KOENIG SOLUTIONS · COURSE OUTLINE

GenAI in Python: LangChain, RAG & HuggingFace

Learn to build, secure and deploy generative AI applications in Python using HuggingFace, LangChain, RAG, agents and MCP.

24 Hours	18	108
DURATION	MODULES	TOPICS

COURSE OVERVIEW

“Mastering Generative AI in Python” is a comprehensive course designed to help you gain both the theoretical understanding and hands-on experience necessary to excel in the field of Generative AI using Python. Anchored around an HR use case, the course takes learners through a full-stack GenAI project using modern tools and frameworks like HuggingFace, LangChain, Gradio, and introduces foundational concepts of AI agents and Model Context Protocol (MCP). The full stack application eventually gets deployed using Docker and Kubernetes. The course is structured to help learners build real-world applications through modular and progressively complex content. It emphasizes practical, production-ready skills that are immediately applicable in industry environments.

WHO THIS COURSE IS FOR

Who Should Attend

Learners who complete this course will be well-positioned for a variety of AI and ML-focused roles, such as:

Generative AI Developer - Building AI-powered applications and solutions

AI/ML Developer - Developing machine learning models and systems

LLM Application Developer - Creating applications that leverage large language models

Junior AI Engineer - Working on AI implementation projects

AI Product Developer - Building AI-driven products and features

Data Scientist - Applying AI in business processes and data analysis

DevOps Engineer - Specializing in AI/ML deployment and operations

PREREQUISITES

- Basic understanding of computers and software development concepts
- Basic Python programming knowledge (variables, functions, loops, conditionals)
- Familiarity with command line/terminal operations
- Basic understanding of APIs and web services (helpful but not mandatory)

LEARNING OBJECTIVES

By the end of this course, learners will be able to:

- Understand the fundamentals of Artificial Intelligence and Generative AI
- Apply foundational and advanced concepts of LLMs in real-world projects
- Build user-friendly interfaces for AI using Gradio
- Integrate multimodal data inputs and outputs into AI workflows
- Use HuggingFace and LangChain to build robust AI applications
- Design effective prompts using advanced prompting techniques
- Implement structured outputs using function calling and validation
- Employ vector databases and retrieval-augmented generation for context-aware AI
- Understand basic AI agent concepts and architectures
- Get introduced to Model Context Protocol (MCP) fundamentals
- Utilize guardrails to ensure responsible AI behavior
- Deploy a full-stack GenAI application using Docker and Kubernetes
- Ensure model reliability and security in production environments

COURSE SYLLABUS

18 Modules, 108 Topics

01

Introduction to AI

TOPICS

What is AI? · **AI:** Key concepts · Standard AI models · Machine Learning · Deep Learning

02

Foundational Models and Generative AI

TOPICS

- How do we Learn?
- Human Brain and AI
- Self-Supervised Learning
- Foundational Models
- Transfer Learning
- Transformers
- Introduction to GenAI
- GenAI use cases
- GenAI Application Lifecycle

03

Introduction to LLMs

TOPICS

- What is an LLM?
- Characteristics of an LLM
- Building Blocks of an LLM
- Types of LLMs
- Fine-tuning LLMs
- Open Source and Closed Source Models
- Deploying LLMs Locally
- Deploying LLMs on Cloud
- Evaluating an LLM

04

Building UIs with Gradio

TOPICS

Introduction to Gradio · Creating basic interfaces · Advanced Gradio features · Deploying Gradio applications · Integrating LLMs with Gradio · Building chatbots with Gradio

05

Multimodal AI

TOPICS

Text-to-image models · Text-to-video models · Image understanding capabilities · Audio processing in AI · Multimodal embeddings · Building multimodal applications

06

Introduction to HuggingFace

TOPICS

- What is HuggingFace?
- What Can We Do with HuggingFace?
- Features of HuggingFace (Models, Datasets, Spaces)
- Transformers library
- Using HuggingFace inference endpoints

07

Prompt Engineering

TOPICS

What is Prompt Engineering? · How to write an effective prompt

PROMPT ENGINEERING TECHNIQUES

Zero-shot prompting · Few-shot prompting · Chain-of-Thought · Tree of Thoughts · ReAct prompting · Meta-prompting

