

Generative AI, LLMs & AI Application Development

Two-Week Comprehensive Training Programme

Duration	2 Weeks / 10 Training Days
Level	Foundation to Intermediate
Methodology	Instructor-led sessions, demonstrations, hands-on labs, exercises and a capstone project

Course Overview

This two-week programme provides a structured learning journey from AI and machine learning foundations to practical Generative AI application development. Participants explore Large Language Models (LLMs), multimodal AI, prompt engineering, APIs, Retrieval-Augmented Generation (RAG), model optimisation, AI agents, security and Responsible AI. The programme removes repetition across the source courses and develops each topic progressively through demonstrations, practical exercises and a final capstone project.

Detailed Course Content

Day 1: AI & Generative AI Foundations

- Evolution of Artificial Intelligence
- AI vs Machine Learning vs Deep Learning vs Generative AI
- Real-world AI applications and business use cases
- Fundamentals of Computer Vision and Natural Language Processing (NLP)
- Introduction to Generative AI architecture
- Industry applications and practical use cases

Day 2: Machine Learning Essentials for Generative AI

- Machine Learning workflow and core concepts
- Supervised vs unsupervised learning
- Data preparation and feature selection
- Regression and classification concepts
- Decision Trees, Random Forests and Naive Bayes
- K-Means clustering for data segmentation
- Principal Component Analysis (PCA)
- Introduction to recommendation systems

Day 3: Understanding Large Language Models

- Architecture of Large Language Models
- Transformers and attention concepts
- Types of LLMs
- Tokens, context windows and model parameters
- Model training and inference
- Text-generation workflow
- LLM limitations, hallucinations and reliability challenges

Day 4: Working with Open-Source and Commercial LLMs

- Overview of major LLM ecosystems
- Introduction to Hugging Face Transformers
- OpenAI and Azure OpenAI services
- Introduction to Ollama
- Working with Llama, Qwen, Cohere and Falcon
- Selecting the right model for a use case
- Hands-on: text generation, summarisation, translation and semantic similarity

Day 5: Multimodal Generative AI

- Image AI models and services
- Text-to-image generation
- Image captioning and image retrieval
- Object detection and image segmentation
- Visual Question Answering (Visual Q&A;)
- Zero-shot image classification
- Practical multimodal AI use cases

Day 6: Prompt Engineering for LLMs

- Prompt engineering fundamentals
- Zero-shot and few-shot prompting
- Role-based prompting
- Instruction and context design
- Iterative prompting techniques
- Summarisation, inference and transformation prompts
- Structured output generation
- Prompt evaluation and optimisation

Day 7: Building Generative AI Applications with APIs

- Introduction to AI APIs and SDKs
- Integrating LLMs into applications
- Text and code completion
- Working with structured responses
- Building applications with Python and/or JavaScript
- API security and error handling
- Hands-on: develop a simple AI chatbot

Day 8: Retrieval-Augmented Generation (RAG)

- Why RAG is required
- RAG architecture and workflow
- Embeddings and vector concepts
- Document loading and chunking
- Retrieval and similarity search
- Introduction to LangChain
- Chains and retrieval pipelines
- Hands-on: develop a document-aware chatbot

Day 9: Model Optimisation, Fine-Tuning & AI Agents

- Fine-tuning vs prompting vs RAG
- Introduction to quantisation
- Model weight optimisation and data types
- Modes of quantisation
- Open-source model optimisation
- Introduction to AI agents
- Tools, memory and agent workflows
- Hands-on: build a basic agent-enabled LLM application

Day 10: Responsible AI, Security & Capstone Project

- Responsible and ethical AI principles
- Privacy and data protection
- Bias, fairness and transparency
- Prompt injection and LLM security risks
- Secure AI application development
- Monitoring and governance
- Capstone project integrating prompting, APIs and/or RAG
- Project presentation and final knowledge assessment

Practical Labs & Capstone Project

The programme includes practical activities throughout the two weeks. Participants progressively apply the concepts covered in class and complete a capstone project based on a real business or organisational use case.

- Identify and define a suitable business problem.
- Select an appropriate LLM or Generative AI service.
- Design, test and evaluate prompts for the chosen use case.
- Integrate the model through an API or application framework.
- Add organisational or domain-specific data using RAG, where applicable.
- Apply security, privacy and Responsible AI controls.
- Present the final solution, approach and outcomes.

Learning Outcomes

- Explain the foundations of AI, Machine Learning, Generative AI and LLMs.
- Compare open-source and commercial LLM platforms and select suitable models.
- Design effective prompts for different business and technical tasks.
- Work with text and image-based Generative AI models.
- Integrate LLM capabilities into applications using APIs.
- Build a basic RAG solution using organisational or external data.
- Understand model optimisation, quantisation and AI agent concepts.
- Identify major security, privacy, ethical and governance risks in AI solutions.
- Develop and present a practical Generative AI solution.

Assessment Methodology

Knowledge checks, guided practical exercises, hands-on labs, instructor-led demonstrations, capstone project evaluation and a final knowledge assessment.