KRISHNAIK ACADEMY

Ultimate Data Science & GenAI Bootcamp

PYTHON + STATS

MACHINE LEARNING

DEEP LEARNING

NATURAL LANGUAGE PROCESSING

COMPUTER VISION

RETRIEVAL AUGUMENT GENERATION

GENERATIVE AI

VECTOR DB

This course is designed for aspiring data scientists, machine learning enthusiasts, and professionals looking to build expertise in Python programming, data analysis, machine learning, and deep learning. Whether you are just starting or have some experience, this comprehensive course will equip you with the skills needed to work with real-world datasets, apply machine learning algorithms, and deploy AI solutions. By the end of the course, you'll have a solid foundation in AI, a portfolio of end-to-end projects, and the confidence to tackle complex challenges in data science and AI.

Learning Objectives

- Master Python Programming: Understand Python fundamentals, including data types, control structures, and object-oriented programming, to write efficient and reusable code.
- Handle Data with Pandas and NumPy: Acquire skills to manipulate, clean, and preprocess large datasets using Pandas and NumPy for data analysis tasks.
- Visualize Data: Create compelling data visualizations using libraries such as Matplotlib, Seaborn, and Plotly to present insights effectively.
- Understand SQL & NoSQL: Gain expertise in both relational (SQL) and non-relational (NoSQL) databases, including MongoDB, for storing, querying, and managing data.
- Grasp Statistics and Probability: Understand the core concepts of statistics, probability, and hypothesis testing, applying them to data analysis and machine learning.
- Master Machine Learning Techniques: Learn key machine learning algorithms, including supervised, unsupervised, and ensemble methods, and apply them to real-world problems.
- Dive into Deep Learning: Develop a strong understanding of neural networks, CNNs, RNNs, and transformers, with hands-on implementation for advanced AI tasks.
- Explore Generative AI & Vector Databases: Learn the concepts and applications of generative models, vector databases, and retrieval-augmented generation to handle complex AI systems.
- Build Real-World Projects: Implement end-to-end machine learning and AI projects, from data preprocessing to model deployment, integrating concepts from multiple modules.

Course Information

Prerequisites

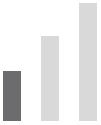
No prerequisites are required for this course. The curriculum covers everything from the basics of Python programming, statistics, and machine learning to advanced topics in deep learning, NLP, and generative AI. Whether you're a beginner or have some prior experience, the course will ensure you gain the skills needed to succeed.

The course is designed to be completed over a duration of approximately 7 to 8 months, providing an in-depth exploration from Python basics to GenAI, with plenty of time for practical implementation and real-world applications.

Estimated Time

8 months 6hrs/week*

Required Skill Level



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Course Instructors

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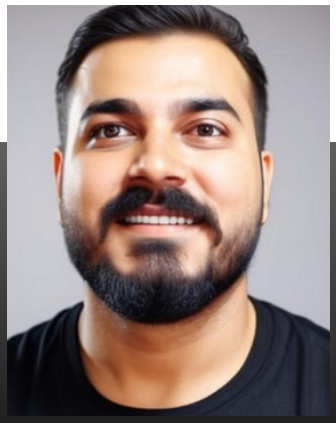

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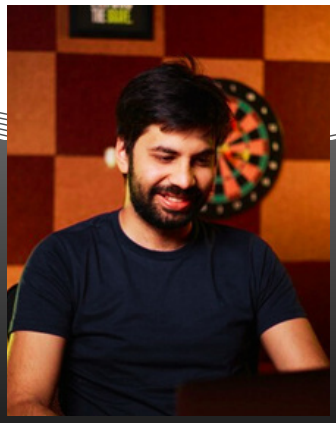

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Module 1

Python Foundations

In this module, you'll get a solid introduction to Python, covering essential programming concepts such as variables, data types, operators, and control flow. You'll learn how to manipulate strings, lists, dictionaries, and other basic data structures. The module will also guide you through writing simple functions and using loops and conditionals effectively. By the end, you'll have a strong understanding of Python syntax, preparing you to tackle more complex programming challenges and form a foundation for learning advanced concepts.

