Prompt Engineering Program - Developer Track

This program consists of two courses and is designed for Python developers who are primed to step into the world of Generative AI application development using popular LLMs and frameworks. Course I sets up a firm foundation in critically important AI, ML and NLP concepts while Course II goes hands-on with Gen-AI application development using various technologies and frameworks.

Course I: Fundamentals of AI, ML and NLP for Developers

Overview

This comprehensive training program delves into the wide-ranging domain of Artificial Intelligence (AI) and Machine Learning (ML), touching on vital areas such as Natural Language Processing (NLP) and Generative AI, with a specific focus on Large Language Models (LLMs). The curriculum is divided into three primary modules: Introduction to AI and ML, Natural Language Processing using Python, and A Deep Dive into Generative AI and LLMs. Over the course of three modules, participants will journey from the basics of AI and ML, understanding their history, types, applications, and the ethical implications, all the way to exploring advanced topics such as the architecture, training, and responsible use of LLMs.

The curriculum also covers various ML techniques, data handling, model evaluation, and a suite of ML libraries in Python. The NLP section incorporates both fundamental and advanced techniques, along with practical applications. The final module provides a thorough understanding of Generative AI and LLMs, their design, application, and associated ethics.

Learning Objectives

- To understand the fundamentals, history, types, and applications of AI and ML.
- To grasp the concepts of Supervised, Unsupervised, and Reinforcement Learning.
- To learn about Neural Networks and Deep Learning.
- To handle and understand data in Machine Learning, including feature engineering and data pre-processing.
- To learn how to evaluate and optimize Machine Learning models.
- To comprehend the ethical considerations in AI and ML and learn about their business applications.
- To understand the basics and applications of Natural Language Processing (NLP).
- To master Python basics required for NLP and various language processing techniques.
- To understand the application of Machine Learning and Deep Learning in NLP.
- To gain practical experience with NLP applications such as Chatbots, Sentiment Analysis, Topic Modelling, etc.
- To understand the concepts and applications of Generative AI.
- To learn about Generative Models including Generative Adversarial Networks (GANs) and Autoencoders.
- To understand the design and training of Large Language Models (LLMs).
- To learn about the application, fine-tuning, and transfer learning with LLMs.
- To understand the ethical and responsible use of LLMs.

Learning Outcomes

- Comprehensive understanding of AI and ML, including their history, types, and applications.
- Ability to differentiate between Supervised, Unsupervised, and Reinforcement Learning and their applications.

- Deep understanding of Neural Networks and Deep Learning.
- Competence in handling data in Machine Learning, including feature engineering and data pre-processing.
- Proficiency in Machine Learning model evaluation and optimization.
- Awareness and understanding of the ethical considerations and business applications of AI and ML.
- Proficiency in the basics and applications of Natural Language Processing (NLP).
- Mastery of Python basics for NLP and various language processing techniques.
- Ability to implement Machine Learning and Deep Learning in NLP.
- Practical skills in various NLP applications like Chatbots, Sentiment Analysis, Topic Modelling, etc.
- Comprehensive understanding of Generative AI and its applications.
- Knowledge about Generative Models like Generative Adversarial Networks (GANs) and Autoencoders.
- Proficiency in the design and training of Large Language Models (LLMs).
- Ability to implement, fine-tune, and perform transfer learning with LLMs.
- Understanding and ability to implement ethical and responsible use of LLMs.

Learner Pre-requisites

- Proficiency in Python programming.
- Understanding of fundamental mathematics and statistics.
- Knowledge of basic data structures and algorithms.
- Familiarity with software tools for data analysis (e.g., Jupyter notebooks).
- Basic understanding of machine learning concepts (optional but recommended).
- Experience with version control systems (e.g., Git) - optional.

