

# Neural Networks: From Perceptron to Practice

Complete Course Summary

## MODULE 1

### The Perceptron

- Biological inspiration
- Single layer classifier
- Linear decision boundaries
- Convergence theorem
- XOR problem limitation

## MODULE 2

### Multi-Layer Perceptrons

- Hidden layers
- Activation functions
- Universal approximation
- Forward propagation
- Loss functions

## MODULE 3

### Training NNs

- Backpropagation
- Gradient descent
- Regularization
- Overfitting
- Hyperparameters

## MODULE 4

### Applications

- Finance applications
- Model selection
- Limitations
- Best practices
- Future directions

## Historical Journey: 1943 - Present

1943

McCulloch-Pitts

1958

Perceptron

1969

XOR Problem

1986

Backprop

2006

Deep Belief

2012

AlexNet

2020s

Modern DL

Key Equations:  $y = \sigma(Wx + b)$  |  $L = -\sum y \log(\hat{y})$  |  $w \leftarrow w - \eta \nabla L$