Topics	
Introduction to Python	Comparison with other programming languages, Python objects: Numbers, Booleans, and Strings
Data Structures & Operations	Container objects and mutability, Operators, Operator precedence and associativity
Control Flow	Conditional statements, Loops, break and continue statements
String Manipulation	Basics of string objects, Inbuilt string methods, Splitting and joining strings, String formatting functions
Lists & Collections	List methods, list comprehension, Lists as stacks and queues, Tuples, sets, and dictionaries, Dictionary comprehensions and view objects

Module 1

Python Foundations

Topics	
Functions & Iterators	Function basics and parameter passing, Iterators and generator functions, Lambda functions, map(), reduce(), filter()

Module 2

Advanced Python Programming

This module takes your Python skills further by diving into object-oriented programming (OOP) concepts like classes, inheritance, and polymorphism. You'll also explore more advanced topics such as decorators, lambda functions, iterators, and generator functions. Additionally, we cover exception handling, file operations, and working with modules and libraries. By the end, you will be comfortable building more sophisticated Python applications and writing efficient, reusable code.

Topics	
Object-Oriented Programming (OOP)	OOP basics and class creation, Inheritance, Polymorphism, Encapsulation, and Abstraction, Decorators, class methods, and static methods, Special (Magic/Dunder) methods, Property decorators: Getters, setters, and delete methods
File Handling & Logging	Reading and writing files, Buffered read and write operations, more file methods, Logging and debugging
Modules & Exception Handling	Importing modules and using them effectively, Exception handling
Concurrency & Parallelism	Introduction to multithreading, Multiprocessing for performance optimization

Module 3

Mastering Data Handling with Pandas

In this module, you will master the core aspects of data manipulation using Pandas. You'll learn how to work with Series, DataFrames, and Panels, as well as perform data selection, filtering, and sorting. The module covers critical tasks like handling missing data, reindexing, and applying statistical functions to datasets. You'll also gain hands-on experience with data visualization and advanced indexing techniques, empowering you to efficiently analyze and manipulate complex datasets.

Topics	
Data Structures & Fundamentals	Series, DataFrame, Panel, Basic Functionality, Indexing & Selecting, Re-indexing, Iteration
Data Operations & Transformations	Sorting, Working with Text Data, Options & Customization, Categorical Data, Date Functionality, Time Delta
Data Analysis & Statistical Functions	Data Statistical Functions, Window Functions
Reading, Writing & Visualization	Reading Data from Different File Systems, Visualization, Tools

Module 4

Mastering NumPy

This module introduces you to NumPy, a key library for numerical computing in Python. You'll learn how to create and manipulate NumPy arrays, perform advanced indexing, and understand broadcasting. The module covers essential mathematical and statistical functions, including array manipulations, binary operations, and vectorized operations. By the end, you'll have the skills to efficiently perform complex numerical computations and leverage NumPy for machine learning and deep learning applications.

Topics	
NumPy Basics & Array Creation	NdArray Object, Data Types, Array Attributes, Array Creation Routines, Array from Existing Data, Data Array from Numerical Ranges
Indexing, Slicing & Advanced Indexing	Indexing & Slicing, Advanced Indexing
Array Operations & Manipulation	Array Manipulation, Binary Operators, String Functions, Arithmetic Operations, Mathematical Functions
Mathematical & Statistical Analysis	Statistical Functions, Sort, Search & Counting Functions, Matrix Library, Linear Algebra
Advanced Concepts	Broadcasting, Iterating Over Array, Byte Swapping, Copies & Views

Module 5

Data Visualization with Python

In this module, you'll learn how to visualize data effectively using Python's popular libraries, Matplotlib, Seaborn, and Plotly. You'll cover essential plot types like line charts, bar graphs, and scatter plots, and learn how to customize these visualizations to highlight key insights. Additionally, the module teaches you how to visualize statistical data, correlations, and distributions, helping you communicate data-driven findings in a visually compelling way.

