KOENIG SOLUTIONS · COURSE OUTLINE

# Deep Learning: Neural Networks & Backpropagation

Learn to build and train neural networks with backpropagation, from logistic regression and vectorization to deep multi-layer architectures.

| 2 Days | 6 | 35 | 4 |
| --- | --- | --- | --- |
| 16 HOURS | MODULES | TOPICS | HANDS-ON EXERCISES |

## COURSE OVERVIEW

This course covers the concept of neural networks and supervised learning, followed by logistic regression built as a neural network, including its cost function and gradient descent. It then addresses vectorization and broadcasting in Python and NumPy for efficient computation. The course moves through the design of single-layer and multi-layer neural networks, covering activation functions, backpropagation, forward and backward propagation, and parameters versus hyperparameters, before applying deep learning to an image classification project.

## WHO THIS COURSE IS FOR

**Data Scientist** **ML Engineer** **DL Engineer**

## LEARNING OBJECTIVES

- Understand and apply neural networks with supervised learning
- Learn vectorization for deep learning
- Build and train single and multi-layer neural networks
- Apply deep neural networks to real-world problems like image classification

COURSE SYLLABUS

# 6 Modules, 35 Topics

01

## Introduction to Neural Network

TOPICS

Concept of Neural Network? · Supervised Learning with Neural Networks

02

## Logistic Regression Using Neural Network

TOPICS

- Binary Classification
- Logistic Regression
- Logistic Regression Cost Function
- Gradient Descent
- Concepts of Derivatives
- Derivatives with a Computation Graph
- Logistic Regression Gradient Descent
- Gradient Descent on m Examples
- Derivation of DL/dz

03

2 Exercises

## Python and Vectorization in Neural Network

TOPICS

- Concept of Vectorization
- Vectorizing Logistic Regression
- Vectorizing Logistic Regression's Gradient Output
- Broadcasting in Python
- Python/NumPy Vectors
- Logistic Regression Cost Function

04

Exercise

## Single-Layer Neural Network (Shallow)

TOPICS

- Neural Networks Overview
- Neural Network Representation
- Computing a Neural Network's Output
- Vectorizing Across Multiple Examples
- Activation Functions
- Need of Non-Linear Activation Functions
- Derivatives of Activation Functions
- Gradient Descent for Neural Networks
- Backpropagation Intuition
- Random Initialization

05

Exercise

## Multi-Layer Neural Network (Deep)

TOPICS

- Deep L-layer Neural Network
- Forward Propagation in a Deep Network
- Getting your Matrix Dimensions Right
- Deep Representations
- Building Blocks of Deep Neural Networks
- Forward and Backward Propagation
- Parameters vs Hyperparameters

06

## Applications of Deep Learning

TOPICS

**Project:** Image Classification Problem

HANDS-ON EXERCISES

# Practise What You Learn

| # | MODULE | ACTIVITY |
|---|---|---|
| 03 | **Python and Vectorization in Neural Network** | ■ Python Basics with NumPy<br>■ Logistic Regression with Neural Network |
| 04 | **Single-Layer Neural Network (Shallow)** | Planar Data Classification with Single Hidden Layer |
| 05 | **Multi-Layer Neural Network (Deep)** | Multi-Layer Neural Network Problem |

WHAT IS INCLUDED

## Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

## Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

FLEXIBLE DELIVERY

## Learn the Way That Suits You

Classroom Training | Live Online Classes (ILO) | Fly-Me-A-Trainer (FMAT) | Flexi (Self-Paced) | 1-on-1 Training

### Ready to Get Started?

Talk to a learning advisor about schedules, group training and customised delivery.

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