

**10,000+**  
Students Trained

**15,000+**  
Students Placed

**1000+**  
Placement  
Companies

**15 Years**  
of Student Trust

# GEN-AI D E V E L O P E R

## COURSE CURRICULUM

# Gen AI Developer Program

COURSE DURATION  
3MONTHS

SESSION HOURS  
200HRS

CASE STUDIES  
& PROJECTS

## Foundations of AI & Machine Learning

### 1. AI & ML Overview

- ⇒ Definitions: AI vs. ML vs. Deep Learning vs. Generative AI
- ⇒ Key enterprise use cases & emerging roles  
(AI Architect, Generative AI Developer)

### 2. ML Workflow & Best Practices

- ⇒ Data ingestion, cleaning, feature engineering
- ⇒ Training & validation (accuracy, precision, recall, F1)

### 3. Python Data Stack

- ⇒ NumPy, Pandas, Matplotlib/Seaborn for EDA
- ⇒ Git & GitHub for version control

### Hands-on Lab

- ⇒ Basic ML Project: A simple classification (e.g., Titanic survival) to practice data workflow, evaluation metrics, and code versioning.

## Deep Learning & Neural Networks

### 1. Neural Network Essentials

- ⇒ Perceptron, forward & backward propagation, activation functions (ReLU, Sigmoid)

### 2. Hands-On Frameworks

- ⇒ PyTorch or TensorFlow basics: tensor operations, training loops, model definition

### 3. CNNs & RNNs (Optional Basics)

- ⇒ CNNs for image tasks (MNIST/CIFAR-10)
- ⇒ RNNs/LSTMs for sequence data (time permitting)

## Hands-on Lab

- ⇒ Train a CNN on MNIST or CIFAR-10 in PyTorch or TensorFlow.

## Performance & Scalability:

- ⇒ Performance & Scalability

## Transformer & Large Language Models (LLMs)

### 1. Transformer Architecture

- ⇒ Self-Attention, Multi-Head Attention, Positional Embeddings
- ⇒ Encoder-Decoder vs. Decoder-only (GPT-like)

### 2. LLM Ecosystem

- ⇒ OpenAI GPT (3.5, 4), Google Gemini, Meta LLaMA
- ⇒ Tokenization (BPE, WordPiece), embeddings, prompt engineering

### 3. Fine-Tuning vs. Prompt Engineering

- ⇒ Fine-tuning techniques: LoRA, Adapters, parameter-efficient methods
- ⇒ Crafting effective prompts (few-shot, chain-of-thought, system prompts)

## Hands-on Lab

- ⇒ Prompt Engineering with OpenAI GPT or local LLaMA for text generation.
- ⇒ Intro to Fine-Tuning: Optional short demonstration of a parameter-efficient fine-tuning method.

## New Emphasis

- ⇒ Experience in fine tuning open-source models:  
lay foundational concepts for advanced tuning in subsequent weeks.

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## Retrieval-Augmented Generation (RAG)

### RAG Fundamentals

- ⇒ Motivation: factual grounding to reduce hallucinations
- ⇒ Typical pipeline: document chunking, indexing, retrieval, generation

### Vector Databases & Embeddings

- ⇒ Pinecone, Chroma, Weaviate, Milvus
- ⇒ Embedding models: OpenAI Embeddings, Sentence Transformers

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### Implementing RAG Pipelines

- ⇒ Index creation & query mechanism
- ⇒ Simple Q&A or chat pipeline (LangChain or similar)

### Hands-on Lab

- ⇒ RAG Q&A: Index a small dataset (FAQ, policy docs) in Pinecone or Chroma.
- ⇒ Build a basic Q&A system retrieving relevant chunks + generating final answers.

### New Emphasis

- ⇒ Discuss benchmarking retrieval results (precision/recall for domain queries).
- ⇒ Introduce the concept of domain-specific embeddings for reliability & performance.

