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GENERATIVE AI MASTERS PROGRAM

masters program

About Edureka

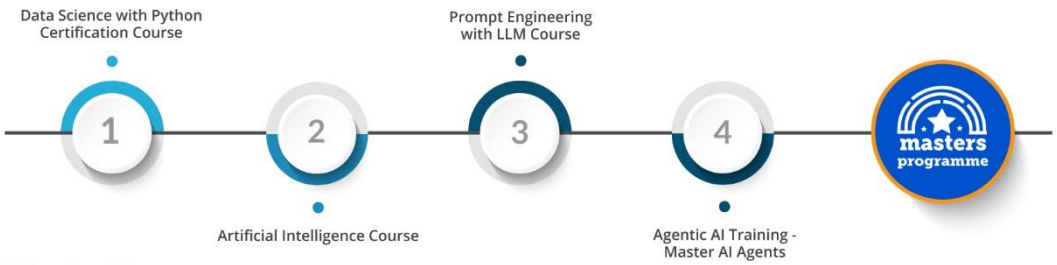
Edureka is one of the world's largest and most effective online education platform for technology professionals. In a span of 10 years, 100,000+ students from over 176 countries have upskilled themselves with the help of our online courses. Since our inception, we have been dedicated to helping technology professionals from all corners of the world learn Programming, Data Science, Big Data, Cloud Computing, DevOps, Business Analytic, Java & Mobile Technologies, Software Testing, Web Development, System Engineering, Project Management, Digital Marketing, Business Intelligence, Cybersecurity, RPA and more.

We have an easy and affordable learning solution that is accessible to millions of learners. With our learners spread across countries like the US, India, UK, Canada, Singapore, Australia, Middle East, Brazil, and many others, we have built a community of over 1 million learners across the globe.

About the Program

Edureka's Generative AI course helps you master the principles of Generative AI and implement them in real-world applications. This generative AI online course includes training on Python Programming, Data Science, Artificial Intelligence, Natural Language Processing, Generative AI, Prompt Engineering, ChatGPT, and many more. The curriculum has been meticulously designed by the industry experts based on an analysis of 5000+ global job descriptions. Enroll today and dive into the fascinating world of Generative AI and elevate your career to the next level.

Generative AI Masters Program



Elective Courses:

- Enhancing Productivity with ChatGPT
- Generative AI Industry Applications
- AI Assisted Software Development

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**Depending on industry requirements, Edureka may make changes to the course curriculum*

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Data Science with Python Certification Course

masters program

Course Curriculum

Course Outline

Module 1: Introduction to Python for Data Science

Topics:

- Python scripting
- Variables & types
- Conditions & loops
- Function basics
- Lambda usage
- Lists & tuples
- Dictionaries
- File reading
- Error handling
- Jupyter setup

Module 2: Working with Python Programming

Topics:

- Set operations
- List comprehensions
- Generator functions
- Using modules
- Regex patterns
- Special collections
- Map & filter
- Custom exceptions

Module 3: Advanced Python Programming for Data Science

Topics:

- OOP concepts
- Class inheritance
- Context managers
- Unit testing
- API requests
- Code profiling
- Logging basics
- JSON handling
- Project packaging
- Type hints

Module 4: Data Analysis with NumPy and Pandas

Topics:

- NumPy arrays
- Vector operations
- Math functions
- Series handling
- DataFrames
- Dataset merging
- Missing values
- Pivot tables
- Data summaries
- Memory tuning

Module 5: Data Visualization and Preprocessing Techniques

Topics:

- Matplotlib Plotting
- Seaborn Visualization Styles
- Line and Bar Charts
- Histogram Analysis
- Web Scraping Basics
- Missing Data Treatment
- Feature Scaling Techniques
- Encoding Categorical Data
- Data Storytelling Approaches

Module 6: Statistical Methods for Data Science

Topics:

- Descriptive stats
- Variance and standard deviation
- Probability
- Normal distribution
- Hypothesis testing: t-tests
- Correlation: Pearson coefficient
- Outlier detection: z-score
- Sampling: random sampling
- Statistical visualization
- P-values: significance

Module 7: Fundamentals of Machine Learning

Topics:

- CRISP-DM process
- ML categories
- Python for ML
- ML tools
- Data lifecycle
- Evaluation
- Feature basics
- AI ethics
- Industry insights

Module 8: Supervised Learning – Regression Analysis

Topics:

