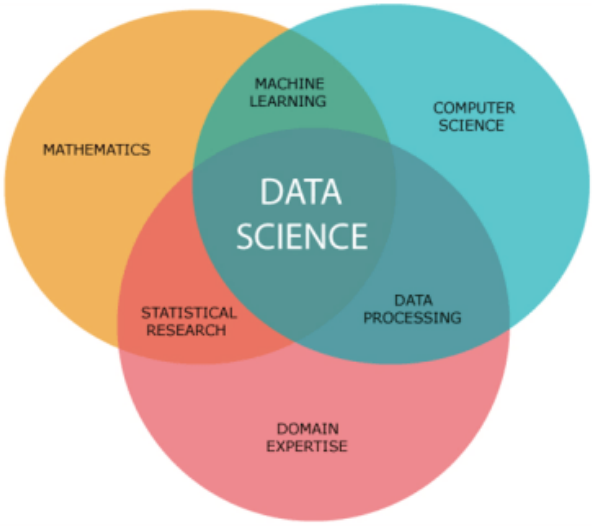
GENESIS
YOUR POTENTIAL. OUR PASSION



Data Science with Gen AI

Course Curriculum

Duration: 3 Months

Objective

Discover how data transforms industries and drives innovation.

Topics Covered:

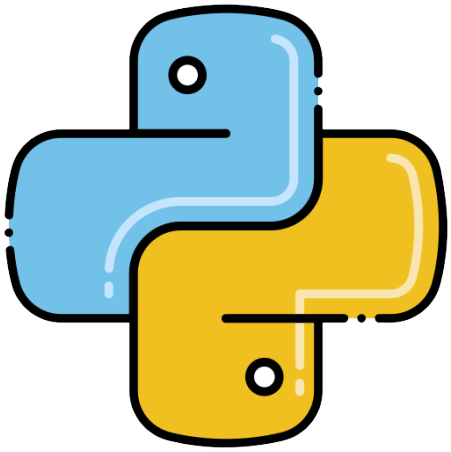
- What is Data Science ?
- Difference between Data Science, Big Data, and Data Analytics
- Data-Driven Decision Making
- Purpose and Identifying Business Problems
- How Data Scientists Work
- Essential Skills of a Data Scientist
- Different Sectors using Data Science
- Real-World Applications of Data Science
- Future of AI and How the World is Changing

PYTHON PROGRAMMING

Learn Python — the most powerful language for data analysis.

Topics Covered:

- Why Python for Data Analysis
- Installing Anaconda & Setting up the Environment
- Writing and Running Simple Python Programs
- Python Basics: Objects, Lists, Strings, Sets, Tuples, Dictionaries
- Arrays and Data Frames in Python
- File Handling in Python
- Comments, Conversion Functions, and Math Functions
- User-Defined Functions, Parameters & Arguments
- Range and Recursive Functions
- Conditional Statements: if, elif, else
- Loops in Python: for, while
- Regular Expressions
- Exception handling



PYTHON LIBRARIES FOR DATA SCIENCE

Work with professional-grade data science libraries

Libraries & Concepts:

- **NumPy:** Array creation, statistical operators, broadcasting, shape manipulation
- **SciPy:** Scientific computation
- **Matplotlib & Seaborn:** Data Visualization, Distribution & Box Plots
- **Pandas:**
  - o Series, DataFrames, Panels
  - o Selection, Deletion, Grouping, Merging, Filtering, Aggregation
  - o Apply, Map, Lambda functions
  - o Accessing objects by index

- **Scikit-Learn:** Machine Learning algorithms
- **Regular Expressions** in Python

STATISTICS & MATHEMATICS FOR DATA SCIENCE

Build strong statistical foundations to analyze data ef ectively.

Topics Covered:



- Introduction to Statistics
- Statistical vs. Non-Statistical Analysis
- Descriptive & Inferential Statistics
- Population, Samples & Sampling Techniques
- Central Tendency: Mean, Median, Mode, Weighted & Trimmed Mean
- Measures of Dispersion: Variance, Standard Deviation, IQR, Range
- Skewness, Kurtosis, Degrees of Freedom
- Confidence Interval, Margin of Error, P-Value Interpretation
- Correlation, Covariance, Multi-Collinearity
- Hypothesis Testing: Z-Test, T-Test, Chi-Square, F-Test, ANOVA
- Probability Concepts, Venn Diagram, Permutation & Combination
- Conditional, Joint & Marginal Probability
- Bayesian Network and Random Variables
- Central Limit Theorem & Law of Large Numbers

MACHINE LEARNING

Train machines to learn from data automatically.

