Generative AI - Course Details

Course Objective

To provide learners with a deep understanding of generative models, their architectures, training methods, and applications across industries, empowering them to build, fine-tune, and deploy generative AI systems.

Target Audience

- AI / ML enthusiasts and professionals
- Data scientists and researchers
- Software engineers interested in deep learning
- Creative technologists and content creators

Prerequisites

- Basic knowledge of Python programming
- Understanding of Machine Learning fundamentals

Course Content

Introduction to Generative AI

What is Generative AI?

History and evolution of generative models.

Applications of Generative AI: Art, music, NLP, gaming, healthcare.

Overview of generative model types.

Fundamentals of Neural Networks Recap

Feedforward Neural Networks.

Backpropagation and gradient descent.

Activation functions and optimization.

Autoencoders and Variational Autoencoders (VAE)

Autoencoder architecture and training.

Dimensionality reduction and data compression.

Variational Autoencoders: Theory and implementation.

Applications of VAEs.

Generative Adversarial Networks (GANs)

GAN architecture: Generator and Discriminator.

Training GANs: Loss functions and challenges.

Types of GANs: DCGAN, Conditional GAN, StyleGAN, CycleGAN.

Hands-on: Build a simple GAN for image generation.

Common pitfalls: Mode collapse, training instability.

Transformer Models in Generative AI

Introduction to Transformers.

Attention mechanism and self-attention.

GPT (Generative Pre-trained Transformer) overview.

Fine-tuning transformer models for generation tasks.

Applications: Text generation, code generation, chatbots.

Diffusion Models

Overview of Diffusion models.

Noise addition and denoising process.

Applications and recent advances (e.g., DALL-E 2, Stable Diffusion).

Text Generation and Language Models

Language modeling basics.

Tokenization and embeddings.

Using pre-trained models: GPT-2, GPT-3, BERT (for generation).

Prompt engineering and model customization.

Image Generation and Manipulation

Generating images from noise vectors.

Style transfer and image-to-image translation.

Tools and frameworks: OpenCV, PIL, TensorFlow, PyTorch.

Hands-on projects: Create AI art, image enhancement.

Audio and Music Generation

Overview of audio synthesis techniques.

WaveNet, Jukebox models.

Hands-on: Generate music or speech samples.

Evaluation Metrics for Generative Models

Inception Score (IS).

Fréchet Inception Distance (FID).

Perceptual metrics and human evaluation.

Ethical Considerations and Challenges

Bias and fairness in generative AI.

Deepfakes and misinformation.

Intellectual property and copyright issues.

Responsible AI development.

Capstone Project

A complete Generative AI project end-to-end.

Examples: Text-to-image generation, AI chatbot, music composer, Data collection and preprocessing, Model training, evaluation, and tuning

Tools and Technologies

- Python, Jupyter Notebook
- TensorFlow, PyTorch
- Hugging Face Transformers
- OpenCV, PIL
- Google Colab or local GPU setup

Total Duration of the Course

- Total duration: 1.5 months.
- Days: Monday to Friday (1 hr daily)
- Mode: Online

Certificate

A course completion certificate will be awarded once you have successfully completed this course.

Wishing you a Smooth Coding ahead!