- Linear regression
- Gradient descent
- Polynomial regression
- Ridge regression
- Error metrics
- R-squared
- Cross-validation
- Residual analysis
- Feature selection
- Overfitting mitigation

Module 9: Supervised Learning – Classification Fundamentals

Topics:

- Logistic regression
- Binary labels
- Decision trees
- Confusion matrix
- Precision & recall
- ROC curve
- Overfitting
- Feature ranking
- Model validation
- Class imbalance

Module 10: Supervised Learning – Advanced Classification

Topics:

- Random forests
- SVM
- XGBoost
- Grid search
- Random search
- SHAP values
- SMOTE
- Model stacking
- Association rules
- Recommendation engines
- Model evaluation

Module 11: Unsupervised Learning and Clustering Techniques

Topics:

- K-Means clusters
- Elbow method
- Hierarchical clustering
- DBSCAN logic
- PCA reduction
- Anomaly detection
- Silhouette score
- Segmentation use
- Cluster visuals

Module 12: AutoML and No-Code Data Science Solutions

Topics:

- AutoML tools
- DataRobot
- KNIME workflows
- H2O.ai models
- Synthetic data
- Rapid prototyping
- AI fairness

Module 13: Reinforcement Learning Essentials (Self-paced)

Topics:

- Agent-Environment Interaction
- OpenAI Gym Setup
- Markov Decision Process
- Q-Learning Fundamentals
- Exploration-Exploitation Tradeoff
- Epsilon-Greedy Strategy
- Reward Shaping Concepts
- Reinforcement Learning Applications
- Q-Table Implementation
- Reinforcement Learning Limitations

Module 14: Time Series Analysis and Forecasting Methods (Self-paced)

Topics:

- Time Series Components
- Stationarity Testing (ADF)
- ARIMA Model Parameters
- Forecasting with Prophet
- Forecast Error Metrics
- Backtesting Techniques
- Trend Visualization Methods
- Confidence Interval Analysis
- External Variable Integration
- Model Selection Strategies

Module 15: Machine Learning on Cloud Platforms (Self-paced)

Topics:

- Cloud ML Introduction
- AWS SageMaker
- Google Cloud AI
- Azure ML
- Cloud storage
- Serverless ML
- Model deployment
- Scalability

Module 16: MLOps Fundamentals (Self-paced)

Topics:

- MLOps Introduction
- CI/CD for ML
- Flask API Deployment
- MLflow Model Tracking
- Docker Containerization
- Model Drift Monitoring
- Model Lifecycle Management

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Artificial Intelligence Certification Course

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Course Curriculum

Course Outline

Module 1: Introduction to Text Mining and NLP

Topics:

- Overview of Text Mining
- Need of Text Mining
- Natural Language Processing (NLP) in Text Mining
- Applications of Text Mining
- OS Module
- Reading, Writing to text and word files
- Setting the NLTK Environment
- Accessing the NLTK Corpora

Module 2: Extracting, Cleaning and Preprocessing Text

Topics:

- Tokenization
- Frequency Distribution
- Different Types of Tokenizers
- Bigrams, Trigrams & Ngrams

- Stemming
- Lemmatization
- Stopwords
- POS Tagging
- Named Entity Recognition

Module 3: Analyzing Sentence Structure

Topics:

- Syntax Trees
- Chunking
- Chinking
- Context Free Grammars (CFG)
- Automating Text Paraphrasing

Module 4: Text Classification - I

Topics:

- Machine Learning: Brush Up
- Bag of Words
- Count Vectorizer
- Term Frequency (TF)
- Inverse Document Frequency (IDF)

Module 5: Introduction to Deep Learning

Topics:

- What is Deep Learning?
- Curse of Dimensionality
- Machine Learning vs. Deep Learning

- Use cases of Deep Learning
- Human Brain vs. Neural Network
- What is Perceptron?
- Learning Rate
- Epoch
- Batch Size
- Activation Function
- Single Layer Perceptron

Module 6: Getting Started with TensorFlow 2.0

Topics:

- Introduction to TensorFlow 2.x
- Installing TensorFlow 2.x
- Defining Sequence model layers
- Activation Function
- Layer Types
- Model Compilation
- Model Optimizer
- Model Loss Function
- Model Training
- Digit Classification using Simple Neural Network in TensorFlow 2.x
- Improving the model
- Adding Hidden Layer
- Adding Dropout
- Using Adam Optimizer

