

Master in Data Science & Business Intelligence with AI

CETPA

TRAINING | RECRUITMENT | DEVELOPMENT
A CMMI Level 5 Company



Master in Data Science & Business Intelligence

Curriculum of Core & Advanced Python

Getting Started

- History & need of Python
- Application of Python
- Advantages of Python
- Disadvantages of Python
- Installing Python
- Program Structure
- Interactive Shell
- Executable or Script Files
- User Interface or IDE

Python Fundamentals

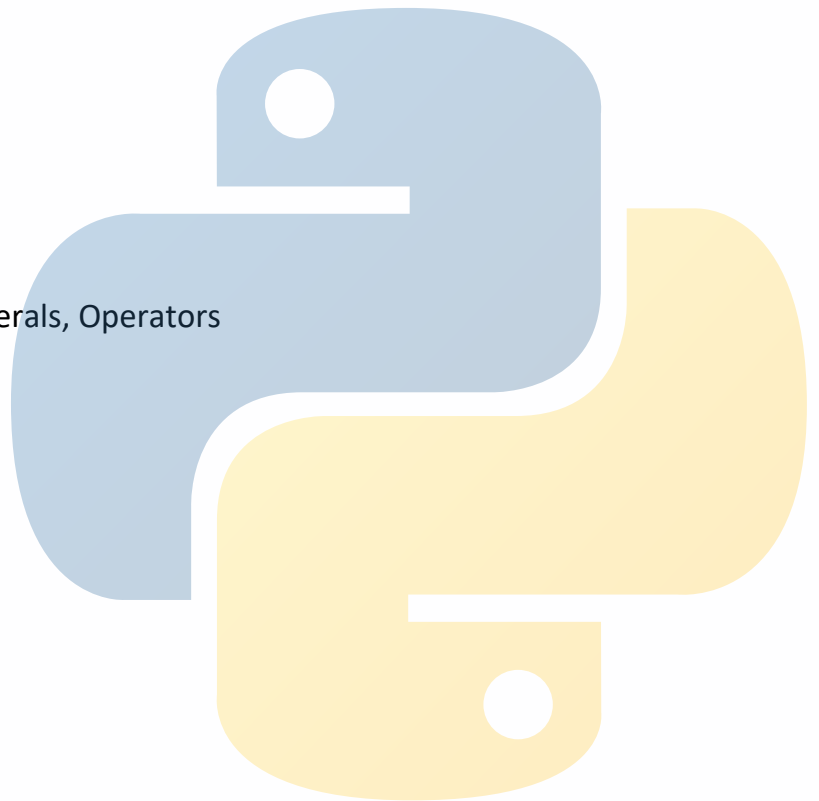
- Working with Interactive mode
- Working with Script mode
- Python Character Set
- Python Tokens, Keywords, Identifiers, Literals, Operators
- Variables and Assignments
- Input and Output in Python

Data Handling

- Data Types
- Numbers
- Strings
- Lists
- Tuples
- Dictionary
- Set
- Frozenset
- Bool
- Mutable and Immutable

String Manipulation

- Introduction to Python String
- Accessing Individual Elements
- String Operators
- String Slices
- String Functions and Methods



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List Manipulation

- Introduction to Python List
- Creating List
- Accessing List
- Joining Lis
- Replicating List
- List Slicing

Tuples

- Introduction to Tuple
- Creating Tuples
- Accessing Tuples
- Joining Tuples
- Replicating Tuples
- Tuple Slicing

Dictionaries

- Introduction to Dictionary
- Accessing values in dictionaries
- Working with dictionaries
- Properties

Set and Frozenset

- Introduction to Set and Frozenset
- Creating Set and Frozenset
- Accessing and Joining
- Replicating and Slicing

Operators

- Arithmetic Operators
- Relational Operators
- Logical Operators
- Membership Operators
- Identity Operators
- Bitwise Operators
- Assignment Operators
- Operators Precedence
- Evaluating Expressia-m---
- Type Casting



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Program Control Flow

- Conditional Statements
- The if Statement
- The if-else Statement
- The if-elif Statement
- Nested if Statements
- Python Indentation
- Looping and Iteration
- The For Loop
- The While Loop
- Loop else Statement
- Nested Loops
- Break and Continue
- The Range Function
- Introduction to range()
- Types of range() function Use of range() function

Introduction to Functions

Built-in-Functions

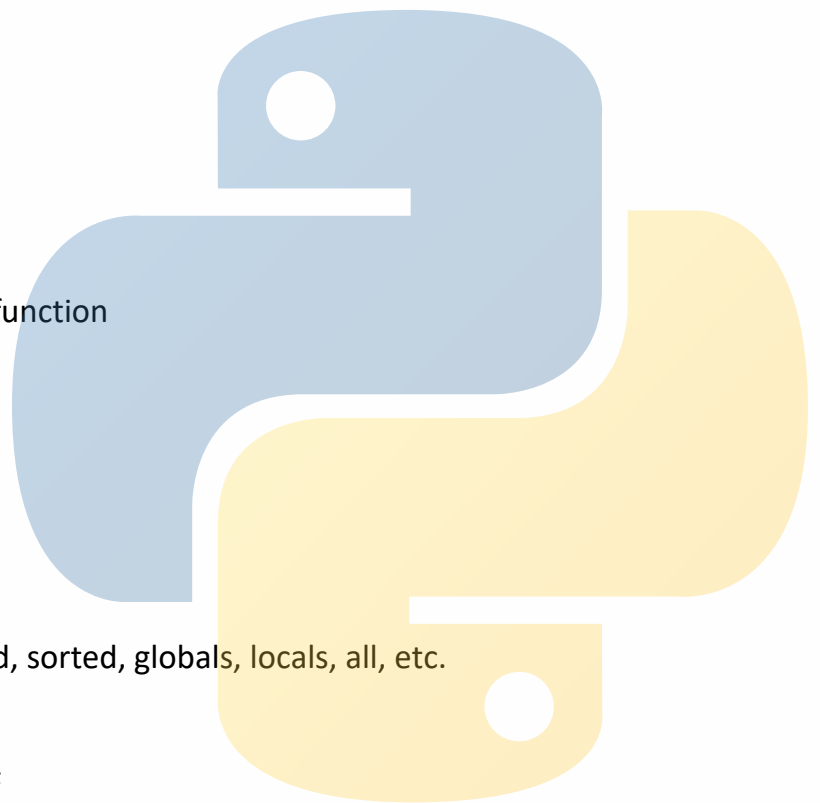
- Introduction to Functions
- Using a Functions
- Python Function Types
- Structure of Python Functions
- E.g. - map, zip, reduce, filter, any, chr, ord, sorted, globals, locals, all, etc.