## Agentic AI Workflows

### What is an AI Agent?

- ⇒ Autonomy, multi-step reasoning, planning

### Agent Frameworks

- ⇒ LangChain Agents, Semantic Kernel, or Crew AI (if relevant)

### Tool & API Orchestration

- ⇒ Setting up “tools” (e.g., weather API, DB queries, calculator)
- ⇒ Chain-of-thought prompting & multi-step decision-making

## Hands-on Lab

- ⇒ Agentic AI Workflow: Build a simple AI Agent that calls a mock external API (e.g., weather or stock data).
- ⇒ Showcase multi-step reasoning and skill-based agent design.

## New Emphasis

- ⇒ Innovative AI Applications: Illustrate how to develop agentic workflows for business or industrial contexts (process automation, specialized “skills”).

## Fine-Tuning & Benchmarking Domain-Specific Generative Models

### 1. Advanced Fine-Tuning Techniques

- ⇒ LoRA, Adapters, QLoRA, or full fine-tuning for large open-source models (LLaMA, GPT-Neo)
- ⇒ Domain adaptation: collecting domain-specific datasets

### 2. Benchmarking & Performance Improvement

- ⇒ Reliability metrics for generative tasks: BLEU, ROUGE, perplexity for text; FID for images
- ⇒ Scalability considerations (distributed training, multi-GPU setups)

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### 4. Bias & Robustness

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- ⇒ Scalability considerations (distributed training, multi-GPU setups)

## Hands-on Lab

- ⇒ Domain-Specific Fine-Tuning: Fine-tune an open-source LLM on a small domain dataset, measure improvements vs. baseline.
- ⇒ Evaluate throughput, latency, memory usage for scalability.

## New Emphasis

- ⇒ Directly addresses “Fine-tune and benchmark Generative AI models using domain-specific datasets, focusing on performance improvement, reliability, and scalability

## MLOps, AIOps & Production Deployment

### 1. Cloud Platforms & AIOps Pipelines

- ⇒ Automated deployment & CI/CD with AIOps tools (e.g., Jenkins, GitHub Actions, Tekton)

### 2. Containerization & Serving

- ⇒ Docker basics, model serving patterns (Kubernetes vs. serverless)
- ⇒ REST/GraphQL APIs around your generative AI model (FastAPI/Flask)

### 3. Observability & Monitoring

- ⇒ Logging, metrics, error handling, drift detection
- ⇒ Setting up monitoring dashboards to track model performance & reliability

### Hands-on Lab

- ⇒ AIOps Pipeline: Containerize your fine-tuned RAG or AI Agent application and deploy to a chosen platform (AWS ECS, GCP Cloud Run).
- ⇒ Integrate logs & monitoring for real-time performance tracking.

### New Emphasis

- ⇒ Explicit coverage of AIOps for multi-environment deployment.
- ⇒ Revisit Agentic AI to show how skill-based agents can be deployed in production pipelines



## Responsible AI, Real-World Use Cases & Wrap-Up

### 1. Responsible AI Principles

- ⇒ Bias, fairness, transparency in generative AI
- ⇒ Prompt security, data privacy, compliance (GDPR, HIPAA)
- ⇒ Testing solutions against Responsible AI guidelines

### 2. Review & Synthesis

- ⇒ Recap from ML basics to advanced RAG & AI Agents
- ⇒ Summaries of fine-tuning and large-scale MLOps

### 3. Career Prep

- ⇒ Resume/LinkedIn updates emphasizing AI experience
- ⇒ Interview readiness (ML theory, system design for LLM-driven apps)
- ⇒ Portfolio building (GitHub, Hugging Face Spaces)

### Hands-on Lab

- ⇒ **Responsible AI:** Evaluate your fine-tuned model or agentic pipeline for bias and policy compliance.
- ⇒ Conduct a final “mini demo” highlighting best practices.

### New Emphasis

- ⇒ Reinforces “Knowledge of Responsible AI principles and ways to implement it in solution, testing the solution against the defined principles.”
- ⇒ Ties responsible AI checks into final project readiness

## Capstone Workshop

After the 8-week program, participants engage in a Capstone Workshop focusing on end-to-end solution development:

### 1. Project Scoping

- ⇒ Use domain-specific datasets (text, images, logs, etc.) relevant to a chosen business or industrial scenario.
- ⇒ Define performance, reliability, and scalability goals.

