Page 1: Introduction to Deep Learning

Deep Learning is a subset of Machine Learning that uses neural networks with multiple layers to learn complex patterns from data. It is inspired by the human brain and is widely used in modern AI applications.

Page 2: Artificial Neural Networks

Artificial Neural Networks (ANNs) consist of neurons, weights, bias, and activation functions. They form the foundation of deep learning models.

Page 3: Activation Functions

Activation functions introduce non-linearity. Common functions include ReLU, Sigmoid, Tanh, and Softmax. ReLU is the most widely used in deep networks.

Page 4: Loss Functions

Loss functions measure how well a model performs. Common examples are Mean Squared Error, Binary Cross-Entropy, and Categorical Cross-Entropy.

Page 5: Optimization Algorithms

Optimizers like Gradient Descent, SGD, Adam, and RMSProp are used to update model weights and minimize loss.

Page 6: Backpropagation

Backpropagation is the core learning algorithm in neural networks. It computes gradients and updates weights using the chain rule.

Page 7: Convolutional Neural Networks

CNNs are designed for image data. They use convolution, pooling, and feature maps to detect patterns like edges and textures.

Page 8: Recurrent Neural Networks

RNNs are used for sequential data such as text and time series. LSTM and GRU solve the vanishing gradient problem.

Page 9: Regularization Techniques

Regularization helps prevent overfitting. Common methods include Dropout, L1/L2 regularization, and Data Augmentation.

Page 10: Applications of Deep Learning

Deep Learning is used in computer vision, natural language processing, healthcare, autonomous vehicles, and recommendation systems.