Sub-Modules:

Supervised Learning

- Regression: Simple, Multiple, Ridge, Lasso, Elastic Net
- Classification: Logistic Regression, Decision Tree, Random Forest, SVM, Naïve Bayes
- Ensemble Models: AdaBoost, GBM, XGBoost
- Gradient Descent, Regularization, Bias-Variance Trade-off

- Feature Engineering: Missing Values, Encoding, Scaling, Outliers
- Evaluation Metrics: RMSE, MSE, R^2, F1-Score

Unsupervised Learning

- K-Means, Hierarchical Clustering, PCA
- Association Rule Mining, KNN Classifier



Model Evaluation & Selection

- Confusion Matrix, ROC Curve, AUC
- Accuracy, Precision, Recall, Sensitivity & Specificity
- Cross-Validation, Grid Search, Bootstrapping

DEEP LEARNING & NEURAL NETWORKS

Explore the power of neural architectures and intelligent systems.

Topics Covered:

- Introduction to Neural Networks and Deep Learning
- Strengths & Limitations of Deep Learning
- Perceptron & Multi-Layer Perceptron (MLP)
- Activation & Loss Functions
- Gradient Descent Optimization, Dropout & Regularization
- CNN (Convolutional Neural Networks): Architecture, Face Recognition
- RNN (Recurrent Neural Networks): LSTM, Bi-Directional LSTM
- GAN (Generative Adversarial Networks)
- ANN (Artificial Neural Networks)

NATURAL LANGUAGE PROCESSING (NLP)

Teach computers to understand and generate human language.

Topics Covered:

- Introduction to NLP
- Stop Words, Tokenization, Text Cleaning

- Stemming & Lemmatization
- Bag-of-Words & TF-IDF Models
- Word Vectorization & POS Tagging
- Named Entity Recognition (NER)
- Sequential Data and RNNs
- Vanishing & Exploding Gradient in RNNs
- LSTM & GRU Networks
- Attention Mechanism & Neural Machine Translation
- Transformers, BERT, XLNet

COMPUTER VISION

Build vision-based AI models for recognition and detection.

Topics Covered:

- Introduction to CNNs and Image Processing
- Convolution, Pooling & Padding
- Forward & Backward Propagation in CNN
- Artificial Neural Networks
- Transfer Learning
- Object Detection: YOLO, R-CNN, SSD
- Face Recognition Systems



ARTIFICIAL INTELLIGENCE & GENERATIVE AI

Understand AI evolution and new-age Generative models.

Topics Covered:

- AI vs. ML vs. DL vs. GenAI
- Supervised vs. Unsupervised Learning
- Discriminative vs. Generative AI
- Generative Models: GANs, Diffusion Models

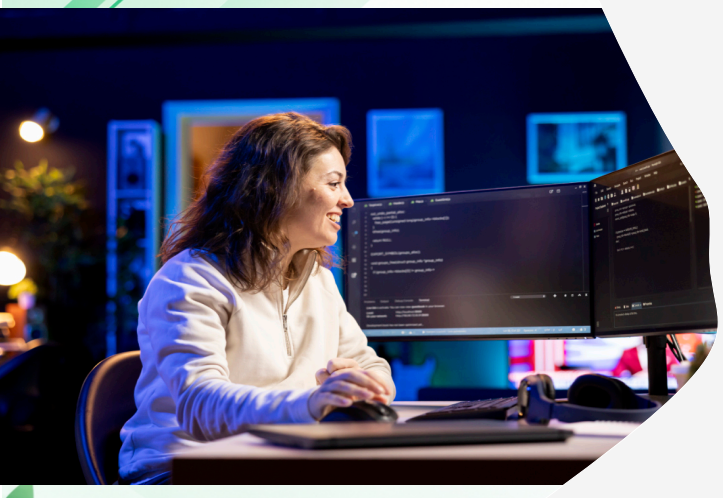
- Large Language Models (LLMs): BERT, GPT
- Attention Mechanism & Word Vectors
- Business Applications of ML, DL & GenAI
- Hands-on with Bing AI, ChatGPT, DALL·E

SQL FOR DATA SCIENCE

Learn to query and manage structured data.

Topics Covered:

- Introduction to RDBMS & Database Concepts
- **SQL Sub-Languages:**
  - DDL: Create, Alter, Drop
  - DML: Insert, Update, Delete
  - DQL: Select
  - TCL: Commit, Rollback
  - DCL: Privileges, Security
- SQL Operators: IN, BETWEEN, LIKE, IS NULL
- Joins: Inner, Outer, Cross, Full
- Subqueries: Single, Multi-row, Correlated, Nested
- Transaction Management and Database Security



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