Topics	
Introduction to Data Visualization	Overview of Data Visualization, Principles of Good Visualization
Matplotlib	Introduction to Matplotlib, Creating Basic Plots (Line, Bar, Scatter), Customizing Axes, Titles, Legends, and Labels, Working with Subplots, Saving and Exporting Figures
Seaborn	Introduction to Seaborn, Visualizing Distributions, Relationship Plots (Pairplots, Heatmaps), Categorical Data Visualization, Advanced Plot Customizations
Plotly	Introduction to Plotly, Creating Interactive Plots (Line, Bar, Scatter), Customizing Plots, Dashboards and Interactive Layouts, Plotly Express

Module 6

Advanced SQL and Database Management

This module dives into advanced SQL techniques, including complex queries, joins, and indexing for efficient data retrieval. You'll learn how to implement stored procedures, triggers, and functions, and explore the use of window functions and partitions. The module covers key database design concepts like primary and foreign keys and normalization. By the end, you'll be proficient in managing large-scale databases and optimizing SQL queries for performance.

Topics	
Introduction to SQL	Introduction to SQL, SQL Queries: SELECT, INSERT, UPDATE, DELETE
SQL Functions and Procedures	SQL Functions (Aggregate, Scalar), Stored Procedures, User-defined Functions (UDFs), Function and Procedure Syntax
Database Constraints	Primary and Foreign Keys, Data Integrity, Referential Integrity
Advanced SQL Techniques	Window Functions, Partitioning, CTE (Common Table Expressions), Indexing
SQL Joins and Unions	Inner Join, Left Join, Right Join, Full Outer Join, Cross Join, Union
Triggers and Case Statements	Triggers (Before, After), CASE Statements, Conditional Logic

Module 6

Advanced SQL and Database Management

Topics	
Normalization and Pivoting	Normalization Forms (1NF, 2NF, 3NF), Pivot Tables, Data Aggregation

Module 7

Introduction to NoSQL with MongoDB

In this module, you'll explore the world of NoSQL databases with MongoDB. You'll learn how to create and manage databases, collections, and documents, and perform CRUD operations. The module covers querying, sorting, and indexing, providing a comprehensive understanding of MongoDB's flexible data model. By the end, you'll be able to efficiently work with NoSQL databases, particularly for use cases that involve unstructured or semi-structured data.

Topics	
Getting Started with MongoDB	MongoDB Introduction, Setting up MongoDB, MongoDB Shell Commands
Database and Collection Management	MongoDB Create Database, MongoDB Create Collection
CRUD Operations	MongoDB Insert, MongoDB Find, MongoDB Update, MongoDB Delete
Querying MongoDB	MongoDB Query, MongoDB Sort, MongoDB Limit
Managing Collections	MongoDB Drop Collection, MongoDB Delete (Specific)

Module 8

Foundations of Statistics and Probability

This module provides a foundation in statistics and probability, covering essential terms, concepts, and methods. You'll learn about different types of data, levels of measurement, and key statistical measures like mean, median, variance, and standard deviation. The module introduces random variables, probability distributions, and various types of probability functions, giving you a strong base to analyze and interpret data from a statistical perspective.

Topics	
Introduction to Statistics	Introduction to Basic Statistics Terms, Types of Statistics, Types of Data, Levels of Measurement, Measures of Central Tendency, Measures of Dispersion
Exploring Random Variables and Probability	Random Variables, Set Theory, Skewness, Covariance and Correlation, Probability Density/Distribution Function
Distributions and Their Applications	Types of Probability Distributions, Binomial Distribution, Poisson Distribution, Normal Distribution (Gaussian Distribution), Probability Density Function and Mass Function, Cumulative Density Function, Examples of Normal Distribution, Bernoulli Distribution, Uniform Distribution
Statistical Inference	Z-Statistics, Central Limit Theorem, Estimation, Hypothesis Testing

Module 9

Advanced Statistical Inference and Hypothesis Testing

In this module, you'll delve deeper into statistical inference techniques, including hypothesis testing, confidence intervals, and the types of errors in statistical tests. You'll explore advanced concepts like P-values, T-tests, and Chi-square tests, learning how to interpret results in the context of real-world data. By the end, you'll be equipped to conduct sophisticated statistical analysis and make informed decisions based on data-driven evidence.