User Defined Functions

- Structure of a Python Program w.r.t. UDF
- Types of Functions
- Invoking UDF
- Flow of Execution
- Arguments and Parameters
- Default Arguments, Named Arguments
- Scope of Variables
- Lambda function

Recursion Function

- Use of recursion function



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Modules and Packages

Built-in Modules

- Importing Modules in Python Programs
- Working with Random Modules
- E.g. - builtins, os, time, datetime, calendar, twilio, smtp, pillow.

User Defined Modules

- Structure of Python Modules

File Operations

Text and Bytes files

- Opening a file
- Reading and Writing Files
- Other File tools

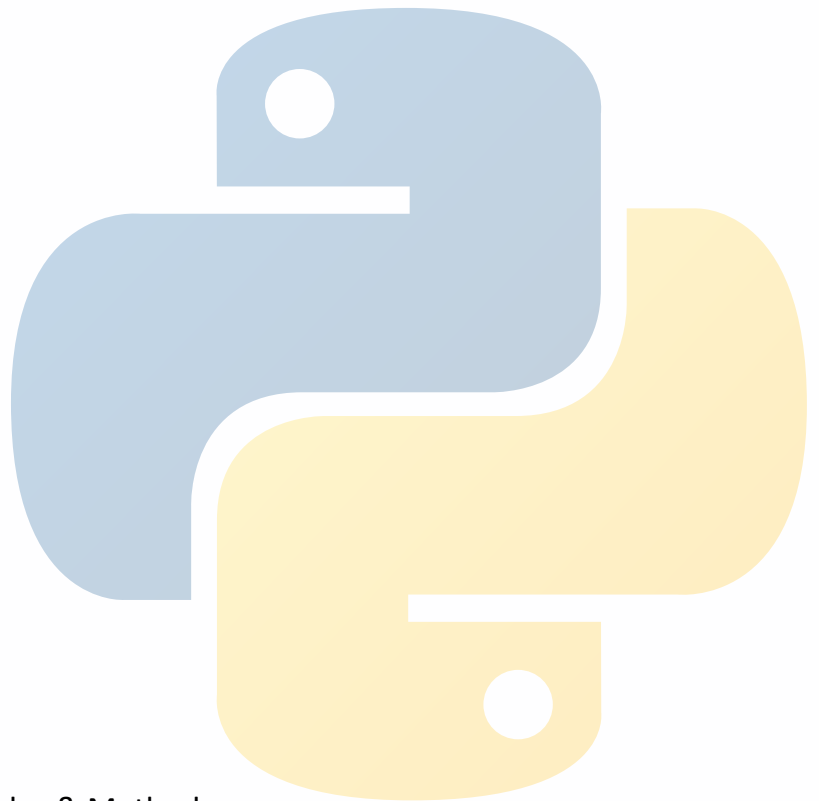
JSON/PICKLE

Format Classes and Objects

- Classes as User Defined Data Type
- Objects as Instances of Classes
- Creating Class and Objects
- Creating Objects By Passing Values Variables & Methods

Exception Handling

- Default Exceptions
- Catching Exception
- Raise an exception
- Try ... except Statement
- Raise, Assert, Finally blocks
- User defined exception



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Introduction to OOPS

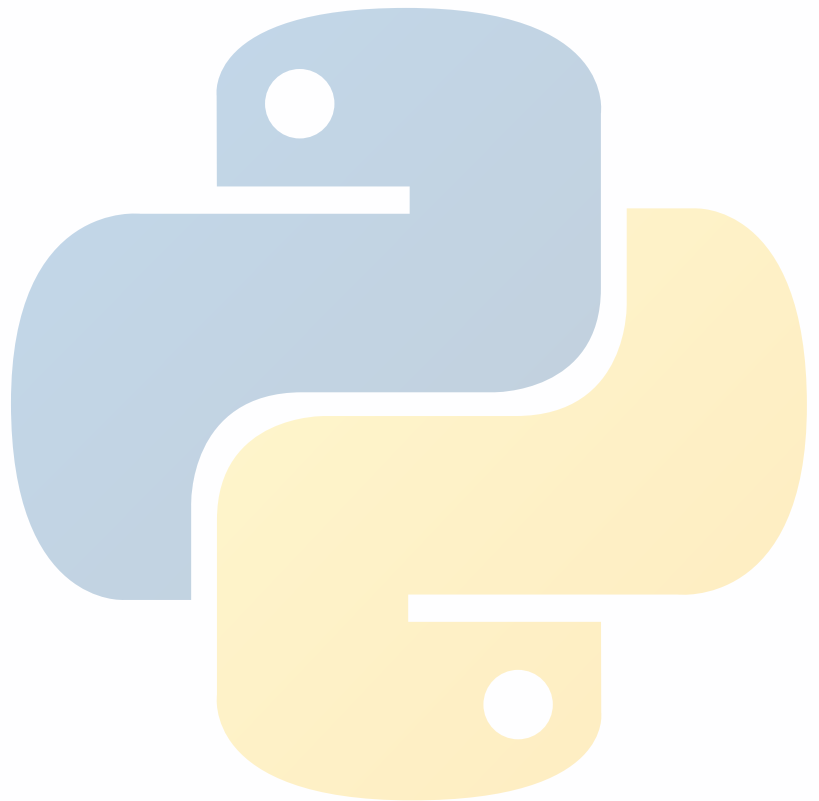
- Procedural Vs Modular Programming
- The Object Oriented Programming
- Data Abstraction
- Data Hiding
- Encapsulation
- Inheritance
- Polymorphism
- Generators
- Iterators

Database

- SIntroduction to MySQL
- PYMYSQL Connections
- Executing queries
- Transaction Handling error

GUI Programming

- Introduction
- Tkinter programming
- Tkinter widgets
- Frame
- Button
- Label
- Entry
- All Widget



Introduction to Data Structures and Algorithms

- What is Data Structure
- Benefits of Data Structure
- Types of Data Structure
- What is algorithm
- Time and Space complexity

