

APPLIED GENERATIVE AI:

LARGE LANGUAGE MODELS AND INTELLIGENT AGENTS

Generative AI is transforming industries by enabling intelligent text generation, chatbots, data analysis, and decision-making systems. This course equips you with practical skills to master LLMs, Lang Chain, RAG, and agentic AI, empowering you to build real-world AI applications, stay ahead in the AI revolution, and advance your career in the rapidly growing field of artificial intelligence.

Course Highlights

- ✓ Hands-On Learning: Practical exercises with Large Language Models (LLMs), Lang Chain, RAG, and AI agents.
- ✓ End-to-End Coverage: From foundational Machine Learning and Deep Learning to advanced Generative AI applications.
- ✓ Real-World Projects: Build chatbots, document analysis systems, data-driven applications, and interactive AI solutions.
- ✓ Latest Tools & Platforms: Work with OpenAI, Hugging Face, Cohere, Replicate, Groq, PandasAI, and more.
- ✓ Advanced Techniques: Explore word embeddings, prompt engineering, sequential chains, conversational memory, and agentic AI.
- ✓ Customizable AI Applications: Learn to integrate LLMs with external tools, databases, and APIs for dynamic workflows.
- ✓ RAG & Knowledge Retrieval: Implement Retrieval-Augmented Generation for accurate, context-aware AI responses.
- ✓ Interactive Web Apps: Deploy AI-powered applications with Streamlit and other platforms.
- ✓ Career-Oriented Skills: Gain expertise to work as a Generative AI developer, LLM engineer, or AI solutions architect.
- ✓ Comprehensive Learning Path: Covers everything from basics to cutting-edge AI techniques in a structured module format.

Module -1: Foundations of Generative AI

Overview:

This module introduces learners to the core concepts of Generative AI and provides a solid foundation for understanding advanced AI systems. It is designed to take you from basic definitions to a comprehensive understanding of Large Language Models and their training methodologies.

-  Introduction to Generative AI and Related Concepts
-  Discriminative Models vs Generative Models
-  AI vs ML vs DL vs Generative AI
-  Evolution of Large Language Models (LLMs)
-  Introduction to Training Large Language Models
-  Analysis of All LLM Models

Module-2: Machine Learning Foundations for Generative AI

Overview:

This module provides a solid foundation in Machine Learning (ML) concepts, essential for understanding and implementing Generative AI solutions. From basic principles to practical regression models, learners will gain the skills to build, evaluate, and optimize ML models effectively.

-  Why You Need to Learn ML Basics for Generative AI
-  Traditional Programming vs Machine Learning
-  Types of Machine Learning
-  Statistical Foundation for ML
-  Simple Regression
-  Multiple Regression
-  What is the Need of Logistic Regression?
-  Building Logistic Regression Line
-  Goodness of Fit Measures
-  Multicollinearity
-  Individual Impact of Variables
-  Model Selection
-  Capstone Project

Module-3: Deep Learning Essentials for Generative AI

Overview:

This module introduces deep learning concepts crucial for building Generative AI models. Learners will explore neural networks, their underlying mathematics, practical implementation, and applications such as image recognition.

Topics Covered:

-  Significance of Deep Learning in Generative AI Development
-  Understanding Neurons and Neural Network Structures
-  Key Terminology and Concepts in Neural Networks
-  Core Neural Network Algorithms
-  Mathematical Foundations of Neural Networks
-  Constructing Neural Network Models
-  Evaluating and Validating Neural Network Performance
-  Practical Applications of Neural Networks
-  **Capstone Project**

Module-4: Representing Language for AI

Overview:

This module focuses on transforming textual data into numerical forms that AI models can process. Learners will study techniques to capture word meanings, relationships, and context, and will gain practical experience creating embedding models with frameworks like TensorFlow and Gensim.

Topics Covered:

-  Extracting Insights from Text Data
-  Understanding Vector Representations of Words
-  Comparing Simple Encoding vs Context-Aware Methods
-  Mechanism Behind Contextual Word Vectors
-  Creating Word Representations with TensorFlow
-  Building Efficient Embedding Models Using Gensim
-  Adjusting Model Settings for Optimal Performance

Module-5: Getting Started with Large Language Models (LLMs)

Overview:

This module provides learners with a practical introduction to open-source LLMs for Generative AI. Through beginner-friendly, hands-on exercises, students will learn to access, configure, and deploy models across multiple platforms, gaining foundational skills for creative and analytical AI tasks.

Topics Covered:

- 🛠️ Hands-on Text Generation with OpenAI APIs
- 🛠️ Experimenting with Cohere for Creative and Simplified Outputs
- 🛠️ Exploring Key Open-Source LLMs for NLP Tasks
- 🛠️ Implementing Models via Hugging Face Hub for Practical Applications
- 🛠️ Fine-Tuning and Deploying Models Using Replicate
- 🛠️ Efficient Model Execution with Groq's LPU for High-Performance Tasks

Module-6: Mastering Hugging Face for Workflows

Overview:

This module provides a comprehensive, hands-on approach to Hugging Face, enabling learners to explore, implement, and optimize NLP models. Students will gain practical experience in loading, fine-tuning, and managing pretrained models, using pipelines, and integrating them into real-world AI workflows.