Topics	
Hypothesis Testing and Errors	Hypothesis Testing Mechanism, Type 1 & Type 2 Error, T-Tests vs. Z-Tests: Overview, When to Use a T-Test vs. Z-Test
Statistical Distributions and Tests	T-Stats, Student T Distribution, Chi-Square Test, Chi-Square Distribution Using Python, Chi-Square for Goodness of Fit Test
Bayesian Statistics and Confidence Intervals	Bayes Statistics (Bayes Theorem), Confidence Interval (CI), Confidence Intervals and the Margin of Error, Interpreting Confidence Levels and Confidence Intervals
Statistical Significance and Interpretation	P-Value, T-Stats vs. Z-Stats: Overview

Module 10

Feature Engineering and Data Preprocessing

This module covers essential techniques for preparing and transforming data before applying machine learning models. You'll learn how to handle missing values, deal with imbalanced data, and scale or encode features. The module also explores methods for handling outliers, feature selection (including forward/backward elimination), and dimensionality reduction techniques. By the end, you'll be proficient in preparing high-quality datasets that are ready for modeling.

Topics	
Handling Missing and Imbalanced Data	Handling Missing Data, Handling Imbalanced Data
Outliers and Scaling	Handling Outliers, Feature Scaling
Data Transformation and Encoding	Data Encoding
Feature Selection Techniques	Backward Elimination, Forward Elimination, Recursive Feature Elimination
Correlation and Multicollinearity	Covariance and Correlation, VIF

Module 11

Exploratory Data Analysis (EDA) for Detailed Insights

In this module, you'll learn how to perform Exploratory Data Analysis (EDA) to uncover patterns, trends, and relationships in your data. You'll master techniques for visualizing distributions, identifying correlations, and detecting anomalies. The module emphasizes the importance of summary statistics, data cleaning, and feature engineering. By the end, you'll be able to extract meaningful insights from raw data and prepare it for further analysis or modeling.

Topics	
Trend Analysis and Segmentation	Analyzing Bike Sharing Trends, Customer Segmentation and Effective Cross-Selling
Sentiment and Quality Analysis	Analyzing Movie Reviews Sentiment, Analyzing Wine Types and Quality
Recommendation and Forecasting	Analyzing Music Trends and Recommendations, Forecasting Stock and Commodity Prices

Module 12

Machine Learning Foundations and Techniques

This module provides a comprehensive introduction to machine learning, covering key algorithms and techniques. You'll learn the differences between supervised and unsupervised learning, as well as the core concepts of regression, classification, and clustering. The module introduces model evaluation metrics like accuracy, precision, recall, and F1-score, giving you the foundation to understand and implement machine learning models in real-world scenarios.

Topics	
Introduction to Machine Learning	AI vs ML vs DL vs DS, Types of ML Techniques, Supervised vs Unsupervised vs Semi-Supervised vs Reinforcement Learning
Linear Regression	Simple Linear Regression, Multiple Linear Regression, MSE, MAE, RMSE, R-squared, Adjusted R-squared, Linear Regression with OLS
Regularization Techniques	Ridge Regression, Lasso Regression, ElasticNet
Logistic Regression	Logistic Regression, Performance Metrics: Confusion Matrix, Accuracy, Precision, Recall, F-Beta Score, ROC-AUC Curve
Support Vector Machines (SVM)	Support Vector Classifiers, Support Vector Regressor, Support Vector Kernels

Module 12

Machine Learning Foundations and Techniques

Topics	
Bayes Theorem and Naive Bayes	Introduction to Bayes Theorem, Naive Bayes Classifier
K-Nearest Neighbors (KNN)	KNN Classifier, KNN Regressor
Decision Trees	Decision Tree Classifier, Decision Tree Regressor
Ensemble Methods	Bagging, Boosting, Random Forest Classifier, Random Forest Regressor, Out-of-Bag Evaluation, XGBoost Classifier, XGBoost Regressor
Support Vector Machines (SVM)	Support Vector Classifiers, Support Vector Regressor, Support Vector Kernels
Introduction to Unsupervised Learning	Overview of Unsupervised Learning, Use Cases, and Applications
Clustering Techniques	KMeans Clustering, Hierarchical Clustering, DBSCAN Clustering

