Rohan Patil

Course Title :

LLM Mastery: From Foundations to Autonomous AI Agents
Build, Fine-tune & Deploy Generative AI Systems for the Real World

- **Total Duration**: 3 months
- **Mode**: Weekend Batch (Saturday & Sunday)
- **Session Length**: 2 to 2.5 hours per session
- **Total Hours**: ~60–65 hrs

Course Objectives

- Master the foundational principles of Python and Deep Learning
- Build and train transformer-based models using PyTorch
- Understand and apply fine-tuning using LoRA/QLoRA
- Implement Prompt Engineering and Retrieval-Augmented Generation (RAG) systems
- Build agent-based AI workflows for real-world applications
- Monetize AI skills through real-world projects and entrepreneurial insights

Curriculum Breakdown

📘 LLM Mastery: Summary Curriculum Table

Month	Week	Topic	Key Tools & Frameworks
1	Week 1	Python for AI – Fast-Track Mastery	Python, Jupyter, NumPy, Pandas, Matplotlib, VS Code
	Week 2	Deep Learning Essentials	PyTorch, TensorBoard
	Week 3	Transformers Demystified	PyTorch, HuggingFace Transformers
	Week 4	PyTorch Hands-On	HuggingFace Transformers, Datasets
2	Week 1	Finetuning Strategies	HuggingFace Transformers, Datasets
	Week 2	LoRA & QLoRA Fine-Tuning	PEFT, Bitsandbytes, Accelerate
	Week 3	RAG Architecture & Concepts	FAISS, ChromaDB, LangChain, LlamaIndex, Sentence Transformers
	Week 4	End-to-End RAG Applications	LangChain, LlamaIndex, Streamlit, FastAPI
3	Week 1	AI Agent Foundations	LangGraph, CrewAI, AutoGen
	Week 2	Building AI Agents	LangChain Agents, LangGraph, CrewAI, DuckDuckGo API, SerpAPI
	Week 3	RAG Deployment with Azure AI	Azure OpenAI, Cognitive Search, Blob Storage, Azure Functions, Azure ML
	Week 4	Capstone Project & Enterprise Integration	Azure DevOps, GitHub, Logic Apps, Power Platform, App Insights

Month 1: Foundations & Frameworks

Week 1: Python for AI – Fast-Track Mastery

Tools: Python, Jupyter, NumPy, Pandas, Matplotlib, VS Code

- Core syntax, data structures, loops, functions
- Functional programming, error handling
- Quick data wrangling & plotting
- Hands-on coding drills

Week 2: Deep Learning Essentials

Tools: PyTorch, TensorBoard

- Neural networks, activations, loss functions
- Backpropagation and optimizers
- Hands-on training loop & evaluation

Week 3: Transformers Demystified

Tools: PyTorch, HuggingFace Transformers

- Self-attention, multi-head attention
- Positional encoding and Transformer architecture
- BERT vs GPT: key differences and evolution

Week 4: PyTorch Hands-On

Tools: HuggingFace Transformers, Datasets

- Build ANN/CNN models
- Save/load models, ensure reproducibility
- Intro to pretrained Transformers with HuggingFace

Month 2: LLM Fine-Tuning & RAG Systems

Week 1: Finetuning Strategies

Tools: HuggingFace Transformers, Datasets

- Pretraining vs Finetuning vs Prompting
- Full vs Parameter-Efficient Finetuning (PEFT)
- Data curation and evaluation

Week 2: LoRA & QLoRA Fine-Tuning

Tools: PEFT, Bitsandbytes, Accelerate

- LoRA/QLoRA implementation and tuning
- Training LLMs on low-resource setups
- Use case: Domain-specific chatbot fine-tuning

Week 3: RAG Explained

Tools: FAISS, ChromaDB, LangChain, LlamaIndex

- RAG architecture: Retriever + Generator
- Embedding generation: `sentence-transformers`, HuggingFace
- Vector DBs: FAISS, Chroma; Retrieval workflows

Week 4: End-to-End RAG Applications

Tools: LangChain, LlamaIndex, Streamlit, FastAPI

- RAG chatbot implementation
- Context injection & memory
- Deploying on Streamlit or FastAPI

Month 3: Agentic AI Systems & Azure Integration

Week 1: AI Agent Foundations

Tools: LangGraph, CrewAI, AutoGen

- Agent loop: Perception → Planning → Action
- Tool-using agents, multi-agent systems
- Real-world examples & architecture overview

Week 2: Building AI Agents

Tools: LangChain Agents, LangGraph, CrewAI

- Tool integration: APIs, Python tools, file readers
- Project: Build a Q&A Document Agent
- Add-ons: Search tools (DuckDuckGo API, SerpAPI free)

Week 3: RAG Deployment with Azure AI

Tools: Azure OpenAI, Cognitive Search, Blob Storage, Functions, Azure ML

- Deploy RAG pipeline using Azure OpenAI + Cognitive Search
- Embedding generation, secure storage (Key Vault + Blob)
- Host LLMs using HuggingFace on Azure ML
- APIs via Azure Functions or App Service

Week 4: Capstone Project & Enterprise Integration

Tools: Azure DevOps, GitHub, Logic Apps, Power Platform, App Insights

- Final capstone: RAG + Agentic System fully on Azure
- Integrate with CRM, email, Teams/Slack using Logic Apps
- CI/CD with GitHub Actions
- Monitoring with Azure App Insights
- Career paths: Cloud AI, Product AI, Research roles

🛠️ Project-Based Learning

Participants will build:

- A Transformer model from scratch (Month 1)
- A fine-tuned RAG-ready LLM (Month 2)
- A deployable Agentic AI workflow on Azure (Month 3)

Suggested Add-ons (Optional)

- **Mini Hackathons** every month-end
- **GitHub Portfolio Push** with starter templates
- **1:1 Mentorship & Feedback**