### 2. Data Prep & Model Fine-Tuning

- ⇒ Apply advanced tuning techniques (LoRA, QLoRA, etc.) on an open-source LLM.
- ⇒ Benchmark the model with domain metrics (e.g., BLEU, ROUGE, FID, perplexity).

## Python Foundations

### 1. Python Basics

- ⇒ Data types (strings, lists, tuples, dicts), control flow, functions
- ⇒ OOP concepts (optional overview)

### 2. Environment Setup

- ⇒ Virtual environments (venv, conda)
- ⇒ Basic Git & GitHub for version control

### 3. Data Handling

- ⇒ File I/O (CSV, JSON)
- ⇒ Simple reading/writing with Pandas

#### Hands-On Lab

- ⇒ Lab 1: Build a Python script to parse a CSV and produce basic summary stats.
- ⇒ Push code to GitHub.

**Outcome:** Students establish a solid Python base, environment management, and Git.

## Python Data Structures & ML Basics

### 1. Advanced Python Data Structures

- ⇒ List/dict comprehensions, sets, decorators (optional)

### 2. Intro to Machine Learning

- ⇒ Overview of scikit-learn
- ⇒ Train/test splitting, simple linear/logistic regression

### 3. Evaluation Metrics

- ⇒ Accuracy, precision, recall, F1

#### Hands-On Lab

- ⇒ Lab 2: Build a simple scikit-learn classifier (e.g., Iris dataset).
- ⇒ Evaluate model metrics, visualize confusion matrix.

**Outcome:** Comfortable with Python data manipulation and basic ML pipeline.

## FastAPI Essentials

### 1. FastAPI Introduction

- ⇒ RESTful API concept, asynchronous I/O
- ⇒ Core features (routers, Pydantic models)

### 2. Basic CRUD

- ⇒ Handling GET/POST/PUT/DELETE
- ⇒ Path & query parameters

### 3. API Security

- ⇒ OAuth2 basics, JWT tokens (high-level overview)

### Hands-On Lab

- ⇒ **Lab 3:** Create a basic FastAPI app with CRUD endpoints for a mock resource (e.g., "employees").
- ⇒ Test endpoints using Postman or curl.

**Outcome:** Ability to scaffold a REST API in Python using FastAPI.

## FastAPI Deep Dive & Unit Testing

### 1. Pydantic Models & Validation

- ⇒ Request/response schemas, data validation

### 2. Unit Testing

- ⇒ Pytest basics, mocking & fixtures
- ⇒ Testing FastAPI endpoints

### 3. Deployment Packaging

- ⇒ Requirements.txt or Pipfile
- ⇒ Dockerfile basics (intro only)

### Hands-On Lab

- ⇒ **Lab 4:** Extend the Fast API app with validated data models and write pytest unit tests.
- ⇒ Optionally create a Docker file for local container testing.

**Outcome:** Students can build a tested, container-ready API with validated schemas

## Deploying Python APIs on AWS

### 1. AWS Overview

- ⇒ **Key services:** AWS ECS, AWS Elastic Beanstalk, AWS Lambda + API Gateway
- ⇒ IAM basics (roles, policies)

### 2. Docker & AWS Deployment

- ⇒ Building Docker images
- ⇒ Pushing to AWS ECR (Elastic Container Registry)
- ⇒ Running containers on ECS or Elastic Beanstalk

### 3. Serverless (Optional)

- ⇒ Brief mention of AWS Lambda

### Hands-On Lab

- ⇒ **Lab 5:** Containerize the FastAPI application and deploy to AWS ECS.
- ⇒ Validate endpoints via public URL.

**Outcome:** Real-world exposure to container-based deployment on AWS.

## Deploying Python APIs on Azure

### 1. Azure Basics

- ⇒ Resource groups, Azure Container Registry (ACR)
- ⇒ Azure Web App for Containers or Azure Container Instances (ACI)

### 2. Deployment Pipeline

- ⇒ Docker image push/pull from ACR
- ⇒ Setting environment variables & app settings

### 3. Monitoring & Logging

- ⇒ Azure Monitor, App Insights for logs and metrics

### Hands-On Lab

- ⇒ **Lab 6:** Deploy the same Dockerized FastAPI app to Azure Web App for Containers.
- ⇒ Review logs and basic metrics in Azure portal.