Total Duration

24 Hours

Module 1 - Introduction to AI and ML	**Duration: 8 Hours**

- Overview of Artificial Intelligence
- History of Artificial Intelligence
- Types of Artificial Intelligence
- Applications of Artificial Intelligence
- Introduction to Machine Learning
- Types of Machine Learning
- Understanding Data in Machine Learning
- Feature Engineering and Data Pre-processing
- Introduction to Supervised Learning
- Introduction to Unsupervised Learning
- Introduction to Reinforcement Learning
- Introduction to Neural Networks and Deep Learning
- Machine Learning Model Evaluation
- Overfitting, Underfitting and Model Optimization
- Introduction to Machine Learning Libraries in Python
- Ethics in AI and Machine Learning
- Business use cases and application

Module 2 - Natural Language Processing using Python	**Duration: 8 Hours**

- Fundamentals and Applications of Natural Language Processing (NLP)
- Python Basics for NLP (File I/O, Text Cleaning, Pre-processing)
- Language Processing Techniques (Tokenization, Stemming, Lemmatization, Stop Word Removal)

- Text Representation and Information Extraction (TF-IDF, Count Vectorization, POS tagging, NER, Dependency Parsing)
- Introduction to Spacy and Word Vectors
- Machine Learning in NLP (Basics, Supervised and Unsupervised Learning, Model Evaluation)
- Deep Learning for NLP (Introduction, Word Embeddings, RNNs, LSTMs, Transformer Architecture)
- Practical Applications of NLP (Chatbots with RASA, Sentiment Analysis, Topic Modelling, Text Summarization, Machine Translation)

Module 3 - Introduction to Generative AI and LLMs	**Duration: 8 Hours**

- Introduction to Generative AI
- Generative AI Applications
- Understanding Probability and Statistics in Generative AI
- Introduction to Generative Models
- Deep Learning for Generative Models
- Introduction to Generative Adversarial Networks (GANs)
- Autoencoders
- Transformers and Attention Mechanisms - "Attention is all you need".
- Introduction to Large Language Models (LLMs)
- Architecture of Large Language Models
- Training Large Language Models
- Fine-tuning and Transfer Learning with LLMs
- Applications of Large Language Models
- Major AI Enablers (OpenAI, Cohere, Huggingface, Anthropic)
- Text AI LLMs (GPT-3, GPT-4, LaMDA, LLaMA, Stanford Alpaca, Google FLAN, Poe, Falcon LLM)
- Image AI Models & Services (Midjourney, Stable Diffusion, ControlNet (SD))
- Video AI Models (Runway - Gen 1 & 2, Kaiber, D-ID)
- Audio AI Models (ElevenLabs)
- Ethics and Responsible Use of LLMs

OUTCOME PROFILE: Upon completion of the course, learners will have established a solid foundation in AI/ML, Natural Language Processing, and Generative AI systems. They will possess a thorough understanding of Large Language Models (LLMs), along with a comprehensive knowledge of their practical applications. This foundational knowledge will empower learners to utilize these tools and techniques to their fullest potential in a variety of use cases.

Course II: Mastering Prompt Engineering and Gen-AI App Development

Overview

This comprehensive course provides learners with an in-depth look into the world of AI applications and prompt engineering using tools like ChatGPT, OpenAI, LangChain, and Streamlit. Divided into four modules, the course covers a wide range of topics from basic introductions to advanced application development, including case studies and hands-on exercises. By the end, learners will have a firm grasp of prompt engineering techniques, AI app development, and rapid prototyping, enabling them to create efficient and powerful AI applications.

Learning Objectives

- To explore the functionalities of ChatGPT and learn about the different models like GPT-3.5 and GPT-4.
- To understand the process of designing a prompt and apply these skills to real-world case studies.
- Getting familiarized with the OpenAI platform, its API, and learn about its various parameters.
- To build practical applications using the learned concepts and the OpenAI API.
- To understand the LangChain ecosystem and its use-cases.
- To develop advanced AI apps using LangChain and learn to integrate them with different databases and APIs.
- To learn to use Streamlit for rapid application development and build interactive web UIs and data visualizations.
- To apply the acquired skills in real-world scenarios through various case studies and hands-on exercises.

Learning Outcomes

- Understand the fundamentals of ChatGPT and Prompt Engineering.
- Learn to design effective prompts and understand the workflow process.
- Gain knowledge of the OpenAI platform and its API.
- Develop practical skills by building various applications like summarization tools, translation tools, and customer service bots.
- Get an in-depth understanding of LangChain for advanced AI app development.
- Learn to build interactive web UIs and data-driven applications with Streamlit.

