

GenAI & ML: LangChain RAG & Llama Fine-Tuning

Learn to build machine learning foundations and generative AI systems, from Python basics through RAG applications to fine-tuning Llama models.

7 Days

56 HOURS

15

MODULES

79

TOPICS

12

HANDS-ON ACTIVITIES

COURSE OVERVIEW

This course begins with Python programming fundamentals for machine learning, covering data structures, NumPy, pandas, data visualization and core scikit-learn concepts through a mini project. It then moves into generative AI, examining the architecture of generative models, large language models and their applications across text and image tasks. The course covers prompt engineering with Llama, building retrieval augmented generation and question-answering systems using LangChain, and fine-tuning open-source models through quantization techniques. It concludes with evaluating large language models using MLflow.

WHO THIS COURSE IS FOR

Machine Learning Engineers

Data Scientists

AI Developers

Python Developers

NLP Engineers

TOOLS AND REQUIREMENTS

Labs

- Open-Source platform and Koenig DC will be provided

LEARNING OBJECTIVES

- Apply Python data structures and NumPy/pandas for data manipulation
- Create data visualizations using Matplotlib and Seaborn
- Build a simple machine learning model using scikit-learn
- Explain the architecture of generative AI and large language models
- Apply prompt engineering techniques using Llama models
- Build RAG and conversational applications using LangChain
- Build question-answering systems over tabular and SQL data
- Apply quantization techniques to fine-tune Llama, Qwen or Gemma

15 Modules, 79 Topics

Section I: Machine Learning Fundamentals

16 hours

01

0.5 hours

Introduction to Python for Machine Learning

OVERVIEW OF PYTHON

Why Python for machine learning? · Key features and benefits

SETTING UP THE ENVIRONMENT

Installing Python · Setting up Jupyter Notebook/Google Colab

BASIC SYNTAX

Variables and data types · Basic operations

02

1 hour

Python Data Structures

LISTS, TUPLES, AND DICTIONARIES

Creating and manipulating lists · Understanding tuples · Using dictionaries

OPERATIONS ON DATA STRUCTURES

Indexing and slicing · Iterating through data structures · Common methods and functions

03

1 hour

Control Flow and Functions

CONTROL FLOW

If-else statements · Loops (for, while)

FUNCTIONS

Defining and calling functions · Parameters and return values · Lambda functions

04

1 hour

Introduction to NumPy

NUMPY BASICS

Importance of NumPy in machine learning · Creating arrays

ARRAY OPERATIONS

Indexing and slicing · Mathematical operations on arrays

ADVANCED NUMPY

Broadcasting · Working with multi-dimensional arrays

05**1 hour**

Data Manipulation with Pandas

INTRODUCTION TO PANDAS

Importance of pandas in data science · DataFrames and Series

DATAFRAME OPERATIONS

Loading and inspecting data · Indexing and selecting data · Handling missing values

ADVANCED PANDAS

Grouping and aggregation · Merging and joining DataFrames

06**1 hour**

Data Visualization

INTRODUCTION TO MATPLOTLIB

- Plotting basics
- Creating different types of plots (line, bar, histogram)

INTRODUCTION TO SEABORN

- Statistical data visualization
- Creating attractive and informative visualizations

07**0.5 hours**

Introduction to Machine Learning Concepts

WHAT IS MACHINE LEARNING?

- Definition and types (supervised, unsupervised, reinforcement)
- Key concepts and terminology

SCIKIT-LEARN BASICS

- Overview of the library
- Key features and benefits

BUILDING A SIMPLE MODEL

- Data preparation
- Training a model
- Making predictions
- Evaluating the model

DISCUSSION ABOUT OTHER FRAMEWORKS

- TensorFlow
- PyTorch
- Transformers
- GAN
- Diffusers

08**1 hour**

Mini Project

TOPICS

- Choose a simple machine learning problem (classification, regression or clustering)
- Provide the student a dataset based on the problem selected
- Demonstrate and share the solution based on his choice
- Guide students for building a ML model (homework if time is constraint)

Section II: Generative AI

05 days (40 hours)

09**Lab**

Introduction of GenAI

TOPICS

- Introduction to Generative AI
- Architecture of Generative AI
- Applications of Generative AI using Transformer Library
- Introduction to Generative Adversarial Networks (GANs)

10**Lab**

Introduction of Large Language Model

TOPICS

- Architecture of Large Language Models
- Types of Large Language Models (LLMs)

TASK BASED TEXT AI LLMs

- Translation, Summarization, Sentence Similarity, Automatic Speech Recognition, Text to Speech, etc.

MAJOR TEXT AI LLMs

- Llama, Qwen, Cohere, Falcon LLM

IMAGE AI MODELS

- Object Detection, Image Segmentation, Image Retrieval, Image, Image Captioning, Visual QnA, Zero-shot Image Classification, etc.

11**Lab**

Learning Prompt Engineering Using Open-Source Models

TOPICS

Introduction to Prompt Engineering · Prompt Engineering Techniques · Text Prompting using Llama (Meta) · Image Prompting using Llama (Meta) · Code Prompting using Llama (Meta)

12

6 Labs

Basic LLM Systems (RAG) Using Open-Source Models

TOPICS

- Introduction to Retrieval Augmented Generation (RAG)
- Introduction to LangChain
- Concept of Embedding, Retrieval, Chain and Agents using LangChain

13

Lab

Advanced LLM Systems (QnA) Using Open-Source Models

TOPICS

- Difference between RAG & Question Answering system
- Build a Question Answering system over Tabular Data using LangChain
- Build a Question/Answering system over SQL data using LangChain

14

Lab

Fine-tuning Techniques Using Open-Source Models

TOPICS

- Introduction to Quantization
- Optimization of model weights (data types)
- Modes of Quantization
- Fine tuning LLMs (Meta's Llama / Alibaba's Qwen / Google's Gemma)

15

Lab

Evaluation of Open-Source Models Using MLflow

TOPICS

Introduction to MLflow · Build a machine learning model using MLflow · MLflow Deployment Servers · LLM Evaluation using MLflow

Practise What You Learn

#	MODULE	ACTIVITY
09	Introduction of GenAI	Labs: Labs
10	Introduction of Large Language Model	Labs: Labs
11	Learning Prompt Engineering Using Open-Source Models	Labs: Labs
12	Basic LLM Systems (RAG) Using Open-Source Models	LAB ■ Build a Simple LLM Application using LangChain ■ Build a Chatbot LangChain ■ Build vector stores and retriever using LangChain ■ Build an Agent LangChain ■ Build a Retrieval Augmented Generation (RAG) App using LangChain ■ Build a Conversational RAG Application using LangChain
13	Advanced LLM Systems (QnA) Using Open-Source Models	Labs: Labs
14	Fine-tuning Techniques Using Open-Source Models	Labs: Labs
15	Evaluation of Open-Source Models Using MLflow	Lab: Evaluate a Hugging Face LLM

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.

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Fly-Me-A-Trainer (FMAT)

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