Module 7: Convolution Neural Network

Topics:

- Image Classification Example
- What is Convolution
- Convolutional Layer Network
- Convolutional Layer
- Filtering
- ReLU Layer
- Pooling
- Data Flattening
- Fully Connected Layer
- Predicting a cat or a dog
- Saving and Loading a Model
- Face Detection using OpenCV

Module 8: Regional CNN

Topics:

- Regional-CNN
- Selective Search Algorithm
- Bounding Box Regression
- SVM in RCNN
- Pre-trained Model
- Model Accuracy
- Model Inference Time
- Model Size Comparison

- Transfer Learning
- Object Detection – Evaluation
- mAP
- IoU
- RCNN – Speed Bottleneck
- Fast R-CNN
- RoI Pooling
- Fast R-CNN – Speed Bottleneck
- Faster R-CNN
- Feature Pyramid Network (FPN)
- Regional Proposal Network (RPN)
- Mask R-CNN

Module 9: Boltzmann Machine & Autoencoder

Topics:

- What is Boltzmann Machine (BM)?
- Identify the issues with BM
- Why did RBM come into the picture?
- Step-by-step implementation of RBM
- Distribution of Boltzmann Machine
- Understanding Autoencoders
- Architecture of Autoencoders
- Brief on types of Autoencoders
- Applications of Autoencoders

Module 10: Generative Adversarial Network (GAN)

Topics:

- Which Face is Fake?
- Understanding GAN
- What is Generative Adversarial Network?
- How does GAN work?
- Step by step Generative Adversarial Network implementation
- Types of GAN
- Recent Advances: GAN

Module 11: Emotion and Gender Detection (Self-paced)

Topics:

- Where do we use Emotion and Gender Detection?
- How does it work?
- Emotion Detection architecture
- Face/Emotion detection using Haar Cascade
- Implementation on Colab

Module 12: Introduction to RNN and GRU (Self-paced)

Topics:

- Issues with Feed Forward Network
- Recurrent Neural Network (RNN)
- Architecture of RNN
- Calculation in RNN
- Backpropagation and Loss calculation
- Applications of RNN

- Vanishing Gradient
- Exploding Gradient
- What is GRU?
- Components of GRU
- Update gate
- Reset gate
- Current memory content
- Final memory at current time step

Module 13: LSTM (Self-paced)

Topics:

- What is LSTM?
- Structure of LSTM
- Forget Gate
- Input Gate
- Output Gate
- LSTM architecture
- Types of Sequence-Based Model
- Sequence Prediction
- Sequence Classification
- Sequence Generation
- Types of LSTM
- Vanilla LSTM
- Stacked LSTM
- CNN LSTM

- Bidirectional LSTM
- How to increase the efficiency of the model?
- Backpropagation through time
- Workflow of BPTT

Module 14: Auto Image Captioning Using CNN LSTM (Self-paced)

Topics:

- Auto Image Captioning
- COCO dataset
- Pre-trained model
- Inception V3 model
- The architecture of Inception V3
- Modify the last layer of a pre-trained model
- Freeze model
- CNN for image processing
- LSTM or text processing

Module 15: Developing a Criminal Identification and Detection Application Using OpenCV (Self-paced)

Topics:

- Why is OpenCV used?
- What is OpenCV
- Applications
- Demo: Build a Criminal Identification and Detection App

Module 16: TensorFlow for Deployment (Self-paced)

Topics:

- Use Case: Amazon's Virtual Try-Out Room
- Why Deploy models?
- Model Deployment: Intuit AI models
- Model Deployment: Instagram's Image Classification Models
- What is Model Deployment
- Types of Model Deployment Techniques
- TensorFlow Serving
- Browser-based Models
- What is TensorFlow Serving?
- What are Servable?
- Demo: Deploy the Model in Practice using TensorFlow Serving
- Introduction to Browser based Models
- Demo: Deploy a Deep Learning Model in your Browser

Module 17: Text Classification-II (Self-paced)

Topics:

- Converting text to features and labels
- Multinomial Naive Bayes Classifier
- Leveraging Confusion Matrix

Module 18: In Class Project (Self-paced)

Topics:

- Sentiment Classification on Movie Rating Dataset

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Prompt Engineering with LLM Course

Course Curriculum

Course Outline

Module 1: Generative AI Essentials

Topics:

- What is Generative AI?
- Generative AI Evolution
- Differentiating Generative AI from Discriminative AI
- Types of Generative AI
- Generative AI Core Concepts
- LLM Modelling Steps
- Transformer Models: BERT, GPT, T5
- Training Process of an LLM Model like ChatGPT
- The Generative AI development lifecycle
- Overview of Proprietary and Open Source LLMs
- Overview of Popular Generative AI Tools and Platforms
- Ethical considerations in Generative AI
- Bias in Generative AI outputs
- Safety and Responsible AI practices

Module 2: Prompt Engineering Essentials

Topics:

- Introduction to Prompt Engineering
- Structure and Elements of Prompts
- Zero-shot Prompting
- One-shot Prompting
- Few-shot Prompting
- Instruction Tuning Basics
- Prompt Testing and Evaluation
- Prompt Pitfalls and Debugging
- Prompts for Different NLP Tasks (Q&A, Summarization, Classification)
- Understanding Model Behavior with Prompt Variation

Module 3: Advanced Prompting Techniques

Topics:

- Chain-of-Thought (CoT) Prompting
- Tree-of-Thought (ToT) Prompting
- Self-Consistency Prompting
- Generated Knowledge Prompting
- Step-back Prompting
- Least-to-Most Prompting
- Adversarial Prompting & Prompt Injection
- Defenses against Prompt Injection
- Auto-prompting techniques
- Semantic Search for Prompt Selection
- Context Window Optimization strategies
- Dealing with ambiguous prompts
- Human-in-the-loop prompt refinement
- Prompt testing and validation methodologies

Module 4: Working with LLM APIs and SDKs

Topics:

- LLM Landscape: OpenAI, Anthropic, Gemini, Mistral API, LLaMA
- Core Capabilities: Summarization, Q&A, Translation, Code Generation
- Key Configuration Parameters: Temperature, Top_P, Max_Tokens, Stop Sequences
- Inference Techniques: Sampling, Beam Search, Greedy Decoding
- Efficient Use of Tokens and Context Window
- Calling Tools
- Functions With LLMs
- Deployment Considerations for Open-Source LLMs (Local, Cloud, Fine-Tuning)
- Rate Limits, Retries, Logging
- Understanding Cost, Latency, and Performance and Calculating via Code

Module 5: Building LLM Apps with LangChain and LlamaIndex

Topics:

- LangChain Overview
- LlamaIndex Overview
- Building With LangChain: Chains, Agents, Tools, Memory
- Understanding LangChain Expression Language (LCEL)
- Working With LlamaIndex: Document Ingestion, Index Building, Querying
- Integrating LangChain and LlamaIndex: Common Patterns
- Using External APIs and Tools as Agents
- Enhancing Reliability: Caching, Retries, Observability
- Debugging and Troubleshooting LLM Applications

Module 6: Developing RAG Systems

Topics:

- What is RAG and Why is it Important?
- Addressing LLM limitations with RAG
- The RAG Architecture: Retriever, Augmenter, Generator
- DocumentLoaders
- Embedding Models in RAG
- VectorStores as Retrievers in LangChain and in Llamaindex
- RetrievalQA Chain and its variants
- Customizing Prompts for RAG
- Advanced RAG Techniques: Re-ranking retrieved documents
- Query Transformations
- Hybrid Search
- Parent Document Retriever and Self-Querying Retriever
- Evaluating RAG Systems: Retrieval Metrics

Module 7: Vector Databases and Embedding in Practice

Topics:

- What are Text Embeddings?
- How LLMs and Embedding Models generate embeddings
- Semantic Similarity and Vector Space
- Introduction to Vector Databases
- Key features: Indexing, Metadata Filtering, CRUD operations
- ChromaDB: Local setup, Collections, Document and Embedding Storage
- Pinecone: Cloud-native, Indexes, Namespaces, and Metadata filtering
- Weaviate: Open-source, Vector-native, and Graph Capabilities
- Other Vector Databases: FAISS, Milvus, Qdrant
- Similarity Search Algorithms
- Building Search Pipelines End to End with an Example Code

- Vector Indexing techniques
- Data Modeling in Vector Databases
- Updating and Deleting Vectors
- Choosing the Right Embedding Model
- Evaluation of Retrieval quality from Vector Databases

Module 8: Building and Deploying End-to-End GenAI Applications

Topics:

