



Month 1: Deep Learning Fundamentals

Topics:

- Introduction to Deep Learning and AI vs ML vs DL
- Basics of Neural Networks (Perceptron, MLP)
- Activation Functions: ReLU, Sigmoid, Tanh
- Forward & Backward Propagation
- Loss Functions & Optimization (Gradient Descent, Adam)
- Introduction to Keras/TensorFlow or PyTorch

Projects:

- Build your first Neural Network to classify digits (MNIST)
- XOR problem with a custom MLP

Month 2: Convolutional & Recurrent Neural Networks

Topics:

- **CNNs:**
 - Convolution, Pooling, Filters, Padding
 - CNN architectures: LeNet, AlexNet, VGG
- **RNNs:**
 - Basic RNNs, Vanishing Gradient Problem
 - LSTM, GRU, Bidirectional RNNs
- Time Series Forecasting

Projects:

- Image classification using CNN
- Text generation using RNN/LSTM

Month 3: Advanced Deep Learning & Transfer Learning

Topics:

- Dropout, Batch Normalization, Regularization
- Pre-trained Models: VGG, ResNet, Inception
- Fine-tuning and Feature Extraction
- Attention Mechanism Basics

- Deployment with Streamlit or Flask

Projects:

- Transfer Learning for Dog/Cat Classification
- Real-time object detection using pre-trained models

Month 4: Introduction to Generative AI

Topics:

- What is Generative AI?
- **Autoencoders:**
 - Vanilla, Sparse, Denoising, Variational Autoencoders (VAEs)
- **GANs (Generative Adversarial Networks):**
 - Generator vs Discriminator
 - DCGANs, Conditional GANs (cGAN)
- Evaluation Metrics: FID, Inception Score

Projects:

- Image generation using DCGAN
- Face reconstruction using VAE

Month 5: Transformers & Foundation Models

Topics:

- Transformer Architecture: Self-Attention, Multi-head Attention
- Pre-trained Language Models:
 - BERT, GPT-2/3/4 basics
- Hugging Face Transformers
- Prompt Engineering 101
- Intro to Diffusion Models (e.g., DALL·E, Stable Diffusion)

Projects:

- Text Summarization using BERT
- Chatbot using GPT-2 or GPT-3 via Hugging Face API
- Image generation using DALL·E (API-based)

Month 6: Applications, Ethics, and Capstone Projects

Topics:

- Applications of GenAI in:
 - Text: Content Generation, Chatbots, Code Assistants
 - Image: AI Art, Style Transfer, Face Generation

- Audio/Video (Intro to Text-to-Speech, Deepfakes)
- AI Ethics, Bias, Hallucination, and Safety
- Productionisation and deployment best practices
- Git, GitHub, Docker basics

Capstone Projects (choose one or more):

- AI Art Generator using Diffusion or GANs
- Personal Assistant Chatbot with GPT
- Text-to-Image Generation using Prompt + API
- Multimodal AI: Combine text + image inputs/outputs

Tools, Libraries, and Platforms

- **Core Libraries:** TensorFlow, PyTorch, Keras
- **GenAI Tools:** Hugging Face, OpenAI API, Stability AI, Replicate
- **Visualization:** Matplotlib, Seaborn, TensorBoard
- **Deployment:** Flask, Streamlit, Docker
- **Others:** Git, Colab, Jupyter, Weights & Biases