



# Fine-Tuning Large Language Models (FT-LLM)

## COURSE OVERVIEW

You will develop the skills to gather, clean, and organize data for fine-tuning pre-trained LLMs and Generative AI models. Through a combination of lectures and hands-on labs, you will use Python to fine-tune open-source Transformer models. Gain practical experience with LLM frameworks, learn essential training techniques, and explore advanced topics such as quantization. During the hands-on labs, you will access a GPU-accelerated server for practical experience with industry-standard tools and frameworks.

## WHO WILL BENEFIT FROM THIS COURSE?

- Project Managers
- Architects
- Developers
- Data Acquisition Specialists

## PREREQUISITES

- Python - PCEP Certification or Equivalent Experience
- Familiarity with Linux

## COURSE OBJECTIVES

- Clean and Curate Data for AI Fine-Tuning
- Establish guidelines for obtaining RAW Data
- Go from Drowning in Data to Clean Data
- Fine-Tune AI Models with PyTorch
- Understand AI architecture: Transformer model
- Describe tokenization and word embeddings
- Install and use AI frameworks like Llama-3
- Perform LoRA and QLoRA Fine-Tuning
- Explore model quantization and fine-tuning
- Deploy and Maximize AI Model Performance

## COURSE OUTLINE

Learning Your Environment

- Using Vim
- Tmux
- VScode Integration
- Revision Control with GitHub



#### Data Curation for AI

- Curating Data for AI
- Gathering Raw Data
- Data Cleaning and Preparation
- Data Labeling
- Data Organization
- Premade Datasets for Fine Tuning
- Obtain and Prepare Premade Datasets

#### Deep Learning

- What is Intelligence?
- Generative AI
- The Transformer Model
- Feed Forward Neural Networks
- Tokenization
- Word Embeddings
- Positional Encoding

#### Pre-trained LLM

- A History of Neural Network Architectures
- Introduction to the LLaMa.cpp Interface
- Preparing A100 for Server Operations
- Operate LLaMa3 Models with LLaMa.cpp
- Selecting Quantization Level to Meet Performance and Perplexity Requirements

#### Fine Tuning

- Fine-Tuning a Pre-Trained LLM
- PyTorch
- Basic Fine Tuning with PyTorch
- LoRA Fine-Tuning LLaMa3 8B
- QLoRA Fine-Tuning LLaMa3 8B

#### Operating Fine-Tuned Model

- Running the llama.cpp Package
- Deploy Llama API Server
- Develop LLaMa Client Application
- Write a Real-World AI Application using the Llama API

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