- Architecting LLM-Powered Applications
- Types of GenAI Apps: Chatbots, Copilots, Semantic Search / RAG Engines
- Design Patterns: In-Context Learning vs RAG vs Tool-Use Agents
- Stateless vs Stateful Agents
- Modular Components: Embeddings, VectorDB, LLM, UI
- Key Architectural Considerations: Latency, Cost, Privacy, Memory, Scalability
- Building GenAI APIs with FastAPI
- RESTful Endpoint Structure
- Async vs Sync, CORS, Rate Limiting, API Security
- Orchestration Tools: LangServe, Chainlit, Flowise
- Cloud Deployment: GCP
- Containerization and Environment Setup

Module 9: Evaluating GenAI Applications and Enterprise Use Cases

Topics:

- Evaluation Metrics: Faithfulness, Factuality, RAGAs, BLEU, ROUGE, MRR
- Human and Automated Evaluation Loops
- Logging, Tracing, and Observability Tools: LangSmith, PromptLayer, Arize
- Prompt and Output Versioning
- Chain Tracing and Failure Monitoring
- Real-Time Feedback Collection
- GenAI Use Cases: Customer Support, Legal, Healthcare, Retail, Finance
- Contract Summarization
- Legal Q&A Bots
- Invoice Parsing with RAG
- Product Search Applications
- Domain Adaptation Strategies

Module 10: Multimodal LLMs and Beyond

Topics:

- Introduction to Multimodal LLMs (GPT-4V, LLaVA, Gemini)
- How multimodal models process different data types
- Use Cases: Image Captioning, Visual Q&A, Video Summarization
- Working with Vision-Language Models (VLMs): Image inputs, text outputs
- Image Loaders in LangChain/LlamaIndex
- Simple visual Q&A applications
- Audio Processing with LLMs: Speech-to-Text (ASR)
- Text-to-Speech (TTS) integration
- Video understanding with LLMs
- Challenges in Multimodal AI

- Ethical Considerations in Multimodal AI
- Agent Frameworks (AutoGPT, CrewAI, LangGraph, MetaGPT)
- ReAct and Plan-and-Act agent strategies
- Future Directions

Module 11: Bonus Module Fine-tuning & PEFT (Self-paced)

Topics:

- Introduction to LLMOps: Managing the ML Lifecycle for Large Language Models
- Prompt Versioning and Experiment Tracking
- Model Monitoring: Latency, Drift, Failures, and Groundedness
- Safety and Reliability Evaluation: Toxicity, Hallucination, Bias Detection
- Evaluation Frameworks Overview: RAGAS, TruLens, LangSmith
- RAG Evaluation with RAGAS: Precision, Recall, Faithfulness
- Observability in Production: Logs, Metrics, Tracing LLM Workflows
- Using LangSmith for Chain/Agent Tracing, Feedback, and Dataset Runs
- Integrating TruLens for Human + Automated Feedback Collection
- Inference Cost Estimation and Optimization Techniques
- Budgeting Strategies for Token Usage, API Calls, and Resource Allocation
- Production Best Practices: Deploying With Guardrails and Evaluation Loops

Module 12: Bonus Module: LLMOps and Evaluation (Self-paced)

Topics:

- Introduction to Model Finetuning: When Prompt Engineering Isn't Enough
- Overview of Parameter-Efficient Finetuning (PEFT)
- LoRA (Low-Rank Adaptation): Concept and Architecture
- QLoRA: Quantized LoRA for Finetuning Large Models Efficiently
- Adapter Tuning: Modular and Lightweight Finetuning
- Comparing Finetuning Techniques: Full vs. LoRA vs. QLoRA vs. Adapters
- Selecting the Right Finetuning Strategy Based on Task and Resources
- Introduction to Hugging Face Transformers and PEFT Library
- Setting Up a Finetuning Environment with Google Colab
- Preparing Custom Datasets for Instruction Tuning and Task Adaptation
- Monitoring Training Metrics and Evaluating Fine-tuned Models
- Use Cases: Domain Adaptation, Instruction Tuning, Sentiment Customization

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Agentic AI Training Course - Master AI Agents

Course Curriculum

Course Outline

Module 1: Agentic AI Essentials

Topics:

- Agentic AI Introduction
- AI Agents vs. Agentic AI
- Comparison: Agentic AI, Generative AI, and Traditional AI
- Agentic AI Building Blocks
- Autonomous Agents
- Human in the Loops Systems
- Single and Multi Agent AI Systems
- Agentic AI Frameworks Overview
- Ethical and Responsible AI
- Agentic AI Best Practices
- AI Implementation Success Stories: Case Studies