Introduction to Array

- Advantages of Arrays
- Disadvantages of Arrays
- Types of Arrays

Introduction to Linked List

- Advantages of Linked List
- Disadvantages of Linked List
- Types of Linked List

Introduction to Stack

- What is Stack?
- Basic operations on Stack
- Types of Stacks
- Implementation of Stacks using Array
- Implementation of Stacks using Linked List
- Applications of Stack

Introduction to Queue

- What is Queue?
- Basic operations on Queue
- Types of Queues
- Implementation of Queue using Array
- Implementation of Queue using Linked List
- Applications of Queue



DATA

S T R U C T U R E S

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DSA

Introduction to Tree

- What is Tree Data Structure?
- Why Tree Data Structure
- Tree Terminologies
- Types of Trees
- Tree Traversal
- Tree Applications

Introduction to Graph

- What is Graph?
- Graph Terminologies
- Graph Representation
- BFS and DFS in Graph
- Cycles in Graph
- Shortest path in Graph
- Graph Operations

Searching Algorithms

- Linear Search
- Sentinel Linear Search
- Binary Search
- Meta Binary Search
- Ternary Search
- Jump Search
- Interpolation Search

Sorting Algorithms

- What is Sorting
- Selection Sort
- Bubble Sort
- Insertion Sort
- Merge Sort
- Quick Sort
- Heap Sort
- Shell Sort
- Many more



DATA

S T R U C T U R E S

Recursion Algorithms

- What is Recursion?
- Why Recursion?
- Types of Recursions
- Tail Recursion
- Implicit Recursion

Backtracking Algorithms

- What is Backtracking?
- How does a Backtracking Algorithm work?
- When to use Backtracking Algorithm?
- Types of Backtracking Algorithms
- Recursive Backtracking Algorithms
- Non-Recursive Backtracking Algorithms

Introduction to Hashing

- What is Hashing?
- Hash table
- Applications of Hashing



DATA
S T R U C T U R E S

Introduction to MySQL

- What is a database?
- What is SQL?
- Differences between SQL and NoSQL databases
- Overview of MySQL
- Downloading and installing MySQL Server and Workbench
- Understanding MySQL components (MySQL Server, MySQL Workbench)
- Connecting to MySQL Server
- Navigating MySQL Workbench
- Creating a connection
- Using SQL editor

Basic SQL Queries

- Introduction to SQL syntax
- SELECT, FROM, WHERE
- Filtering and sorting data (ORDER BY, LIMIT)
- Introduction to MySQL data types

Data Definition Language (DDL) & Data Types

1. Creating Databases and Tables

- Database creation
- Creating tables with different data types (INT, VARCHAR, DATE, etc.)

2. Modifying and Dropping Tables

- Adding, modifying, and deleting columns
- Dropping tables and databases
- Altering table structure

3. Primary Keys, Foreign Keys, and Constraints

- Understanding primary keys and unique constraints
- Foreign keys and relationships between tables
- Enforcing constraints in MySQL

4. Data Types in MySQL

- Overview of numeric, string, date, and time data types
- Choosing the right data type for columns



MySQL

Data Manipulation Language (DML)

1. Inserting Data

- INSERT statement
- Inserting multiple rows
- Auto-incrementing fields

2. Updating Data

- UPDATE statement
- Using WHERE with UPDATE
- Handling NULL values

3. Deleting Data

- DELETE statement
- Difference between DELETE and TRUNCATE
- Cascading delete with foreign keys

4. Using Functions in SQL

- String functions (e.g., CONCAT, SUBSTRING)
- Numeric functions (e.g., ROUND, ABS)
- Date and time functions (e.g., NOW, DATE_FORMAT)

Advanced SQL Queries

1. Joins in MySQL

- Inner joins, outer joins (LEFT, RIGHT)
- Cross joins and self joins
- Practical examples of joining tables

2. Grouping Data with Aggregate Functions

- GROUP BY clause
- Aggregate functions (COUNT, SUM, AVG, MIN, MAX)
- Using HAVING with GROUP BY

3. Subqueries and Nested Queries

- Introduction to subqueries
- Using subqueries in SELECT, FROM, and WHERE
- Correlated vs non-correlated subqueries

4. Unions and Intersections

- Using UNION and UNION ALL
- Combining results from multiple queries
- Performance considerations



MySQL

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MySQL

Indexing, Views, and Performance Optimization

1. Indexes and Keys

- Creating and using indexes for optimization
- Clustered vs non-clustered indexes
- Index maintenance and performance tips

2. Views in MySQL

- Creating views
- Using views to simplify complex queries
- Updating and managing views

3. Stored Procedures and Functions

- Introduction to stored procedures
- Creating and executing stored procedures
- Creating and using user-defined functions

4. Optimizing Queries for Performance

- Query optimization tips
- Using EXPLAIN to analyze query performance
- Indexing strategies

Database Administration and Security

1. User Management and Privileges

- Creating and managing MySQL users
- Granting and revoking privileges
- Role-based access control

2. Database Backups and Restoration

- Backup strategies: full, incremental, and binary logs
- Using mysqldump for backups
- Restoring data from backups

3. Security Best Practices

- Securing MySQL installations
- Protecting against SQL injection
- Using SSL for secure connections

4. Replication and Clustering in MySQL

- Overview of MySQL replication
- Setting up master-slave replication



MySQL

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Mongo DB

MODULE 1:

- Understanding NoSQL DB
- NoSQL vs. SQL DB
- Understanding Mongo DB
- Introduction of mongoose Atlas
- MongoDB Data types
- MongoDB Shell Commands
- Understanding db, collection & document
- Understanding Embedded documents
- Querying database Tools & API
- MongoDB Tools
- Introduction to Mongo Chef
- Mongo Chef for database operations

MODULE 2: INDEXING AND RELATIONSHIPS

- Types of Indexes
- Creating an Indexes
- Dropping an Indexes
- Defining Relationships between Documents

MODULE 3: MONGO DB ODM –MONGOOSE AND POSTMAN

- Introduction to Mongoose
- Exploring fundamentals of Mongoose
- Mongoose Models
- Mongoose Data Types
- Mongoose Relationships
- Mongoose CRUD operations

