

## DATA SCIENCE with PYTHON

### COURSE CONTENT

#### PYTHON

##### Introduction

- ❖ Python and its uses
- ❖ Installing Python and PyCharm
- ❖ Hello world Program in Python
- ❖ Some mathematical operations in Python
- ❖ Strings in Python
- ❖ Accepting Input from the user in Python
- ❖ Performing operations on a string in Python
- ❖ Variables in Python
- ❖ In place operators in Python
- ❖ Writing the first program in PyCharm

##### Control structures in Python

- ❖ If statement
- ❖ Elif statement
- ❖ Introduction to list in Python
- ❖ List operations in Python
- ❖ List functions in Python
- ❖ Range function in Python
- ❖ Code reuse and functions in Python
- ❖ For loop in Python
- ❖ Boolean logic in Python
- ❖ While Loop in Python

##### Functions and Modules in Python

- ❖ Passing arguments to functions
- ❖ Making function return value
- ❖ Passing functions as arguments
- ❖ Modules

##### Exception Handling and File Handling in Python

- ❖ Errors and Exceptions
- ❖ Exception handling
- ❖ Finally Block
- ❖ File Handling
- ❖ Reading Data from file
- ❖ Adding data to file
- ❖ Appending to a file

##### Some More Types in Python

- ❖ Dictionaries
- ❖ Dictionary Functions
- ❖ Tuples
- ❖ List Slicing
- ❖ List Comprehension
- ❖ String Formatting
- ❖ String functions
- ❖ Numeric Functions

##### Functional Programming in Python

- ❖ Functional Programming
- ❖ Lambdas
- ❖ Map
- ❖ Filters
- ❖ Generators

##### Object Oriented Programming in Python

- ❖ Object Oriented Programming
- ❖ Inheritance
- ❖ Recursion
- ❖ Sets
- ❖ Itertools
- ❖ Operator Overloading
- ❖ Data Hiding

##### Regular Expressions in Python

- ❖ Regular Expressions
- ❖ Search and Find all
- ❖ Find and Replace
- ❖ The dot metacharacter
- ❖ Caret and Dollar metacharacter
- ❖ Character class
- ❖ Star metacharacter
- ❖ Group

#### Business Statistics

##### Introduction to Analytics

- ❖ Analytics Industry Overview
- ❖ Application of Analytics & Challenges to Analytics

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### Data Understanding

- ❖ Data Types
- ❖ Summarizing Techniques
- ❖ Five Number Summary
- ❖ Histograms & Ogives
- ❖ Box Plots
- ❖ Scatter Diagram
- ❖ Frequency Tables and Distribution
- ❖ Cumulative Distributions

### Measure of Central Tendency, Dispersion and its importance

- ❖ Understanding Range
- ❖ Inter Quartile Range
- ❖ Variance
- ❖ Standard Deviation

### Probability and Probability Distribution

- ❖ Introduction to Probability
- ❖ Types of Probability
- ❖ Probability Rules
- ❖ Probability Distribution
- ❖ Random Variables
  - Discrete Random Variable
  - Continuous Random Variable
- ❖ Discrete Distributions
  - Binomial Distribution
  - Negative Binomial Distribution
  - Geometrical Distribution
  - Poisson Distribution
- ❖ Continuous Distribution
  - Normal Distribution
  - Standard Normal Distribution
  - Z scores

### Sampling and Sampling Distribution

- ❖ Introduction to Sampling
- ❖ Random Sampling & Non Random Sampling
- ❖ Sampling Techniques
  - Stratified Sampling Method
  - Cluster Sampling Method
- ❖ Sampling Distribution
- ❖ Central Limit Theorem
- ❖ Standard Error Concept

### Statistical Inference

- ❖ Estimation
  - Introduction

- Point Estimates and Interval Estimates
- Calculating Interval Estimates using 'Z' table
- Introduction to 't' distribution
- Degrees Of Freedom
- Calculating Interval Estimates using 't' table
- Confidence Intervals with t & z distributions
- Determining Sample Size in Estimation

### Hypotheses Testing

- ❖ Introduction
- ❖ Testing Procedure
- ❖ Testing Hypotheses
- ❖ One Sample Test & Two Sample Tests
  - Z test
  - t test
  - One Tail & Two Tail Test
  - Dependent & Independent Samples
- ❖ Concept of p-value
- ❖ ANOVA
  - Introduction
  - F distribution
  - One way ANOVA
  - Two Way ANOVA
- ❖ CHISQ Test
- ❖ Some Non Parametric Tests
- ❖ Man-Whitney U Test
  - Wilcoxon Test
  - Kruskal Wallis Test

