# Generative AI and ML

# Training Course

**(For Beginners)**

# GENERATIVE AI and ML CURRICULUM (BEGINNERS)

## CONTENT

## COURSE 1: Foundation of AI and Machine Learning (Prerequisite / Introduction)

AIP1 - Introduction to AI
AIP2 - Brief history of AI.
AIP3 - Narrow AI vs. General AI.
AIP4 - Ethical considerations in AI.
AIP5 - Introduction to Machine Learning
AIP6 - Supervised Learning
- classification
- regression

AIP7 - Unsupervised Learning
- Clustering
- Dimensionality
- reduction

AIP8 - Reinforcement Learning (brief mention).
AIP9 - Key ML concepts: data, features, training, testing, models, prediction.
AIP10 - Essential Math for ML (Conceptual, not in-depth derivations):
- Basic Linear Algebra (vectors, matrices - understanding data representation).
- Basic Probability and Statistics (mean, median, mode, distributions, likelihood).
- Introduction to Calculus (gradient descent concept - how models learn).

AIP11 - Python for ML
- Basic Python syntax (variables, data types, control flow).
- Essential libraries: NumPy (numerical operations), Pandas (data manipulation), Matplotlib/Seaborn (data visualization).

## COURSE 2 : Introduction to Neural Networks and Deep Learning

AIP1 - What is a Neural Network?
AIP2 - Perceptron and its limitations.
AIP3 - Multi-Layer Perceptrons (MLPs): Layers, neurons, activation functions.
AIP4 - Forward Propagation and Backpropagation
AIP5 - Overview of Deep Learning
AIP6 - Why "Deep" Learning?
AIP7 - Advantages and challenges of Deep Learning.
AIP8 - Brief introduction to popular Deep Learning frameworks (TensorFlow, PyTorch).
AIP9 - Specialized Neural Networks (Brief Overview)
- Convolutional Neural Networks (CNNs) for image processing
- Recurrent Neural Networks (RNNs) for sequential data

## COURSE 3 : Core Generative AI Concepts

AIP1 - What is Generative AI?
AIP2 - Generative vs. Discriminative models
AIP3 - Applications of Generative AI (text, images, audio, video, code).
AIP4 - Prompt Engineering Fundamentals
- What is a prompt?
- Crafting effective prompts for text generation.
- Understanding the role of context and constraints.
- Basic prompt techniques

AIP5 - Key Generative Models (Conceptual Introduction)
- Generative Adversarial Networks (GANs)
    1. Generator and Discriminator concept.
- Variational Autoencoders (VAEs)
    1. Encoder-Decoder structure.
    2. Latent space and reconstruction.
- Transformer Models (High-level overview)
    1. Introduction to the Transformer architecture (self-attention concept).
    2. Why Transformers are powerful for sequence data

## COURSE 4: Large Language Models (LLMs) and Text Generation

AIP1 - Introduction to Large Language Models (LLMs):
- What are LLMs and why are they "large"?
- Evolution of LLMs (e.g., GPT series, BERT, Llama).
- Capabilities of LLMs (text generation, summarization, translation, Q&A).

AIP2 - Interacting with LLMs:
- Using pre-trained LLMs via APIs (e.g., OpenAI, Google Gemini).
- Practical prompt engineering for various tasks (creative writing, coding assistance, conversational AI).
- Understanding limitations: hallucinations, bias, safety.

AIP3 - Basic Fine-tuning (Conceptual):
- What is fine-tuning?
- Why fine-tune an LLM?
- Conceptual overview of techniques like LoRA (low-rank adaptation) for efficient fine-tuning.

## COURSE 5: Generative AI for Other Modalities (Brief Overview)

AIP1 Text-to-Image Generation:
- Introduction to models like DALL-E, Stable Diffusion, Midjourney.
- Prompting for image generation.
- Understanding the creative potential and ethical considerations.

AIP2 Introduction to Other Generative Modalities:
- Text-to-Audio/Music (brief mention).
- Text-to-Video (brief mention).
- Code Generation (brief mention of tools like GitHub Copilot).

## COURSE 6: Responsible AI and Future Trends

AIP1 Ethics and Responsible Generative AI:

- Bias in generative models.
- Misinformation and deep fakes.
- Intellectual property and copyright.
- Safety and guardrails in AI development.
- Principles of Responsible AI.

AIP2 Real-World Applications and Impact

- Case studies of generative AI in various industries.
- Impact on jobs and creativity.

AIP3 Future of Generative AI

- Emerging trends and research directions.
- Multimodal AI.
- Agentic AI (brief introduction).