MODULE 4: GITHUB

- Real-me environmental setup with GitHub
- REST API WITH MONGOOSE, MONGODB AND POSTMAN
- CREATING REST API USING EXPRESS AND MONGOOSE
- IMPLEMENTING THE PROJECT
- DEPLOYMENT OF MEAN APPLICATION



mongoDB

ADVANCE FUNCTIONS OF EXCEL

- Logical Function : IF / ELSE, AND, OR, NOT, NESTED IF/ELSE
- Date and Time Functions: DATE, DAY, SECOND, MINUTES, HOURS, NOW, TODAY, MONTH, YEAR
- Information Functions: ISBLANK, ISERROR, ISEVEN, etc.
- Math Functions: : RAND, ROUND, CEILING, FLOOR, INT, LCM, MOD, EVEN, SUMIF, SUMIFS
- Statistical Functions: AVERAGE, AVERAGEIF, COUNT, COUNTA, COUNTBLANK, COUNTIF, MAX, MIN
- Text Functions: LEFT, RIGHT, TEXT, LOWER, UPPER, PROPER, REPLACE, REPT, FIND, SEARCH, SUBSTITUTE, TRIM, CONCATENATE

CONDITIONAL FORMATTING

- Using Conditional Formatting
- Using Conditional Formatting with Multiple Cell Rules
- Using Colour Scales in Conditional Formatting
- Highlighting Duplicate
- Creating New Rules and Managing Existing Rules

DATA SORTING AND FILTERING

- Sorting Data A-Z and Z-A
- Using Filters to Sort Data
- Advance Filtering Options

PIVOT TABLES

- Creating Pivot Tables
- Using Pivot Table Options
- Changing and Updating Data Range
- Formatting Pivot Table

CONCEPT OF CELL REFERENCING

- Relative
- Absolute, Mixed



XLS

VLOOKUP & HLOOKUP

- Using VLOOKUP & HLOOKUP from same sheet
- Using VLOOKUP & HLOOKUP from other sheet
- Using VLOOKUP & HLOOKUP from other workbook
- Using VLOOKUP with MATCH

CHARTS

- Column Chart
- Pie Chart
- Line Chart
- Shortcut Of Chart

INDEX & MATCH

- Using Index and Match to find LEFT column Values
- Using MATCH to make the column dynamic

OFFSET

- Using OFFSET to make reports Dynamic
- Using OFFSET to make Name Range Dynamic
- Using OFFSET to make PIVOT Table Dynamic

NAME MANAGER

- 3 methods of Creating Range name
- Making Range Name Dynamic

DATA VALIDATION

- Custom Validation
- Multilevel Data Validation
- Input Message
- Error Alert

DATA CONSOLIDATION

- Data Consolidation
- 3D Formulas



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Advanced Excel

WHAT-IF ANALYSIS

- Scenario Manager
- Goal Seek
- Data Table

NEW FEATURES OF 2016

- Sparkline
- Slicer

PANES PROPERTIES

- Freeze Panes & Unfreeze Panes
- Split Panes

SORTING

- Sorting
- Custom Sort
- Sort on Custom List
- Sort on Colour

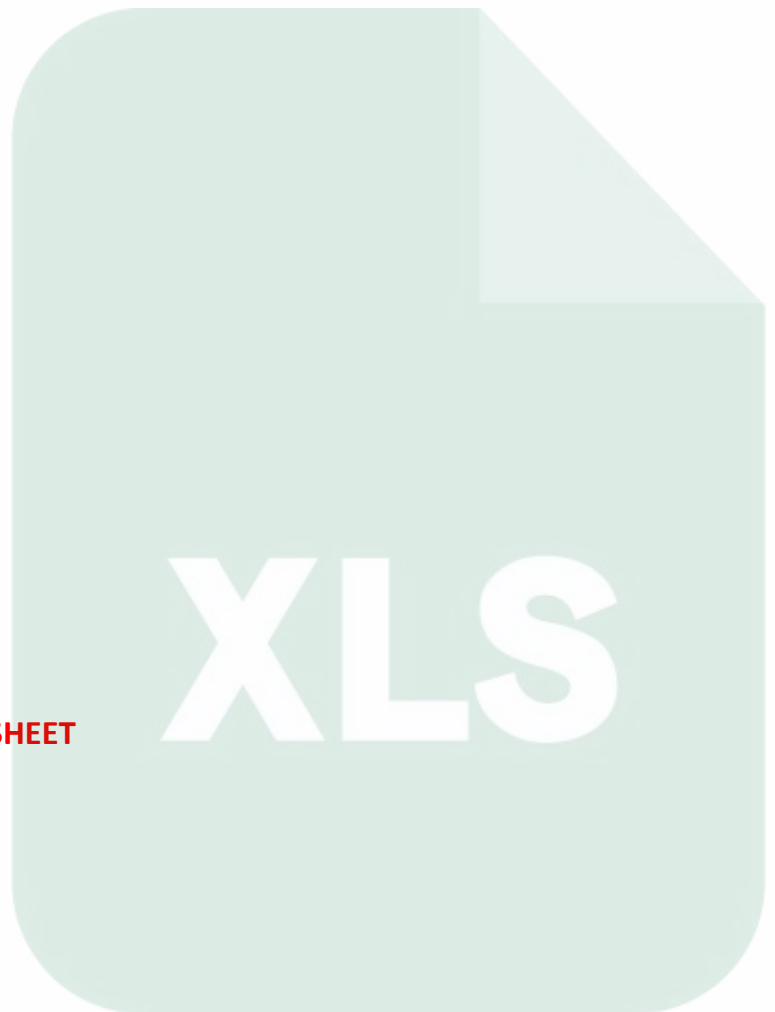
PASTE SPECIAL FEATURES

SHARE & PROTECT WORKBOOK AND WORKSHEET

- Protection of whole sheet
- Protection of a range
- Protection of a cell
- Sharing a workbook
- Watching the Changes by Users
- Accepting or Rejecting the Changes

DATA ANALYSIS

- Correlation
- Histogram
- Pareto Analysis



Module 1: Introduction to ChatGPT

Introduction to GPT and ChatGPT

- GPT: What it is and how it works
- OpenAI and the development of ChatGPT
- Use cases and applications of ChatGPT

Module 2: Using ChatGPT Effectively

1. ChatGPT Interface and API

- OpenAI API basics
- Working with ChatGPT API for various platforms
- ChatGPT Playground: Features and use cases

2. Prompt Engineering

- Designing effective prompts for better responses
- Prompt refinement and iteration strategies

3. Customizing ChatGPT Behavior

- Controlling tone, style, and response structure
- Limiting responses and handling inappropriate content

Module 3: ChatGPT for Everyday Tasks

• Using ChatGPT for Personal Assistance

- Creating schedules, setting reminders.
- Answering questions on general knowledge.