Module 2: Agentic AI: Architectures and Design Patterns

Topics:

- Agentic AI Introduction
- AI Agents vs. Agentic AI
- Comparison: Agentic AI, Generative AI, and Traditional AI
- Agentic AI Building Blocks

- Autonomous Agents
- Human in the Loops Systems
- Single and Multi Agent AI Systems
- Agentic AI Frameworks Overview
- Ethical and Responsible AI
- Agentic AI Best Practices
- AI Implementation Success Stories: Case Studies

Module 3: Working with LangChain and LCEL

Topics:

- Components and Modules
- Data Ingestion and Document Loaders
- Text Splitting
- Embeddings
- Integration with Vector Databases
- Introduction to Langchain Expression Language (LCEL)
- Runnables
- Chains
- Building and Deploying with LCEL
- Deployment with Langserve

Module 4: Building AI Agents with LangGraph

Topics:

- Introduction to LangGraph
- State and Memory
- State Schema
- State Reducer
- Multiple Schemas
- Trim and Filter Messages
- Memory and External Memory
- UX and Human-in-the-Loop (HITL)
- Building Agent with LangGraph

- Long Term Memory
- Short vs. Long Term Memory
- Memory Schema
- Deployment

Module 5: Implementing Agentic RAG

Topics:

- What is Agentic RAG?
- Agentic RAG vs. Traditional RAG
- Agentic RAG Architecture and Components
- Understanding Adaptive RAG
- Variants of Agentic RAG
- Applications of Agentic RAG
- Agentic RAG with Llamaindex
- Agentic RAG with Cohere

Module 6: Developing AI Agents with Phidata

Topics:

- Agents
- Models
- Tools
- Knowledge
- Chunking
- Vector DB
- Storage
- Embeddings
- Workflows
- Developing Agents with Phidata

Module 7: Multi Agent Systems with LangGraph and CrewAI

Topics:

- Multi Agent Systems
- Multi Agent Workflows
- Collaborative Multi Agents
- Multi Agent Designs
- Multi Agent Workflow with LangGraph
- CrewAI Introduction
- CrewAI Components
- Setting up CrewAI environment
- Building Agents with CrewAI

Module 8: Advanced Agent Development with Autogen

Topics:

- Autogen Introduction
- Salient Features
- Roles and Conversations
- Chat Terminations
- Human-in-the-Loop
- Code Executor
- Tool Use
- Conversation Patterns
- Developing Autogen-powered Agents
- Deployment and Monitoring

Module 9: AI Agent Observability and AgentOPs

Topics:

- AI Agent Observability and AgentOPs
- Langfuse Dashboard
- Tracing
- Evaluation
- Managing Prompts
- Experimentation
- AI Observability with Langsmith
- Setting up Langsmith
- Managing Workflows with Langsmith
- AgentOps Practical Implementation

Module 10: Building AI Agents with No/Low- Code Tools

Topics:

- Introduction to No-Code/Low-Code AI
- Benefits and Challenges of No-Code AI Development
- Key Components of No-Code AI Platforms
- Building AI Workflows Without Coding
- Designing AI Agents with Drag-and-Drop Interfaces
- Integrating No-Code AI with Existing Systems
- Customizing and Fine-Tuning AI Solutions
- Optimizing Performance and Efficiency in No-Code AI
- Security and Compliance Considerations in No-Code AI
- Best Practices for Deploying No-Code AI Solutions
- Real-World Use Cases and Applications of No-Code AI
- Scaling and Future Trends in No-Code AI

Module 11: Bonus Module: Generative and Agentic AI on Cloud (Self-paced)

Topics:

- Deploying Generative AI Models with Amazon Bedrock
- Implementing Retrieval-Augmented Generation (RAG)
- Building and Managing AI Agents
- Serverless AI Agent Deployment
- Observability and Monitoring AI Agents
- Developing Generative AI Applications with Azure OpenAI Service
- Implementing Agentic AI Workflows with Azure Machine Learning (AML)
- Fine-Tuning Large Language Models (LLMs) on Azure
- Building AI Agents on Azure
- AI Model Deployment and Governance on Azure
- Working with Vertex AI Agent Builder
- Building No Code Conversational AI Agent