Inception Score
2. Fréchet Inception Distance (FID)
3. Precision-Recall Curves for Text Generation

Unit-2 (8 Hours)

Tokenization:-

* + - 1. BPE
      2. Sentencepiece
      3. Wordpiece

Embeddings:

1. Word2Vec
2. GLove
3. ELMo
4. BERT
5. Knowledge Base Embeddings (for RAG) - knowledge bases (KBs)

VectorDB:

1. High-dimensional embedding spaces for data representation
2. k-Nearest Neighbors (KNN) search for efficient retrieval

Applications: Product recommendations

LangChain:

1. A modular approach to building large language models (LLMs) by chaining together smaller, specialized models.

Application: Text summarization, Machine translation

RAG:

1. Leveraging pre-trained retrieval models to find relevant information from a knowledge base to inform text generation

Application: Dialogue systems, question answering

Unit-3 (8 Hours)

Prompt Engineering:

Crafting effective prompts to guide the behaviour of foundation models towards generating the desired outputs

Training methodologies: - Few-shot learning, zero-shot learning, fine-tuning

Application: Chatbots, creative writing assistants

Unit-4 (8 Hours)

Introduction to Multimodal Generative AI:

Generating outputs that combine different modalities like text, images, audio, or video.

1. Text-to-Image Generation (DALLE)
2. Audio Generation Model
3. Generative Video Models

Application: Generative Design, Text-to-3D

Unit-5 (8 Hours)

LLMOps Fundamentals: OpenAI Playground, Hugging Face Transformers

Debugging and Monitoring LLMs: LIME, Prometheus, Grafana

Responsible AI

1. Challenges and Considerations in Multimodal Generative AI
2. Ethical Considerations in Multimodal Generation
3. Hallucination

Recommended Book: -

1. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play (David Foster)
2. Generative Adversarial Networks (Ian Goodfellow, Yoshua Bengio, and Aaron Courville)
3. Deep Learning for Natural Language Processing (Yoav Goldberg)
4. Generative Models for Explainable AI (Yoshua Bengio, Sameer Arora, S. Joshua Dillon, and Mehdi Le+), Francois Chollet
5. Generative Deep Learning for Music Discovery (Meinard Müller, Francesco Caramia, and Alberto Conti)
6. Demystifying Prompt Engineering: AI Prompts at Your Fingertips (A Step-By-Step Guide) (Harish Bhat)
7. Human-Centered AI: Designing for Collaboration (Wendy Mackay, Ben Shneiderman, and Catherine Plaisant)