• Using ChatGPT for Content Generation

- Writing emails, blog posts, and social media content.
- Brainstorming ideas for different topics.

Module 4: Designing multi-turn conversations

Using ChatGPT to Help with Basic Excel Tasks

- Asking ChatGPT for help with Excel formulas
- Generating Excel formulas using ChatGPT
- Quick data validation and summarization with ChatGPT

Module 5 : Simple Excel Problem-Solving with ChatGPT

- Asking ChatGPT to explain Excel error messages and suggest solutions.
- Using ChatGPT to debug Excel formula issues.
- Real-world example: ChatGPT helps fix a broken formula.

Module 6 : Data Analysis Assistance using ChatGPT

1. Using ChatGPT for Data Insights

- How ChatGPT can suggest basic data analysis techniques.
- Sample conversation: Asking ChatGPT for tips on summarizing data in Excel.

2. Guided Data Cleaning in Excel with ChatGPT

- Using ChatGPT to guide cleaning and organizing data.
- Sample use case: Removing duplicates, handling missing data, etc.

3. ChatGPT's Role in Basic Data Visualization

- Asking ChatGPT for recommendations on creating visual representations (charts, graphs) in Excel.
- Use case: ChatGPT suggests how to visualize sales data using charts.

4. Advanced Formulas with ChatGPT Guidance

- Using ChatGPT to understand advanced Excel formulas (e.g., INDEX, MATCH, PivotTables).
- Sample conversation: ChatGPT explains how to create a dynamic report with PivotTables.

ChatGPT

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M365

Introduction to Microsoft 365

- **Overview of Microsoft 365**
 - What is Microsoft 365?
 - Key Features and Benefits
 - Understanding Cloud Services
- **Microsoft 365 Plans and Pricing**
 - Home, Business, and Enterprise Plans
 - Licensing and Subscription Models
- **Setting Up a Microsoft 365 Account**
 - Creating a Microsoft 365 Account
 - Understanding the Admin Portal
 - Setting Up Users and Assigning Licenses
- **Navigating the Microsoft 365 Dashboard**
 - Overview of the Interface
 - Basic Customizations
 - Accessing Key Applications (Word, Excel, PowerPoint, Outlook)
 -



Microsoft Word

- **Introduction to Microsoft Word**
 - Creating, Saving, and Opening Documents
 - Interface Overview: Ribbon, Toolbars, and Status Bar
- **Basic Document Formatting**
 - Text Formatting (Font, Size, Bold, Italics, etc.)
 - Paragraph Formatting (Indentation, Alignment, Spacing)
 - Adding Headers, Footers, and Page Numbers
- **Working with Tables and Images**
 - Inserting and Formatting Tables
 - Adding and Formatting Images
 - Using SmartArt and Shapes
- **Document Sharing and Collaboration**
 - Saving Documents to OneDrive
 - Sharing Documents and Real-time Collaboration

Master in Data Science & Business Intelligence

M365

Microsoft Excel

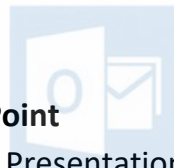
- **Introduction to Microsoft Excel**
 - Creating, Saving, and Opening Spreadsheets
 - Understanding the Interface: Cells, Rows, Columns
- **Basic Data Entry and Formatting**
 - Entering Data, Text, and Numbers
 - Cell Formatting (Borders, Colors, Fonts)
 - Using Conditional Formatting
- **Basic Formulas and Functions**
 - Understanding Formulas and Cell References
 - Common Functions (SUM, AVERAGE, COUNT)
 - Using AutoFill and Flash Fill
- **Creating Charts and Graphs**
 - Creating Basic Charts (Bar, Line, Pie)
 - Customizing Chart Elements
 - Using Sparklines for Data Visualization



Office 365

Microsoft PowerPoint

- **Introduction to Microsoft PowerPoint**
 - Creating, Saving, and Opening Presentations
 - Understanding the Interface: Slides, Themes, Layouts
- **Creating and Designing Slides**
 - Adding Text, Images, and Media to Slides
 - Using Slide Transitions and Animations
 - Working with Slide Masters
- **Presentation Tips and Tricks**
 - Creating Engaging Presentations
 - Using Speaker Notes
 - Rehearsing and Timing Your Presentation
- **Collaborating on Presentations**
 - Sharing Presentations in Microsoft 365
 - Co-authoring and Reviewing Changes
 - Presenting Online with Microsoft Teams



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M365

Microsoft Outlook and Teams

- **Introduction to Microsoft Outlook**
 - Setting Up and Configuring Email Accounts
 - Composing, Sending, and Receiving Emails
 - Organizing Emails with Folders, Categories, and Rules
 - Scheduling Meetings and Appointments with Calendar
- **Managing Contacts and Tasks in Outlook**
 - Creating and Managing Contacts
 - Creating and Assigning Tasks
 - Integrating Calendar and Tasks
- **Introduction to Microsoft Teams**
 - Setting Up Teams and Channels
 - Understanding Chat and Messaging Features
 - Scheduling and Hosting Meetings in Teams
 - File Sharing and Collaboration within Teams



Office 365



OneDrive and SharePoint Basics

- **Introduction to OneDrive**
 - Storing Files in OneDrive
 - Syncing Files Across Devices
 - Sharing Files and Managing Permissions
 - Version History and File Recovery
- **Introduction to SharePoint**
 - Creating and Managing Sites in SharePoint
 - Document Libraries and Lists
 - Sharing and Collaborating on Documents
 - Integrating SharePoint with Microsoft Teams and OneDrive

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Power BI

INTRODUCTION

- Introduction to Power BI
- About the Course

SIGN UP FOR POWER BI

- Load Data
- Practical Activity

THE POWER BI DESKTOP

- Introduction to Power BI Desktop

CREATING REPORTS IN POWER BI DESKTOP

- Creating Tables in Power BI
- Table Style and Formatting
- Matrix Visualization
- Tables and Metrics Practical Activity
- Changing Method of Aggregation
- Cards & Multi Row Cards
- Cards, Matrix and Multi Row Card Challenge
- Percentage Calculations
- Filtering Data- Using Slicers
- Filtering Data- Visual Filters
- Filtering Data- Page Filters
- Filtering Data- Drill Through Filter
- Practical Activity