**Outcome:** Students learn how to replicate a container deployment process on Azure.

## Deploying Python APIs on GCP

### 1. GCP Overview

- ⇒ Services: Cloud Run, GKE, App Engine

### 2. Cloud Run Deployment

- ⇒ Containerizing (Docker)
- ⇒ Submitting images to Google Container Registry
- ⇒ Configuring environment variables and concurrency

### 3. CI/CD

- ⇒ GitHub Actions or GCP Cloud Build integration

## Hands-On Lab

- ⇒ **Lab 7:** Deploy the same FastAPI container to GCP Cloud Run.
- ⇒ Validate auto-scaling behavior by sending multiple requests.
- ⇒ **Outcome:** Students see how to deploy container-based Python services on GCP.

## Building a Simple ML Model

### 1. GCP Overview

- ⇒ scikit-learn pipeline (classification/regression)
- ⇒ Basic hyperparameter tuning (grid/random search)

### 2. Saving & Loading Models

- ⇒ Joblib/pickle or ONNX format
- ⇒ Best practices for reproducibility

### 3. Integration with FastAPI

- ⇒ Exposing a model inference endpoint
- ⇒ Handling model load in memory or on demand

## Hands-On Lab

- ⇒ **Lab 8:** Create a simple ML model (e.g., sentiment classifier or regression model) using scikit-learn.
- ⇒ Integrate with FastAPI: A /predict endpoint that loads the model and returns predictions.
- ⇒ **Outcome:** Demonstrate how to build a small ML model and wrap it in an API for inference.

## Deploying the ML Model on AWS, Azure & GCP

### 1. Model Serving Approaches

- ⇒ Containerizing an ML model + FastAPI into one container
- ⇒ Dealing with environment & memory constraints (esp. for large models)

### 2. Cloud-Specific Details

- ⇒ AWS: ECS or SageMaker (intro only)
- ⇒ Azure: Web App for Containers + model storage
- ⇒ GCP: Cloud Run or Vertex AI (intro only)

### 3. Best Practices

- ⇒ Logging predictions, monitoring model performance in each cloud
- ⇒ Cost management & scaling concerns

#### Hands-On Lab

- ⇒ **Lab 9:** Deploy the ML + FastAPI container to each cloud (or pick your favorite).
- ⇒ Validate that your inference endpoint is accessible, stable, and logs performance metrics.

**Outcome:** Students learn to host a simple ML model on AWS, Azure, and GCP, reinforcing multi-cloud concepts with a working example.

#### Hands-On Lab

- ⇒ **Lab 10:** Final Project: A minimal end-to-end pipeline from local dev
- ⇒ Docker container
- ⇒ ML model
- ⇒ cloud deployment.

**Outcome:** A portfolio-ready final project showcasing a containerized ML-powered API deployed on at least one major cloud provider.

## Summary of Curriculum

- ⇒ **Python & FastAPI:** Students learn Python basics and build robust REST APIs.
- ⇒ **Testing & Containerization:** Master unit testing (pytest) and Docker packaging.
- ⇒ **Cloud Deployments:** Deploy the same containerized application to AWS, Azure, and GCP.
- ⇒ **Building & Hosting an ML Model:** Integrate a simple scikit-learn model into FastAPI and deploy to the cloud.
- ⇒ **Final Capstone:** A fully tested, containerized ML solution running in production-like cloud environments.

By the end, participants will be confident in Python fundamentals, API development, and deploying ML-driven apps across multiple cloud platforms—an essential skill set for developers moving toward Generative AI and more advanced ML solutions.

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orn false;
1 <html>
2 <head><script>
3 <script> function show(shown, hidden) {
4   document.getElementById(shown).style.dis
5   document.getElementById(hidden).style.dis
6   return false;
7 <a href="#" onclick="return false;">Po
8 }
9 </script>
y id="Page2" style="display:none">
ontent of page 2</div>
a href="#" onclick="return show('Page1')>
10 <head>
iv>
11 <body>
12 <div id="Page1">
13   Content of page 1
14 <a href="#" onclick="return show('Page2')>
15

```

## Our Students Are Placed In



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