Module 12

Machine Learning Foundations and Techniques

Topics	
Clustering Evaluation	Silhouette Coefficient, Evaluation Metrics for Clustering Algorithms

Module 13

Natural Language Processing for Machine Learning

In this module, you'll explore the basics of Natural Language Processing (NLP) for machine learning applications. Topics include text preprocessing (stemming, lemmatization), tokenization, and POS tagging. You'll also learn how to implement key NLP techniques like Named Entity Recognition, word embeddings (Word2Vec), and TF-IDF. By the end of this module, you'll have the skills to work with textual data and apply machine learning models to solve NLP tasks.

Topics	
Introduction to NLP for ML	Roadmap to Learn NLP for ML, Practical Use Cases of NLP in Machine Learning
Text Preprocessing	Tokenization, Basic Terminology, Stemming, Lemmatization, Stopwords
Text Representation	One-Hot Encoding, N-Gram, Bag of Words (BoW), TF-IDF Intuition
Part of Speech (POS) Tagging	POS Tagging using NLTK, Understanding POS Tags
Named Entity Recognition (NER)	Introduction to NER, Implementing NER with NLTK
Word Embeddings	Introduction to Word Embeddings, Benefits of Using Word Embeddings in ML

Module 13

Natural Language Processing for Machine Learning

Topics	
Word2Vec	Intuition behind Word2Vec, Training Word2Vec Models, Skip-gram and CBOW Architectures

Module 14

Introduction to Deep Learning and Neural Networks

This module introduces you to deep learning and the fundamental concepts behind artificial neural networks (ANNs). You'll learn about the architecture and workings of a neural network, including activation functions, loss functions, and optimization techniques. The module also covers backpropagation and the vanishing gradient problem. By the end, you'll be equipped to build and train basic neural networks and understand how deep learning models are used in AI applications.

Topics	
Introduction to Deep Learning	Why Deep Learning Is Becoming Popular?
Perceptron Intuition	Understanding the Perceptron Model, Basic Working Principle
Artificial Neural Network (ANN) Working	Structure of ANN, Neurons, Layers, and How Data Passes Through the Network
Backpropagation in ANN	The Backpropagation Process, Gradient Descent, and Training Networks
Vanishing Gradient Problem	Explanation, Causes, and Solutions
Exploding Gradient Problem	Causes and Mitigation Techniques

Module 14

Introduction to Deep Learning and Neural Networks

Topics	
Activation Functions	Different Types of Activation Functions (Sigmoid, ReLU, Tanh, etc.)
Loss Functions	Common Loss Functions for Regression and Classification
Optimizers	Types of Optimizers (SGD, Adam, RMSprop, etc.)
Weight Initialization Techniques	Methods for Initializing Weights (Xavier, He Initialization)
Dropout Layer	Concept of Dropout and its Role in Regularization
Batch Normalization	How Batch Normalization Works and Why It's Important
Keras Framework Fundamentals	Introduction to Keras, Building Models with Keras, Basic Operations
PyTorch Framework Fundamentals	Introduction to PyTorch, Tensor Operations, Building Models with PyTorch

Module 15

Deep Learning : Convolutional Neural Networks (CNN) Fundamentals and Applications

In this module, you'll dive into Convolutional Neural Networks (CNNs), a cornerstone of deep learning in computer vision. You'll learn the architecture of CNNs, including convolution layers, pooling layers, and fully connected layers. The module covers practical applications like image classification, object detection, and segmentation using CNNs. By the end, you'll have hands-on experience building and training CNNs for real-world vision tasks.