Power BI

VISUALIZATIONS AND GRAPHS

- Column
- Stacked
- Area, Ribbon
- Trend Analysis
- Scatter Plot
- Bubble Plot

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Power BI

DASHBOARDS

- Creating Interactive Dashboards
- Create an Interactive Report- Activity
- Publishing Reports to the Power BI service
- Pinning Visualization to Dashboards
- Mobile Reports
- App Workspaces
- Publishing an App
- Using Themes in Power BI
- Using Custom Visualization

DAX FORMULAS

- DAX Formulas
- Date Functions
- Formatting Dates
- Date Master Tables

DAX MEASURES

- Introduction to DAX Measures
- DAX Measures Practical Activity
- The = Calculate Formula

POWER BI EDITOR

- Introduction to Power BI Query Editor
- Basic Transformation
- Aggregating Data

RELATIONSHIPS

- Creating and Managing Relationships in Power BI
- Relationships Calculations
- Analyze Data with Excel
- Introduction to Power BI and Excel
- Power BI and Excel Connections
- Excel Data Types from Power BI
- Loading Excel Files into Power BI Service



Power BI

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Power BI

CORONA CASE STUDY

- Introduction to the Corona Virus Case Study
- Corona Virus Case Study Part 1
- Corona Virus Case Study Part 2
- Corona Virus Dashboard Update
- Understanding the flow of using Power BI, from connecting to various data sources, importing these into Power BI, transforming the data and then presenting it effectively
- How to use Power BI Desktop, Power BI Query Editor & the Power BI Service
- How to create relationships between related data sources
- How to build reports with various types of aggregations and filters
- About the various types of visualizations possible in Power BI and how to use them
- How to create interactive dashboards with drill through and relative date filters
- How to publish dashboards to the web and mobile app
- How to use themes and custom visualizations
- About DAX and how to use it to build measures
- How to work with Excel & Power BI to create a dynamic and effective business solution
- How to put this all into practice with a case study about the Corona Virus.

REQUIREMENTS

You will need to have a PC/Windows laptop loaded with the latest version of Microsoft Power BI (available as a free download)

Power BI

Master in Data Science & Business Intelligence

Machine Learning

MODULE 1: INTRODUCTION TO MACHINE LEARNING

- What is ML?
- Applications of ML
- Why ML?
- Uses of ML
- Machine learning methods
- Machine learning algorithms (Regression, Classification Clustering, Association)
- A brief introduction on python libraries

MODULE 2: CREATING A MACHINE LEARNING MODEL

- Types of ML algorithms
- Labelled Dataset
- Training and Testing Data
- Importing the Libraries
- Importing the Dataset
- Demo: Creating a machine model

A graphic featuring the words "Machine Learning" in a large, blue, sans-serif font. The text is set against a light blue background that resembles a brain, with intricate circuitry and neural network patterns overlaid on it. The overall design is modern and tech-oriented.

Machine Learning

MODULE 3: DATA PREPARATION AND EXPLORATION

- What is data?
- What is information?
- Analyzing data to fetch the information
- Entropy, Information gain
- Data exploration and preparation
- Univariate, bivariate, and multivariate analysis
- Correlation
- Chi-Square, Z-test, T-test, ANOVA
- Categorical Data
- Feature Scaling
- Dimensionality Reduction
- Outliers

MODULE 4: REGRESSION

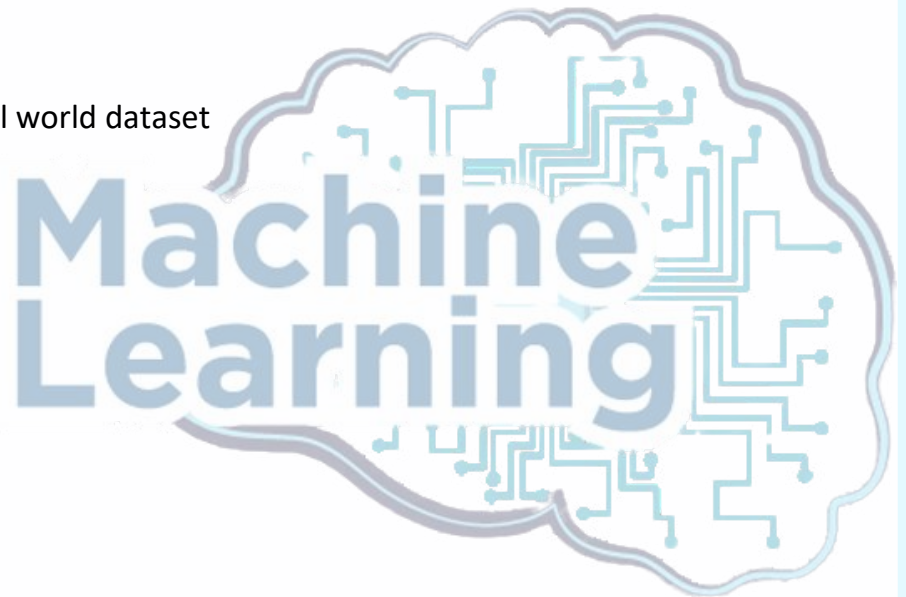
- What is regression?
- Applications of regression
- Types of regression
- Fitting the regression line
- Simple linear regression
- Simple linear regression in python
- Polynomial regression
- Polynomial regression in python
- Gradient Descent
- Cost function
- Regularization
- Demo: Perform regression on a real world dataset
- Ridge and lasso Regression

MODULE 5: CLASSIFICATION

- How is classification used?
- Applications of classification
- Logistic Regression
- Sigmoid function
- Decision tree
- K-Nearest Neighbors (K-NN)
- SVM
- Naive Bayes
- Understand limitations of linear classifier and evaluate abilities of non-linear classifiers using a data set

MODULE 6: EVALUATION OF CLASSIFICATION MODELS

- Confusion Matrix
- Precision, Recall
- F1-score
- ROC, AUC
- n-fold cross validation
- Measuring classifier performance
- Overfitting
- Ensemble Learning
- Bagging and Boosting



