Course Overview

This comprehensive course is designed to equip experienced testers with the knowledge and skills to leverage Generative AI and Large Language Models (LLMs) in software testing.

Starting from the fundamentals and advancing to intermediate levels, the course includes hands-on exercises, real-time use cases, and practical projects focused on enhancing productivity and job readiness.

Week 1: Introduction to Generative AI and LLMs

Session 1: Understanding AI and Generative Models

- **Basics of Artificial Intelligence and Machine Learning**
  - Key concepts in AI and ML
  - Difference between AI, ML, and Deep Learning
- **Introduction to Generative AI**
  - What is Generative AI?
  - Evolution and applications
- **Large Language Models (LLMs): An Overview**
  - Understanding LLMs
  - Impact on various industries and domains
- **Q&A Session**

Session 2: Deep Dive into GPT-4 and Llama 3.2

- **Introduction to OpenAI GPT-4**
  - Architecture and capabilities
  - Use cases in testing
- **Introduction to Llama 3.2**
  - Features and differences from GPT-4
- **Applications of Generative AI in Software Testing**
  - Potential and limitations

Week 2: Fundamentals of LLMs for Testers

Session 1: Mechanics of LLMs

- **How LLMs Work: Transformers and Attention Mechanisms**
    - Detailed explanation of transformer architecture
    - Role of attention mechanisms in LLMs
- **Language Model Training Basics**
    - Pre-training vs. fine-tuning
    - Data requirements and pre-processing

Session 2: Hands-On with LLMs

- **Initial Interaction with GPT-4 and Llama 3.2**
    - Setting up the environment
    - Exploring basic functionalities
- **Ethical Use of LLMs in Testing**
    - Bias and fairness
- **Q&A and Wrap-up**

Week 3: Prompt Engineering for Testers

Session 1: Crafting Effective Prompts

- **Introduction to Prompt Engineering**
    - Importance in maximizing LLM outputs
- **Techniques for Effective Prompt Creation**
    - Understanding context and intent
    - Avoiding common pitfalls
- **Crafting Prompts for Testing Scenarios**
    - Use cases specific to software testing

Session 2: Hands-On Prompt Engineering

- **Exercise: Creating Prompts for Test Data Generation**
    - Group activities and discussions
- **Exercise: Crafting Prompts for Test Cases**
    - Individual practice with feedback
- **Q&A and Wrap-up**

Week 4: Use Cases in Test Automation

Session 1: LLMs in Test Script Generation

- **Generating Selenium Scripts Using LLMs**
  - Step-by-step guide
  - Best practices
- **Automating Test Script Creation**
  - Integrating LLM outputs into automation frameworks

Session 2: Test Scenario and Data Generation

- **Generating Test Scenarios with LLMs**
  - Techniques and examples specific to retail banking and payments domain
- **Hands-On Exercise: Refining Generated Scripts**
  - Real-time problem-solving
- **Q&A and Wrap-up**

Week 5: Fine-Tuning LLMs for Testing Purposes

Session 1: Understanding Fine-Tuning

- **Concepts of Fine-Tuning LLMs**
  - Benefits and challenges
- **Data Preparation for Fine-Tuning**
  - Data collection, cleaning, and formatting
- **Tools and Platforms for Fine-Tuning**
  - Overview of popular tools

Session 2: Hands-On Fine-Tuning

- **Fine-Tuning GPT-4/Llama 3.2 for Testing Tasks**
  - Practical implementation steps
- **Exercise: Fine-Tuning a Model for a Specific Testing Domain**
  - Guided project work
- **Q&A and Wrap-up**

Week 6: Reinforcement Learning and LLM-Powered Applications

Session 1: Introduction to Reinforcement Learning (RL)

- **Basics of Reinforcement Learning**
  - Key concepts and terminology
- **Applying RL in Testing**
  - How RL enhances testing strategies
- **LLM-Powered Applications Using RL**
  - Case studies and examples

Session 2: Hands-On with RL in Testing

- **Implementing RL for Test Optimization**
  - Setting up an RL environment
  - Developing a simple RL model for testing
- **Q&A and Wrap-up**

Week 7: Evaluating and Optimizing LLMs

Session 1: Model Evaluation Techniques

- **Metrics for Evaluating LLM Performance**
  - Accuracy, perplexity, BLEU scores, etc.
- **Testing and Validating LLM Outputs**
  - Ensuring reliability and correctness
- **Error Analysis and Troubleshooting**
  - Identifying and fixing common issues

Session 2: Enhancing LLM Performance

- **Improving Models for Testing Tasks**
  - Strategies for optimization
- **Hands-On Exercise: Evaluating and Refining Models**
  - Applying learned techniques
- **Q&A and Wrap-up**

Week 8: Real-Time Use Cases and Integration

Session 1: Case Studies and Best Practices

- **Real-World Applications in Testing**
  - Success stories and lessons learned
- **Implementing LLMs in Existing Test Environments**
  - Integration strategies and considerations

Session 2: Final Projects and Course Completion

- **Best Practices for LLM Integration**
  - Maintenance and scalability
- **Final Project Presentations**
  - Students present their projects showcasing the application of course learnings
- **Course Wrap-Up and Feedback**
  - Summary of key takeaways
  - Collection of participant feedback

Additional Resources:

- **Reading Materials:**
  - Articles on Generative AI applications in testing
  - Additional use cases : GPT-4 and Llama 3.2
- **Tools and Software:**
  - Access to LLM platforms for hands-on practice
  - Code samples and templates for exercises
- **Support:**
  - Discussion forums for peer interaction
  - Implementation support at work

Outcomes:

By the end of this course, you will:

- Understand the fundamentals of Generative AI and LLMs.
- Be proficient in prompt engineering tailored to software testing.
- Apply LLMs to generate test scripts, scenarios, and data.
- Fine-tune LLMs for specific testing purposes.
- Utilize reinforcement learning to optimize testing processes.
- Evaluate and enhance the performance of LLMs in testing contexts.
- Integrate LLM-powered solutions into existing testing frameworks.
- Be equipped with practical skills to increase productivity and job performance.