Learner Pre-Requisites

- Basic understanding of Artificial Intelligence and Machine Learning concepts.
- Familiarity with Natural Language Processing.
- Proficiency in a programming language, preferably Python.
- Basic understanding of software development concepts.
- Familiarity with web development and API usage would be beneficial.
- An understanding of data structures and algorithms.
- Familiarity with cloud platforms for deployment (optional but helpful).

Total Duration

38 Hours

Module 1 - Learning Prompt Engineering using ChatGPT	Duration: 6 Hours

- Introduction to ChatGPT
- Introduction to Prompt Engineering
- An overview of available models (GPT-3.5 vs. GPT-4)

- Designing a prompt - The process and workflow
- Case Study: Summarization
- Defining personas and roles
- Case Study: ChatGPT as a copywriter. Writing ad copies.
- Avoiding prompt injections using delimiters
- Defining constraints
- Zero-shot learning
- Few-shot learning.
- Case Study: Sentiment / Emotion Analysis / Keyword inference
- Case Study: Language translation
- Structured Responses
- Popular prompt patterns and examples
- Case Study: Code Generation, Analysis and Review
- An introduction to Google Bard

Module 2 - Prompt Engineering for Developers using OpenAI	**Duration: 12 Hours**

- Getting started with the OpenAI Platform
- A look at the available models
- Using the Playground
- Understanding temperature, token length, penalties, Top P etc.
- Using the Chat Completion (Playground)
- Getting started with the OpenAI API
- Authentication and Access Keys
- The Completions endpoint
- The Chat Completion endpoint
- Case Study: Building a summarization tool
- Case Study: Building a message translator tool
- Working with embeddings
- Case Study: A customer service bot
- Case Study: Q&A with a PDF
- Fine-tuning the model
- Controlling Hallucinations
- Using Function calls for turbocharging your apps
- Case Study: Using function calls for getting structured data
- Case Study: Building a weather app using function calls
- Case Study: Building a currency convertor using function calls
- Case Study: Code analysis and review
- Case Study: Natural Language to Code

Module 3 - Advanced AI App Development using Langchain	**Duration: 12 Hours**

- What is LangChain and when should you use it?
- The LangChain Ecosystem
- Supported LLMs
- Case Study: Getting started with LangChain and OpenAI
- Prompt composition and templates
- Few-shot prompts.
- Using multiple LLMs (Chains)
- Working with Data loaders - Ingesting documents
- Working with text splitters - Chunking Data
- Working with Chains (Conversational Retrieval QA, Retrieval QA, Summarization, API etc.)
- Working with Memory

- Working with Embedding
- Case Study: Working with Google FLAN on HuggingFace
- Case Study: Build a Q&A Chain ChatBot for a set of HTML/PDF documents
- Building Agents
- Working with Vector Databases (PineCone, Deep Lake, and others)
- Working with APIs
- Structured Data and Output Parsing Techniques
- Case Studies (ChatBots, Q&A Bots, Action Chains - Using Functions & third-party services)
- Case Study - Integrating DALL-E for image generation
- Building an API using Flask and LangChain
- Deployment

Module 4 - Mastering Streamlit for rapid application development	**Duration: 8 Hours**

- Introduction to Streamlit
- Streamlit Setup and Installation
- Streamlit Basics
- Building Web UIs
- Data Visualization with Streamlit
- Building Interactive UI with Streamlit
- Deploying Streamlit Apps
- Advanced Streamlit Topics
- Case Studies - Building Data Driven AI Apps with LangChain integration
- Using st-chat for building a ChatGPT like chatbot for your own documents

OUTCOME PROFILE: Upon completion of this program, the learner will have a comprehensive understanding of Prompt Engineering, Generative AI systems, and rapid AI application development. The learner will be proficient in using Large Language Models (LLMs) like ChatGPT and OpenAI, understand their intricate details and use-cases, and be capable of designing effective prompts for varied applications. Additionally, the learner will have practical experience in developing AI applications using LangChain and deploying user-friendly web interfaces using Streamlit. They will be equipped with the skills to integrate AI applications with databases and APIs, and deploy these applications for real-world use.