MODULE 7: UNSUPERVISED LEARNING - CLUSTERING

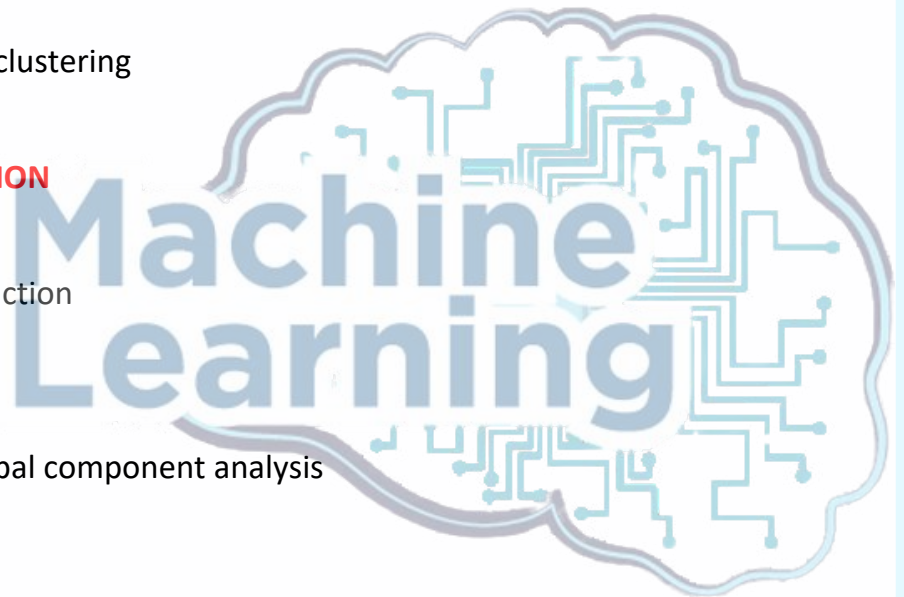
- Application of Unsupervised learning, examples, and applications
- Clustering
- Hierarchical Clustering in Python, Agglomerative and Divisive techniques
- Measuring the distance between two clusters
- k-means algorithm
- Limitations of K-means clustering
- SSE and Distortion measurements
- Demo: Agglomerative Hierarchical clustering

MODULE 8: DIMENSIONALITY REDUCTION

- What is dimensionality reduction?
- Applications of dimensionality reduction
- Feature selection
- Feature extraction
- Dimensionality reduction via Principal component analysis
- Eigenvalue and Eigenvectors
- Hands on PCA on MNSIT data

MODULE 9: REINFORCEMENT LEARNING

- What is reinforcement learning
- Applications of reinforcement learning
- An Example use case
- Components of RL
- Approaches to RL
- RL algorithms
- Deep reinforcement learning



MODULE 10: INTRODUCTION TO NATURAL LANGUAGE PROCESSING (NLP)

- What is NLP?
- Why NLP
- Applications of NLP
- Components of NLP
- NLP techniques

MODULE 11: INTRODUCTION TO DEEP LEARNING

- Why deep learning?
- Neural networks
- Applications of neural networks
- Biological Neuron vs Artificial Neuron
- Artificial Neural networks, layers

HANDS ON CASE STUDY



Machine Learning

Master in Data Science & Business Intelligence

Data Analytics

REVISITING PYTHON

- Revisiting Python
- List and dictionary comprehension
- Programming assignment

INTRODUCTION TO DATA ANALYTICS

- Why Analytics?
- Traditional Data Management
- Types of Analytics
- Dimensions and measures
- Why learn Python for data analysis?

LIBRARIES FOR DATA ANALYTICS

- Anaconda
- Numpy, Scipy, Pandas, Matplotlib, Seaborn

STATISTICS:

- Mean, Median, Mode
- Z-scores
- Bias -variance dichotomy
- Sampling and t-tests
- Sample vs Population statistics
- Random Variables
- Probability distribution function
- Expected value
- Binomial Distributions
- Normal Distributions
- Central limit Theorem
- Hypothesis testing
- Z-Stats vs T-stats
- Type 1 type 2 error
- Chi Square test
- ANOVA test and F-stats



Data Analytics

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Data Analytics

JUPYTER NOTEBOOK

- Create Documentation
- Code mode
- Markdown mode
- Heading mode

NUMPY:

- Creating NumPy arrays
- Indexing and slicing in NumPy
- Downloading and parsing data
- Creating multidimensional arrays
- NumPy Data types
- Array tributes
- Indexing and Slicing
- Creating array views copies
- Manipulating array shapes I/O

SCIPY:

- Introduction to SciPy
- Create function
- modules of SciPy

PANDAS:

- Using multilevel series
- Series and Data Frames
- Grouping, aggregating
- Merge DataFrames
- Generate summary tables
- Group data into logical pieces
- Manipulate dates
- Creating metrics for analysis
- Data wrangling
- Merging and joining
- Analytics Vidhya dataset- Loan Prediction Problem
- Data Mugging using Pandas
- Building a Predictive Model



Data Analytics

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Data Analytics

MATPLOTLIB:

- Scatter plot
- Bar charts, histogram
- Stack charts
- Legend title Style
- Figures and subplots
- Plotting function in pandas
- Labelling and arranging figures
- Save plots

SEABORN:

- Style functions, Color palettes
- Distribution and Categorical plots
- Regression plots
- Axis grid objects

WEB SCRAPING:

- Scraping Webpages
- Beautifulsoup package
- Real time project

INTRODUCTION TO ML

- What is ML? And Why ML?
- Introduction to Supervised ML
- Introduction to Unsupervised ML
- Mathematical Background for ML
- Matrix ops Probability Theory (Bayes' Theorem)
- ML Glossary- Variable types, k-fold
- CV, AUC, F1 score,
- Overfitting / Underfitting
- Data split & hyper parameter



Data Analytics

Deep Learning Essentials:

Topics Covered:

- Difference between ML and Deep Learning
- Neural Networks: Architecture & Activation Functions
- Forward Propagation & Backpropagation
- Deep Learning Frameworks (TensorFlow, Keras basics)
- Building and training Feedforward Neural Networks
- Overfitting, Regularization, Dropout
- GPUs and model optimization concepts



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Natural Language Processing (NLP)

Natural Language Processing (NLP):

Topics Covered:

- Text preprocessing (Tokenization, Lemmatization, Stopwords)
- Vectorization techniques: Bag of Words, TF-IDF, Word2Vec
- Sentiment Analysis, Named Entity Recognition (NER)
- Topic Modeling (LDA, LSA)
- Sequence modeling with RNNs and LSTMs

