Deep Learning

Lecture Plan

I. Introduction to Deep Learning

Lecture 1: Overview and Intuition of Deep Learning
Lecture 2: Applications of Deep Learning
Lecture 3: Mathematical Preliminaries for Deep Learning

II. Neural Network Basics

Lecture 4: Neural Network Architecture
Lecture 5: Understanding Hidden Units
Lecture 6: Empirical Loss and Loss Functions (Binary Cross Entropy, MSE)
Lecture 7: Gradient-Based Learning
Lecture 8: Introduction to Back-Propagation
Lecture 9: Optimization for Training Deep Models (Mini-batch Gradient Descent)
Lecture 10: Advanced Optimization Techniques (Exponentially Weighted Averages, Momentum)

III. Advanced Training Techniques

Lecture 11: Understanding Local/Global Optimum
Lecture 12: Learning Rate Decay Strategies
Lecture 13: Train/Dev/Test Set Configurations
Lecture 14: Exploring Bias/Variance
Lecture 15: Underfitting and Overfitting
Lecture 16: Regularization Techniques (Including Dropout)
Lecture 17: Input Normalization and Activation Functions

IV. Deep Learning Challenges

Lecture 18: Vanishing/Exploding Gradients Problem
Lecture 19: Weight Initialization Strategies
Lecture 20: Bias-Variance Trade-Off
Lecture 21: Introduction to Convolutional Neural Networks (CNNs)
Lecture 22: CNN Architecture and Layers
Lecture 23: Pooling Layers and Convolution Techniques

V. Advanced Neural Network Architectures

Lecture 24: Deep Dive into CNN Architectures
Lecture 25: Image Classification with CNNs
Lecture 26: Batch Normalization Techniques
Lecture 27: Data Augmentation in CNNs
Lecture 28: Sequence Models: RNNs, LSTMs, GRUs
Lecture 29: Backpropagation Through Time in RNNs

Lecture 30: Bidirectional and Deep RNNs
Lecture 31: Optimization for Long-Term Dependencies

VI. Introduction to Transformers

Lecture 32: Fundamentals of Transformers
Lecture 33: Self-Attention Mechanism
Lecture 34: Positional Encoding and Multi-head Attention
Lecture 35: Applications in NLP
Lecture 36: Introduction to Vision Transformers

VII. Generative Modeling

Lecture 37: Understanding Generative Models: Latent Space, Autoencoders
Lecture 38: Variational Autoencoder (VAE)
Lecture 39: Generative Adversarial Networks (GANs) Basics
Lecture 40: Advanced GANs and Applications (including Cycle GAN)