Complete
Deep Learning

STUDY GUIDE

01 NEURAL NETWORKS BASICS

- Introduction to Neural Networks
- Perceptrons and Activation Functions
- Feedforward Neural Networks
- Backpropagation Algorithm
- Loss Functions and Gradient Descent

02 CONVOLUTIONAL NEURAL NETWORKS

- Convolutional Layers and Filters
- Pooling Layers
- CNN Architectures (e.g., LeNet, AlexNet, VGG, ResNet)
- Transfer Learning with CNNs

03 RECURRENT NEURAL NETWORKS

- Basics of Sequential Data
- RNN Architecture and Backpropagation Through Time (BPTT)
- Exploding and Vanishing Gradient Problem
- Bidirectional RNNs

04 LSTM & GRU

- Introduction to LSTMs
- GRU Architecture
- Applications of LSTMs and GRUs

05 AUTOENCODERS

- Encoder and Decoder Architecture
- Variational Autoencoders (VAEs)
- Applications of Autoencoders

06 GENERATIVE ADVERSARIAL NETWORKS

- GAN Architecture
- Training GANs
- Conditional GANs
- Applications of GANs

07 TRANSFER LEARNING

- Using Pre-trained Models
- Fine-tuning and Feature Extraction

08 OBJECT DETECTION & IMAGE SEGMENTATION

- Object Detection Techniques (e.g., YOLO, SSD)
- Image Segmentation Methods

09 ATTENTION MECHANISMS

- Encoder-Decoder Architectures
- Attention Mechanisms in Sequence Models

10 REINFORCEMENT LEARNING

- Basics of Reinforcement Learning
- Deep Q-Learning
- Policy Gradients

11 HYPERPARAMETER TUNING

- Importance of Hyperparameters
- Hyperparameter Optimization Techniques

12 OPTIMIZATION ALGORITHMS

- Adam Optimizer
- Stochastic Gradient Descent (SGD)

13 BATCH NORMALIZATION & DROPOUT

- Batch Normalization in Neural Networks
- Dropout for Regularization

14 TENSORBOARD

- Visualizing Neural Network Training with TensorBoard

15 DEEP LEARNING FRAMEWORKS

- TensorFlow vs. PyTorch
- Overview and Installation of TensorFlow and PyTorch

16 KERAS

- Introduction to Keras
- Building Models with Keras

17 NATURAL LANGUAGE PROCESSING

- Word Embeddings (e.g., Word2Vec, GloVe)
- Recurrent Neural Networks for NLP
- Transformers in NLP

18 SPEECH RECOGNITION

- Spectrogram and Mel-frequency Cepstral Coefficients (MFCCs)
- Deep Learning Models for Speech Recognition

19 TIME SERIES FORECASTING

- Time Series Data Preparation
- Recurrent Neural Networks for Time Series Forecasting

20 MODEL DEPLOYMENT

- Exporting Models for Deployment
- Deployment Platforms (e.g., Flask, Docker)

21 CLOUD PLATFORMS

- AWS, Azure, and Google Cloud for Deep Learning