Image Processing:

Topics Covered:

- Introduction to images as arrays
- Image pre-processing (resizing, normalization, augmentation)
- Convolutional Neural Networks (CNNs)
- Pooling, Filters, Feature Maps
- Transfer Learning with pretrained models (VGG16, ResNet)

Generative AI Fundamentals:

Topics Covered:

- What is Generative AI? Use cases in business and analytics
- Types of Generative Models: GANs, VAEs, Diffusion Models
- Generative AI vs. Predictive AI
- Introduction to ChatGPT, DALL·E, Codex, etc.
- Text-to-Text, Text-to-Image, and Code Generation overview

Large Language Models (LLMs) & Transformers

Topics Covered:

- Evolution from RNN → LSTM → Transformers
- Anatomy of a Transformer: Attention, Self-Attention, Positional Encoding
- LLM examples: GPT, BERT, T5
- Fine-tuning vs. Prompting
- Challenges: hallucination, token limits, latency



Prompt Engineering

Topics Covered:

- Zero-shot, one-shot, and few-shot prompting
- Structuring effective instructions for analytics tasks
- Role prompting, chain-of-thought, system messages
- Prompt optimization and benchmarking
- Prompt chaining for multi-step workflows



Gen AI for Data Augmentation

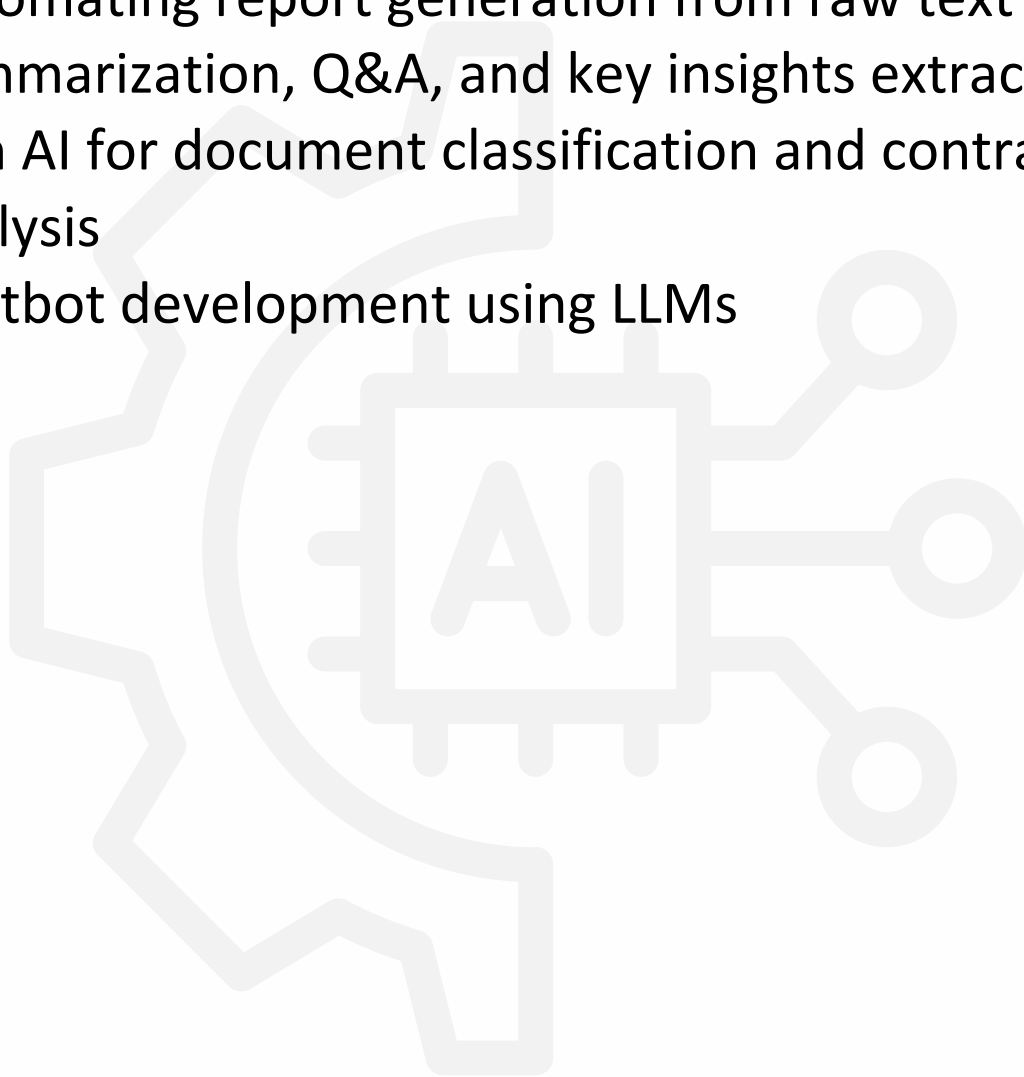
Topics Covered:

- Synthetic data generation for tabular datasets
- Text augmentation using paraphrasing and summarization
- Image data augmentation (GANs, style transfer)
- Use cases in fraud detection, churn prediction, sentiment modeling

Gen AI in NLP & Text Analytics

Topics Covered:

- Automating report generation from raw text
- Summarization, Q&A, and key insights extraction
- Gen AI for document classification and contract analysis
- Chatbot development using LLMs



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AI-Driven Predictive Analytics & Forecasting

AI-Driven Predictive Analytics & Forecasting

Topics Covered:

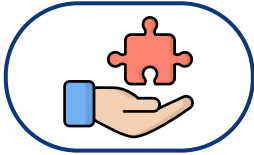
- Time series forecasting with ML and DL (LSTM, ARIMA)
- Integrating external text/LLM-based features into models
- Predictive modeling pipelines with Gen AI-generated features
- Demand forecasting, sales prediction, risk modeling

Ethical Considerations & Responsible AI Use

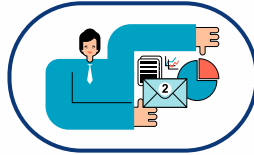
Topics Covered:

- Fairness, accountability, transparency in AI (FAT)
- Bias detection in datasets and models
- Explainable AI (XAI) principles
- Data privacy, consent, and compliance (GDPR, HIPAA)
- Green AI and sustainability considerations

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