
CTR-808 AI Engineering

About This Course

This course provides an in-depth and practical foundation for becoming an AI Developer. It is designed for technical professionals seeking to build, train, and deploy AI models using real-world tools and frameworks. Participants will explore machine learning, deep learning, and generative AI while developing and deploying intelligent applications using Python, TensorFlow/Keras, and cloud services. The course also emphasizes ethical AI development and prepares learners for real-world integration and deployment.

Audience Profile

This course is intended for:

- Developers and software engineers
- Data scientists and analysts
- Technical professionals interested in AI development
- Individuals aiming to build and deploy AI models in production environments

At course completion

After completing this course, students will be able to:

Build, and deploy AI solutions using Python, machine learning, deep learning, and generative AI tools. They will be proficient in developing models with frameworks like TensorFlow and Scikit-learn, processing data for AI applications, and integrating models into real-world environments using APIs, Docker, and cloud platforms (AWS, Azure, GCP). Additionally, they will understand ethical AI development, including bias mitigation and explainability, and will complete a full AI project, equipping them with practical experience and a professional portfolio to pursue roles in AI development and data science.

Course Outline

Module 1: Introduction to AI Development

- AI vs ML vs Deep Learning: Key distinctions
- Overview of AI development lifecycle
- Setting up the AI development environment (Python, Jupyter, Colab) Learning Outcomes:
 - Understand AI development stages
 - Set up tools for AI development
 - Recognize key AI domains and use cases

Module 2: Python for AI Developers

- Essential Python libraries: Numpy, Pandas, Matplotlib
- Data preprocessing and feature engineering
- Exploratory Data Analysis (EDA) for AI models Learning Outcomes:
 - Process and analyze data
 - Prepare data for model input
 - Visualize and interpret datasets

Module 3: Machine Learning Algorithms

- Supervised and Unsupervised Learning (Regression, Classification, Clustering)
- Building ML models with Scikit-learn
- Model evaluation and optimization techniques Learning Outcomes:
 - Build ML models from scratch
 - Evaluate and optimize ML models
 - Select the right algorithm for the problem

Module 4: Deep Learning with Neural Networks

- Neural Networks: Architecture and training process
- Using TensorFlow and Keras to build models
- Applications: Image classification and basic NLP Learning Outcomes:
 - Build deep learning models
 - Train and evaluate neural networks
 - Apply DL models to real-world tasks

Module 5: Natural Language Processing (NLP)

- Text preprocessing, tokenization, and embeddings
- Sentiment analysis and text classification
- Introduction to Transformers (BERT, GPT) Learning Outcomes:
 - Process and analyze text data
 - Build NLP models
 - Utilize pre-trained language models

Module 6: Generative AI and Large Language Models (LLMs)

- Overview of Generative AI and LLMs
- Using OpenAI API and other LLM platforms
- Fine-tuning models for specific tasks Learning Outcomes:
 - Understanding LLM capabilities
 - Use LLMs for content generation

- Customize AI model outputs

Module 7: Model Deployment and Integration

- Deploying AI models using Flask, FastAPI, and Streamlit
- Creating APIs for AI model access
- Dockerizing AI applications for deployment Learning Outcomes:
 - Deploy models as web services
 - Create scalable AI APIs
 - Package and deploy using Docker

Module 8: AI in the Cloud (AWS, Azure, GCP)

- Overview of AI services in the cloud
- Training and deploying models in cloud environments
- Serverless AI workflows and automation Learning Outcomes:
 - Utilize cloud AI tools
 - Deploying AI models at scale
 - Automate workflows using cloud platforms

Module 9: AI Ethics, Bias, and Responsible Development

- Understanding AI fairness and bias
- Ensuring transparency and explainability
- Ethical deployment of AI models Learning Outcomes:
 - Develop responsible AI applications
 - Identify and mitigate AI bias
 - Implement explainable AI practices

Module 10: Final Project: Full AI Application Development

- Define and scope a real-world AI use case
- Build, train, and deploy an AI solution
- Present and document the end-to-end AI workflow Learning Outcomes:
 - Execute a complete AI project
 - Integrate AI into an application
 - Present AI-driven solutions professionally

Prerequisites

Participants should have:

- Basic programming knowledge (preferably in Python)
- Familiarity with software development concepts
- Interest in AI, data, and building intelligent applications