Hands-on Generative Artificial Intelligence

Duration: 24 Hours

Level: Advanced

Course Overview: Hands-on Generative AI is an interactive three-day training course that offers a comprehensive learning experience for developers, data engineers/analysts, and tech product owners. The course is specifically designed to equip participants with the essential skills and in-depth knowledge required to harness the power of generative AI effectively. By combining theory with extensive hands-on practice, this course ensures that participants gain a deep understanding of generative AI concepts and the ability to apply them to various domains. Students will learn how to generate realistic and novel outputs, such as images, music, text, and more, using state-of-the-art algorithms and frameworks

PREREQUISITES

● Python Programming: Participants should have a solid understanding of Python programming, including knowledge of data structures, control flow, functions, and libraries commonly used in data analysis and machine learning, such as NumPy, Pandas and scikit-learn.

● Data Analysis and Machine Learning: Familiarity with data analysis concepts, exploratory data analysis (EDA), and machine learning algorithms is essential.

● Deep Learning Basics: Basic knowledge of deep learning concepts is recommended.

Day 1 (4 Hrs)

Module 1: Machine Learning Fundamentals

1. AI vs ML vs Generative AI
2. Understanding Machine Learning vs Traditional Programming
3. Machine Learning Fundamentals - Features and Labels
4. Machine Learning Fundamentals - Steps and Terminology
5. The AI Turmoil

Module 2: Introduction to Generative AI, Deep Learning, and Building Blocks

- What is Artificial Intelligence?
- Getting Started with ChatGPT
- ChatGPT Availability
- Using ChatGPT for Coding, Learning, and Design
- Exploring ChatGPT Technology
- Generating Ideas with ChatGPT
- Non-Deterministic Nature of Generative AI

Module 3: Introduction to Generative AI

- Overview of Generative AI
- Introduction to generative AI and its applications

Day 2 (4 Hrs)

Module 4: Deep Learning Primer

- Recap of essential deep learning concepts
- Review of neural networks and their architectures
- Explanation of optimization techniques (e.g., gradient descent, backpropagation)

Module 5: Navigating the Generative AI Landscape

- Introduction to Generative AI Landscape
- Exploring Generative AI Terminology - Foundation Models and LLMs
- Overview of Generative AI Models
- Introduction to OpenAI Playground
- Practical Uses of OpenAI Playground
- Working with Text Features - Summarization, Classification, Extraction, and Ideation

- Understanding the basics of generative models and their importance
- Overview of different types of generative models (e.g., GANs, VAEs, autoregressive models)

Day 3 (4 Hrs)

Module 6: Effective Prompt Design and OpenAI API

- Introduction to Effective Prompt Design
- Prompt Design - Practical Exercises
- Utilizing Prompt Examples - ZERO SHOT, ONE SHOT, MANY SHOT
- Exploring Prompt Frameworks - RTF, CTF, and RASCEF
- Parameter Experimentation for Effective Prompts

Module 7: Introduction to Large Language Models (LLMs)

- What lies behind ChatGPT?
- LLMs as Transformers
- Different types of transformers and tasks
- How to use Transformers without training: Prompt Engineering

Day 4 (4 Hrs)

Module 8: Harnessing the Power of OpenAI API

- Getting Started with OpenAI API
- Understanding Pricing of OpenAI APIs
- Course Downloads - Downloaded Notebooks for Next Lecture
- Exploring OpenAI API - Basic Prompting
- Exploring OpenAI API - Response Example
- Exploring OpenAI API - Prompts with Examples
- Exploring OpenAI API - Chat API
- Exploring OpenAI API - Image & Audio Examples

Module 9: Advanced Techniques and Applications

- Tuning Language Models
- What are Embeddings?
- Exploring Embeddings with an Example
- Getting Started with LangChain
- Understanding LangChain Fundamentals
- Answering Questions from a Long Article with LangChain

- Summarization with LangChain
- Understanding LangChain Chaining

Day 5 (4 Hrs)

Module 10: Implementing RNN (Recurrent Neural Networks) and LSTM

- Why RNN's
- Need of RNN
- RNN vs LSTM
- Implementing Sentiment Analysis using RNN

Module 11: Variational Autoencoders, Generative Adversarial Networks, and Large Language Models

- Variational Autoencoders (VAEs)
    - VAEs architecture
    - Training VAEs and generating new samples
    - Hands-on exercise: Building a VAE for text generation
- Generative Adversarial Networks (GANs)
    - Exploring the theory behind GANs
    - GAN architecture and training process
    - Generating synthetic data using GANs
    - Hands-on exercise: Training a GAN to generate images and evaluating the results

Day 6 (4 Hrs)

Module 12: Hugging Face, and Training Large Language Models

- Hugging Face
    - Introduction to Hugging Face
    - Introduction to datasets
    - How to use a model from Hugging Face
    - How to upload a checkpoint to Hugging Face
- Training Large Language Models: The Easy Part
    - When to train and when not to train your LLM
    - Computing difficulties of training LLMs
    - Full finetuning, costs, and potential catastrophic forgetfulness
    - Capstone: Perform full finetuning of Flan-T5 and verify forgetfulness
    - Single task vs multitask finetuning
    - Perform transfer learning to avoid full finetuning
    - Capstone: Perform transfer learning of on Sentiment Analysis