Topics	
Introduction to CNN	CNN Fundamentals, What is Convolutional Neural Network, CNN Architecture Overview
Explaining CNN in Detail	CNN Explained in Detail, Understanding Tensor Space, CNN Explainer
CNN-Based Architectures	Various CNN Architectures, Deep Dive into ResNet and its Variants
Training CNN from Scratch	Steps to Train CNNs, Hyperparameter Tuning, Overfitting, and Underfitting
Building Web Apps for CNN	Deploying CNN Models into Web Applications, Using Flask or Django, Serving Models with TensorFlow.js
Exploding Gradient Problem	Causes and Mitigation Techniques

Module 15

Deep Learning : Convolutional Neural Networks (CNN) Fundamentals and Applications

Topics	
Object Detection Using YOLO	Introduction to YOLO (You Only Look Once), YOLO Architecture, Training and Deployment
Object Detection Using Detectron2	Understanding Detectron2 for Object Detection, Using Pre-trained Models and Fine-tuning
Segmentation Using YOLO	Semantic and Instance Segmentation with YOLO, Implementing YOLO for Segmentation Tasks
Segmentation Using Detectron2	Using Detectron2 for Semantic and Instance Segmentation, Implementing Pre-trained Models for Image Segmentation

Module 16

Deep Learning : Recurrent Neural Networks (RNN) and Transformer Models

This module covers Recurrent Neural Networks (RNNs) and Transformer models, focusing on their applications in sequential data processing. You'll learn how RNNs and LSTMs are used for time series analysis, speech recognition, and language modeling. The module also explores the Transformer architecture, which powers models like BERT and GPT. By the end, you'll have a strong grasp of these advanced neural network architectures and their applications in NLP and beyond.

Topics	
Introduction to RNNs	Recurrent Neural Networks (RNN) Fundamentals, How RNNs Work, Applications of RNN
Long Short Term Memory (LSTM)	LSTM Cells, How LSTM Solves Vanishing Gradient Problem, LSTM for Sequence Modeling, Training and Tuning LSTM
Gated Recurrent Units (GRU)	GRU vs LSTM, Understanding GRU Architecture, Advantages of GRU in Sequence Modeling
Encoders and Decoders	Encoder-Decoder Architecture, Applications in Machine Translation, Sequence-to-Sequence Models
Attention Mechanism	What is Attention, Types of Attention Mechanisms, Soft and Hard Attention

Module 16

Deep Learning : Recurrent Neural Networks (RNN) and Transformer Models

Topics	
Attention Neural Networks	Self-Attention in Neural Networks, Applying Attention to RNNs, Transformer vs RNN
BERT Model	BERT (Bidirectional Encoder Representations from Transformers), Pre-training and Fine-tuning BERT, Applications of BERT in NLP
GPT-2 Model	GPT-2 (Generative Pre-trained Transformer 2), Autoregressive Language Modeling, Fine-tuning GPT-2 for Text Generation

Module 17

Introduction to Generative AI

In this module, you'll explore the world of Generative AI, understanding how these models generate new data based on patterns learned from existing data. You'll compare generative and discriminative models and discover their applications in text, image, and audio generation. The module also covers advancements in generative models, including GANs and VAEs. By the end, you'll be familiar with key concepts and applications of Generative AI.

Topics	
Overview of Generative AI	What is Generative AI?, Overview of Generative vs. Discriminative Models, Significance and Applications of Generative AI
Understanding Generative Models	How Generative Models Work, Key Types of Generative Models (e.g., GANs, VAEs), Advantages of Generative Models
Generative AI vs. Discriminative Models	Key Differences, Use Cases, Performance Comparison
Recent Advancements and Research	Latest Breakthroughs in Generative AI, State-of-the-Art Models and Techniques, Future Trends in Generative AI
Key Applications of Generative Models	Applications in Art and Creativity (e.g., Image Synthesis), Healthcare (e.g., Drug Discovery), Natural Language Processing, and More

Module 18

Introduction to Vector Databases

This module introduces you to the concept of vector databases, which are designed to store and retrieve high-dimensional data vectors. You'll learn how vector databases differ from traditional SQL and NoSQL databases, and explore their use cases, including similarity searches and machine learning applications. The module also covers popular vector databases like Faiss, Pinecone, and ChromaDB. By the end, you'll be equipped to work with vector databases for handling complex data queries.

