



TECHNOCATION FREELANCING TRAINING INSTITUTE & SOFTWARE HOUSE

# Professional Deep Learning Course Outline

## Module 1: Introduction to Deep Learning

- What is Deep Learning?
  - Difference Between Machine Learning & Deep Learning
  - Applications of Deep Learning (NLP, Computer Vision, Robotics)
  - Overview of Deep Learning Frameworks (TensorFlow, PyTorch, Keras)
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## Module 2: Fundamentals of Neural Networks

- Understanding Perceptrons & Artificial Neurons
  - Activation Functions (Sigmoid, ReLU, Tanh, Softmax)
  - Feedforward Neural Networks (FNN)
  - Backpropagation & Gradient Descent
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## Module 3: Building Deep Neural Networks

- Designing & Training Deep Learning Models
  - Hyperparameter Tuning (Learning Rate, Batch Size, Optimizers)
  - Regularization Techniques (Dropout, L1/L2 Regularization)
  - Model Evaluation Metrics (Loss Functions, Accuracy, Precision, Recall)
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## Module 4: Convolutional Neural Networks (CNNs)

- Introduction to Image Processing & Convolution
- CNN Architecture (Convolution, Pooling, Fully Connected Layers)

- Transfer Learning & Pretrained Models (ResNet, VGG, Inception)
  - Image Classification & Object Detection
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## **Module 5: Recurrent Neural Networks (RNNs) & Time-Series Analysis**

- Understanding Sequence Data & Temporal Dependencies
  - RNN Architecture & Backpropagation Through Time (BPTT)
  - Long Short-Term Memory (LSTM) & Gated Recurrent Units (GRUs)
  - Applications in Stock Market Prediction & Speech Recognition
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## **Module 6: Natural Language Processing (NLP) with Deep Learning**

- Introduction to Word Embeddings (Word2Vec, GloVe)
  - Transformers & Attention Mechanism
  - Implementing NLP Tasks (Text Classification, Sentiment Analysis, Chatbots)
  - Using Pretrained Models (BERT, GPT, T5)
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## **Module 7: Generative Models & Advanced Architectures**

- Autoencoders & Variational Autoencoders (VAEs)
  - Generative Adversarial Networks (GANs) & Deepfakes
  - Deep Reinforcement Learning & Applications
  - Ethical Considerations in Generative AI
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## **Module 8: Optimization, Deployment & Scalability**

- Model Optimization Techniques (Quantization, Pruning, Knowledge Distillation)
  - Deploying Deep Learning Models (Flask, FastAPI, TensorFlow Serving)
  - Running Models on Edge Devices (Mobile, IoT, Raspberry Pi)
  - Scaling Deep Learning with Distributed Computing & Cloud Platforms
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## **Final Module: Capstone Project & Certification**

- Hands-on Deep Learning Project (Healthcare, Finance, Autonomous Vehicles, etc.)
- Model Interpretation & Explainability (SHAP, LIME)
- Building a Deep Learning Portfolio
- Course Completion Certification