

Deep Learning

Chapter 1: Introduction to Deep Learning

- 1.1 Deep Learning: Introduction
- 1.2 Applications, Advantages and Disadvantages of DL
- 1.3 Historical Trends in Deep Learning
- 1.4 Artificial Neural Networks (ANNs) and Types of Neural Networks
- 1.5 Non-Linear Classification Example Using Neural Networks: XOR/XNOR
- 1.6 Neural Network Architectures: Single and Multilayer Perceptron
- 1.7 Feedforward Neural Network
- 1.8 Deep Feedforward Networks
- 1.9 Stochastic Gradient Descent (SGD)
- 1.10 Hidden Units
- 1.11 Neural Network Architecture Design
- 1.12 Back-Propagation

Chapter 2: Convolution Neural Network (CNN)

- 2.1 Introduction to CNNs and Their Applications
- 2.2 What is a Convolutional Neural Network (CNN)?
- 2.3 CNN Architecture and Model
- 2.4 Activation Functions
- 2.5 Types of Pooling Layers
- 2.6 Training a CNN Using TensorFlow
- 2.7 Popular CNN Architectures – VGG, GoogleNet, ResNet
- 2.8 Dropout in Neural Networks
- 2.9 Normalization
- 2.10 Data Augmentation

Chapter 3: Recurrent Neural Network (RNN)

- 3.1 Introduction to RNNs and Their Applications in Sequential Data Analysis
- 3.2 Backpropagation Through Time (BPTT) in RNNs
- 3.3 Vanishing Gradient Problem
- 3.4 Gradient Clipping in Long Short-Term Memory (LSTM) Networks
- 3.5 Gated Recurrent Unit (GRU)
- 3.6 Bidirectional LSTM (Bi-LSTM)

Chapter 4: Generative Adversarial Networks (GANs)

- 4.1 Introduction to GANs
- 4.2 Training and Prediction of GANs
- 4.3 Loss Function and Challenges in GANs
- 4.4 Different Variants of GANs
- 4.5 Top Applications of GANs
- 4.6 Generative Models vs Discriminative Models

Chapter 5: Auto-Encoders

- 5.1 Autoencoders: An Overview
- 5.2 Architecture of Autoencoders
- 5.3 Training an Autoencoder for Data Compression and Reconstruction
- 5.4 Autoencoder Variants for Enhanced Image Compression and Reconstruction
- 5.5 Applications of Autoencoders in Image Compression and Reconstruction
- 5.6 Relationship between Autoencoders and GANs
- 5.7 Hybrid Models: Encoder-Decoder GANs