### Simple Regression & Correlation

- ❖ Introduction
- ❖ Dependent and Independent Variables
- ❖ Correlation Analysis
  - Spearman Correlation
  - Pearson Correlation
- ❖ Estimation in Regression
- ❖ Least Squared Method
- ❖ Standard Error Of Line
- ❖ Finding Regression Equation
- ❖ Hypotheses Testing for estimates
- ❖ Limitations & Errors in Simple Regression Analysis
- ❖ Multiple Regression analysis:
  - Introduction
  - Multicollinearity

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- ❖ Fitting the model
- ❖ Regression Assumptions
- ❖ Residual Analysis for Regression Assumptions
- ❖ Transformation Of Variables

### Logistic Regression

- ❖ Understanding Logistics Regression
- ❖ Difference between linear and logistics regression
- ❖ Odds Ratio
- ❖ Logit Model
- ❖ Building Models
- ❖ ROC concept
- ❖ Model Fitting
- ❖ Evaluation of goodness of fit
- ❖ Model Suitability

### Cluster Analysis

- ❖ Introduction to Cluster Analysis
- ❖ Clustering Algorithm
  - Hierarchical Clustering Procedure
    - Agglomerative Clustering Technique
  - Non Hierarchical Procedure
    - K-means
- ❖ Evaluation of Clustering Results
- ❖ Application

### Factor Analysis

- ❖ Definition and examples
- ❖ Factor Analysis
- ❖ Communality
- ❖ Rotation Of Factors
- ❖ Implementation
- ❖ Evaluation

## MACHINE LEARNING USING PYTHON

- ❖ Introduction
- ❖ Environment Set-up
- ❖ Jupyter Overview
- ❖ Python for Data Analysis
  - Welcome to the Numpy
  - Numpy Arrays
  - Quick Note on Array Indexing
  - Numpy Array Indexing

- Numpy Operations
- ❖ Numpy Exercises
- ❖ Python for Data Analysis
  - Welcome to Pandas
  - Series
  - Data Frames
  - Missing Data
  - Groupby
  - Merging, Joining and Concatenating
  - Operations
  - Data Input and Output
- ❖ Pandas Exercise
- ❖ Python for Data Visualization
- ❖ Welcome to Matplotlib
  - Matplotlib
  - Matplotlib exercises
- ❖ Python for Data Visualization
  - Introduction to Seaborn
  - Distribution Plots
  - Categorical Plots
  - Matrix Plots
  - Grids
  - Regression Plots
  - Style and Color
- ❖ Seaborn Exercise
- ❖ Python for Data Visualization – Pandas Built-in Data Visualization
- ❖ Pandas Data Visualization Exercise
- ❖ Python for Data Visualization – Plotly and Cufflinks
- ❖ Python for Data Visualization – Geographical Plotting
- ❖ Introduction to Geographical Plotting
  - Choropleth Maps
  - Choropleth Exercises
- ❖ Capstone Project
- ❖ Introduction to Machine Learning
- ❖ Linear Regression
  - Theory
  - Model selection update for Scikit Learn 0.18
  - Linear Regression with Python
- ❖ Linear Regression Project
- ❖ Cross Validation and Bias-Variance Trade-off
- ❖ Logistic Regression
  - Theory
  - Logistic Regression with Python
- ❖ Logistic Regression Project
- ❖ K Nearest Neighbors

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- Theory
- KNN with Python
- ❖ KNN Project
- ❖ Decision Trees and Random Forests
  - Introduction to Tree Methods
  - Decision Trees and Random Forest with Python
- ❖ Decision Trees and Random Forest Project
- ❖ Support Vector Machines
  - Theory
  - Support Vector Machines with Python
- ❖ SVM Project
- ❖ K Means Clustering
  - Theory
  - K Means with Python
- ❖ K Means Project
- ❖ Principal Component Analysis
  - Theory
  - PCA with Python
- ❖ Recommender Systems
  - Theory
  - Recommender Systems with Python
- ❖ Natural Language Processing
  - Theory
  - NLP with Python
- ❖ NLP Project
- ❖ Neural Nets and Deep Learning
  - Neural Network Theory
  - Welcome to Deep Learning
  - What is TensorFlow?
  - Changes with TensorFlow
  - TensorFlow Installation
  - TensorFlow Basics
  - MNIST with Multi-Layer Perceptron
  - TensorFlow with ContribLearn
- ❖ TensorFlow Project

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