Deep Learning Complete Guide

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Introduction to Deep Learning

Deep Learning is a subset of Machine Learning where neural networks with multiple layers are used to extract higher-level features from data. It is widely used in image recognition, NLP, speech processing, and more.

Artificial Neural Networks (ANN)

ANN consists of input, hidden, and output layers. Each neuron applies an activation function to process inputs.

Convolutional Neural Networks (CNN)

CNN is used for image processing. It includes convolution layers, pooling layers, and fully connected layers.

Recurrent Neural Networks (RNN)

RNNs are used for sequential data like text and speech. Variants include LSTMs and GRUs.

Transformers and Attention Mechanism

Transformers use self-attention mechanisms for NLP tasks. They are the backbone of models like GPT and BERT.

Optimization Algorithms

Gradient Descent, Adam, RMSProp, and their role in training deep learning models.

Loss Functions

Common loss functions include Cross-Entropy Loss and Mean Squared Error (MSE).

Backpropagation

A method for training neural networks using the chain rule to compute gradients.

Practical Implementations

Step-by-step implementations of key DL models using TensorFlow and PyTorch.