Topics	
Overview of Vector Databases	What are Vector Databases?, Key Concepts and Use Cases of Vector Databases, Difference Between Vector Databases and Traditional Databases
Comparison with SQL and NoSQL Databases	SQL vs. NoSQL vs. Vector Databases: Key Differences, Use Cases, and Performance Considerations
Capabilities of Vector Databases	Handling High-Dimensional Data, Fast Similarity Search, Efficient Storage and Querying, Real-Time Processing
Data Storage and Architecture of Vector Databases	Structure of Vector Data, Indexing Techniques, Optimizations for Vector Search, Performance Considerations
Types of Vector Databases	In-Memory Vector Databases: Benefits and Limitations, Local Disk-based Vector Databases, Cloud-Based Vector Databases and Their Use Cases

Module 18

Introduction to Vector Databases

Topics	
Exploring Popular Vector Databases	Chroma DB, Faiss, Quadrant, Pinecone, LanceDB: Overview, Features, and Use Cases
Vector Search with NoSQL Databases	Integrating Vector Search with MongoDB and Cassandra, Best Practices for Implementing Vector Search in NoSQL Databases

Module 19

Introduction to Retrieval-Augmented Generation (RAG)

This module introduces the concept of Retrieval-Augmented Generation (RAG), which combines retrieval-based search with generative models for enhanced language generation tasks. You'll learn about the end-to-end RAG pipeline, including how to implement it with tools like LangChain, vector databases, and LLMs. The module also covers hybrid search, reranking, and multimodal retrieval techniques. By the end, you'll understand how to implement advanced RAG systems for various use cases.

Topics	
Overview of Retrieval-Augmented Generation (RAG)	What is RAG?, Key Components of a RAG System, Why RAG is Important for Advanced AI Systems
Understanding the End-to-End RAG Pipeline	Overview of the RAG Workflow, Data Retrieval, Contextualization, and Generation Phases, Challenges and Opportunities in RAG
Integrating LangChain in RAG	Introduction to LangChain Framework, Building End-to-End RAG Pipelines with LangChain
Leveraging Vector Databases in RAG	Using Vector Databases for Efficient Retrieval in RAG, Popular Vector Databases for RAG (e.g., Pinecone, FAISS, Chroma DB)
Role of LLMs in RAG	How LLMs (Large Language Models) Enhance Generation in RAG, Fine-Tuning LLMs for Retrieval-Augmented Tasks

Module 19

Introduction to Retrieval-Augmented Generation (RAG)

Topics	
RAG with Hybrid Search and Reranking	Combining Multiple Retrieval Methods, Reranking Results for Improved Relevance, Hybrid Search Implementation Techniques
RAG with Various Retrieval Methods	Exact vs Approximate Retrieval Methods, Filtering and Ranking Retrieved Data, Customizing Retrieval Approaches for Specific Applications
Integrating Memory in RAG Systems	How Memory Can Improve RAG, Persisting and Recalling Information for Consistent Results, Implementing Long-Term Memory in RAG
Multimodal Retrieval-Augmented Generation	Combining Text, Images, and Other Modalities in RAG, Techniques for Multimodal Retrieval and Generation, Practical Applications of Multimodal RAG Systems

PROJECT

End-to-End AI Project Implementation

In this course, you'll gain hands-on experience in implementing end-to-end AI projects. You'll learn how to manage the entire project lifecycle, from data collection and preprocessing to model development, evaluation, and deployment. The module includes working on real-world AI projects, with a focus on best practices for integration, testing, and scalability. By the end, you'll be prepared to take on AI projects from start to finish, applying machine learning and deep learning techniques to solve real-world problems.

Topics	
Python Project: Building End-to-End Applications	Overview of Python Projects, Project Design and Architecture, Key Considerations in Python Projects (Performance, Scalability, etc.), Best Practices for Code Quality
End-to-End Machine Learning Projects	Understanding End-to-End ML Projects, Key Components of an End-to-End ML Project, Project Example: Real-World ML Application
Deep Learning Projects	Deep Learning Fundamentals in Projects, End-to-End Deep Learning Projects
Generative AI End-to-End Projects	Introduction to Generative AI Projects, Steps in Building Generative AI Projects