08

Structured Outputs

TOPICS

Reliable JSON output generation · Using Pydantic with LLMs · Function calling · JSON schema validation · Parsing and error handling · Real-world applications

09

Embeddings and Vector Databases

TOPICS

- What are embeddings in AI/ML?
- Text and multimodal embeddings
- What is a Vector Database?
- Introduction to vector database options (Pinecone, ChromaDB, Weaviate, Milvus/Zilliz, FAISS)
- Applications of Embeddings

10

Retrieval Augmented Generation (RAG)

TOPICS

What is RAG? · Why is RAG important? · How does RAG work? · Basic components (retriever, generator) · Simple RAG implementation example · Advanced RAG techniques (introductory level) · Common RAG challenges and solutions

11

LangChain Framework

TOPICS

- What is LangChain?
- Core components (LLM chains, Retrieval chains, Memory, Tools)
- Tool Calling and Routing Chains
- Using various models with LangChain
- Building RAG applications with LangChain

12

Introduction to AI Agents

TOPICS

What is an AI Agent? · Basic agent concepts and architecture · Simple agent implementation · Agent vs. traditional AI models · Use cases for AI agents · Introduction to LangGraph (basic concepts)

13

Model Context Protocol (MCP) - Introduction

TOPICS

Introduction to Model Context Protocol · Why MCP matters for GenAI applications · Basic MCP concepts and architecture · Simple MCP server setup · Integration with LLM applications

14

Guardrailing GenAI Applications

TOPICS

- Tools & Techniques for Implementing Guardrails
- Overview of guardrailing solutions
- Data Curation and Bias Detection
- Human-in-the-Loop Processes
- Regular Review and Updates

15

AI for Business Applications

TOPICS

- How GenAI can drive business transformations
- Industry-specific use cases
- Integrating GenAI with existing business processes
- Developing an AI strategy
- ROI measurement

16

Overview of LLMOps

TOPICS

What is LLMOps and its importance? · Model versioning, retraining, and updates · Scaling infrastructure for LLMs · CI/CD pipelines for LLM deployment · Monitoring and observability basics

17

Securing LLM Applications

TOPICS

Best Practices to secure LLM Apps · Prompt injection prevention · Information leaks and PII protection · Preventing jailbreaks · LLM reliability and safety measures

18

Final Project: Full-Stack GenAI Application

TOPICS

Designing a comprehensive application · End-to-end GenAI application development · Containerization with Docker · Deployment strategies · Performance optimization · Project presentation and review

NOTES

- Training delivery: Online Live Training
- Skill Level: Beginners/Intermediate
- Duration: 24 Training Hours
- The course objectives are to: Introduce Key Concepts in AI and Machine Learning - Provide learners with a solid understanding of Artificial Intelligence, including the foundational theories behind machine learning and deep learning; Explore Generative AI Technologies - Familiarize learners with the components and mechanisms of Generative AI models, focusing on how they are designed, built, and applied; Teach the Fundamentals of Large Language Models (LLMs) - Help learners understand the architecture, training, and deployment of LLMs, covering essential concepts like tokenization, embeddings, and fine-tuning; Demonstrate Practical Use of AI Tools - Guide learners in using popular AI frameworks like HuggingFace, LangChain for building AI-driven applications in Python; Develop Proficiency in Prompt Engineering - Equip learners with the knowledge and skills to craft effective prompts that optimize the performance of AI models in various use cases; Apply Embeddings and Vector Databases - Teach the importance of embeddings and how to work with vector databases for AI applications such as search and recommendation engines; Build Interactive Frontends for AI Applications - Enable learners to develop user interfaces using Gradio, integrating generative AI features for enhanced functionality; Introduce AI Agent Concepts - Provide foundational understanding of AI agents and their basic implementation patterns; Introduce Model Context Protocol - Familiarize learners with MCP basics and its role in modern AI applications; Secure and Operationalize GenAI Applications - Empower learners to deploy and manage full-stack GenAI apps using Docker, Kubernetes, and CI/CD workflows.
- These skills are especially relevant in sectors undergoing AI-driven transformation such as HRTech, EdTech, FinTech, HealthTech, Retail, Customer Experience, and Enterprise Software.

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.

Visit koenig-solutions.com | info@koenig-solutions.com