Topics Covered:

- 🛠️ Introduction to Hugging Face
- 🛠️ Platform Overview and Key Features
- 🛠️ Navigating the Hugging Face Model Hub
- 🛠️ Loading and Using Pretrained Models
- 🛠️ Utilizing the pipeline() Function for Various Tasks
- 🛠️ Fine-Tuning Pretrained Models for Custom Applications
- 🛠️ Saving, Reloading, and Version Management of Models
- 🛠️ Integrating Hugging Face Models into Real-World Projects
- 🛠️ **Capstone Project**

Module-7: Practical Applications of Retrieval-Augmented Generation (RAG)

Overview:

This module introduces Retrieval-Augmented Generation (RAG), a technique that enhances AI outputs by combining information retrieval with text generation. Learners will gain hands-on experience building RAG pipelines, managing data, generating embeddings, and integrating models into real-world applications like sentiment analysis and interactive web apps.

Topics Covered:

- 📌 Importance of RAG in Enhancing AI Responses
- 📌 Overview of RAG Workflow and Process
- 📌 Key Steps in RAG: Data Collection, Chunking, Embedding, Storage, Retrieval
- 📌 Loading and Preparing Diverse Datasets
- 📌 Segmenting Text Data for Efficient Retrieval
- 📌 Generating Semantic Representations of Text Chunks
- 📌 Managing Vector Databases for Fast Information Access
- 📌 Retrieving Relevant Context for AI Responses

Module-8: Building Smart Workflows with LangChain

Overview:

This module introduces LangChain, a framework that extends LLM capabilities by connecting them to external data, structured workflows, and intelligent document handling. Learners will gain practical skills in designing chains, managing model input/output, and creating applications

Topics Covered:

- 📌 Limitations of LLMs in Real-World Applications
- 📌 Integrating LLMs with External Data and Services
- 📌 LangChain as a Framework for Advanced AI Workflows
- 📌 Core Components: Prompt Templates, LLM Models, and Chains
- 📌 Creating Structured Prompts for Consistent Outputs
- 📌 Sequential Chains for Multi-Step Processing
- 📌 **Capstone Project**

Module-9: Conversational Memory and Smart Chatbots

Overview:

This module explores memory management in chatbots and conversational AI using LangChain. Learners will understand different memory types, manage context in dialogues, and build practical applications that combine memory with retrieval mechanisms for enhanced conversational experiences.

Topics Covered:

-  Introduction to Chatbots and the Role of Memory
-  OpenAI() vs ChatOpenAI() for General and Conversational Tasks
-  ConversationBufferMemory: Storing Complete Dialogues
-  Human, AI, and System Messages in Conversations
-  Advanced Memory Types:
 - ConversationBufferWindowMemory
 - ConversationSummaryMemory
 - ConversationSummaryBufferMemory
 - ConversationKnowledgeGraphMemory (KGMemory)
 - ConversationEntityMemory
-  Deep Dive: ConversationSummaryMemory for Long Dialogues
-  Deep Dive: ConversationEntityMemory for Key Details
-  **Capstone Project**

Module-10: Building Intelligent Agents with Lang Chain

Overview:

This module introduces Lang Chain agents, enabling large language models (LLMs) to interact with external tools, databases, and datasets for dynamic, context-aware task execution. Learners will explore agent setup, tool integration, CSV and SQL agents, custom tools, and practical applications like automated report generation and data analysis.

Topics Covered:

-  Introduction to Lang Chain Agents and Their Role
-  OpenAI() vs ChatOpenAI() for Task Automation and Conversations

- 🛠️ **Setting Up Agents and Integrating External Tools**
- 🛠️ **Tool Examples: Wikipedia, SerpAPI, LLM-Math, ArXiv**
- 🛠️ **PPT Maker Application: Automating Slide Content from Essays**
- 🛠️ **CSV Agents: Querying and Analysing CSV Datasets**
- 🛠️ **SQL Database Agents: Safe Read-Only Queries and Insights**
- 🛠️ **Creating Custom Tools with the @tool Decorator**
- 🛠️ **Pandas Data Frame Agents for Structured Data Analysis**
- 🛠️ **PandasAI and SmartDataframe: Conversational Analytics**
- 🛠️ **Application: Building “Talk to Your Data” for Interactive Data Exploration**

Bonus Module: Introduction to Agentic AI

Summary:

This module introduces Agentic AI, a type of artificial intelligence that can make decisions, plan actions, and execute tasks autonomously. Learners will understand the basic concepts, real-world applications, and potential of agents that operate with minimal human supervision.

Topics Covered:

1. What is Agentic AI?
2. Difference Between Traditional AI and Agentic AI
3. Key Capabilities: Autonomy, Decision-Making, and Goal-Oriented Behaviour
4. Examples of Agentic AI in Daily Life (Virtual Assistants, Autonomous Vehicles, Robotics)
5. Basic Architecture of Agentic Systems