

# Machine Learning Specialist

**Data Analysis, ML , Deep Learning & AI**

**with Python**

**6 Months (3 hours / day)**

Day 1

## **1. Introduction to Python**

- What is Python
- The application areas of Python
- Download and install Python
- Execute Python program from command prompt and using IDLE
- Save programs with .py extension and execute it from prompt

## **2. Python Basics**

- Data types and variables
- Operators and operator precedence
- Data type conversions
- Command line argument
- Data input
- Comments

### **3. Python Flow Control**

- If statement
- If.. elif.. else statement

Day 2

- While loop
- For loop
- Break & continue
- Else clause

Day 3,4

### **4. Introduction to Python IDE – PyCharm**

### **5. Python Sequences**

- Range
- String
- List
- Tuple
- Dictionary
- Set

### **6. Shallow and deep copy**



Day 5,6,7

### **7. Functions and modules**

- What is function
- Define a function
- Pass arguments
- Arguments with default values
- Arbitrary arguments
- Local and global variables
- Return a value from function
- Return multiple values
- Documentation Strings

### **8. Python built in functions**

- Mathematical functions
- Random number functions
- Mathematical constants

### **9. Recursive functions**

Day 8,9

### **10. Python Modules**

- What is module?
- Import module using import statement
- Namespaces and scoping
- Dir(), globals(), locals() and reload()

## **11. File Handling**

- Reading
- Writing
- File manipulations
- Directories

Day 10

## **12. Exception Handling**

- What is exceptions
- Python built-in exceptions
- Try
- Except
- Finally
- Raise exceptions
- User defined exception
- Assertions

Day 11

## **13. Python classes and objects**

- Class definition
- Creating objects
- Constructors
- Accessing attributes
- Build-in class attributes
- Destructors



- Inheritance (Single, Multiple, Multilevel)
- Overriding
- Operator Overloading
- Data hiding

Day 12

#### **14. Regular Expressions**

- Match()
- Search()
- Search and replace
- Modifiers
- Patterns
- Character classes
- Repetitions

Day 13

#### **15. Multithreading**

- What is a thread?
- What is multithreading?
- Create and start a new thread
- The Threading module
- Thread synchronization

Day 14

### **16. Date and Time in Python**

- The DateTime module
- Time tuple
- The Time module
- Date object
- The Calendar module

Day 15,16,17,18

### **17. Database programming**

- With SQLite
  - Installing SQLite browser
  - Creating database
  - CRUD operations
- With MySQL
  - MySql datatypes
  - CRUD operations
  - Subquery
  - Join
  - Aggregate functions
  - Procedures

Day 19, 20

### **18. Python GUI Programming with Tkinter**

- Widgets
- Geometry managers / layout managers
- Variable classes
- Events and binds

Day 21

- Evaluation Test

Day 22

### **19. Packages**

- Creating packages
- Installing packages using PIP

### **20. Functional Programming**

- Iterators
- Generators
- The lambda construct
- Comprehensions
- Map, reduce and filter



Day 23 - 25

### **Basic Project**

Day 26 - 29

## **21. Python Packages for Data Analysis and Visualization**

- NumPy
  - Installation
  - Creating arrays
  - Performing array operations
  - Indexing and selection
  - Slicing
  - Broadcasting
  
- Pandas
  - Installation
  - Data Structure- series data frame
  - Reading files - csv, excel (datasets)
  - Data operations
    - Row and column selection
    - Filter data
    - Sorting
    - Null values
    - String operations
    - Count values





- Group by
- Index
  
- Matplotlib
  - Installation
  - Basic commands
  - Plot Bar and Scatter Diagrams
  - Subplot

Day 30,31,32, 33, 34, 35

## **22. Statistics and Algebra for machine Learning**

- Descriptive Statistics
  - Frequency Distribution – Data representation and visualization
  - Measures of central tendency – Mean Median Mode
  - Measures of Dispersion – Range, Quartile Deviation, Standard Deviation
  - Skewness and Kurtosis
  
- Probability
  - Definition of Probability (Classical, Frequency, Axiomatic)
  - Conditional Probability
  - Independence of events
  - Bayes Theorem
  - Random Variables
  - Probability Distribution



- Distribution function
- Mathematical Expectation, Variance, Moments, Moment Generating function
- Standard Distributions – Binomial, Bernoulli, Uniform, Normal
- Bi-variate Probability distribution
- Marginal and Conditional Probability Distribution
  
- Inferential Statistics
  - Probability Distribution
  - Hypothesis Testing
  - Correlation and Regression Analysis
  - Analysis of Variance
  
- Linear Algebra
  - Principal Component Analysis (PCA)
  - Singular value Decomposition (SVD)
  - Matrices and Matrix Operations
  - Transpose, Symmetric Matrices, Orthogonalization and Orthonormalization
  - Inverse of Matrix, Determinant of Matrix
  - Rank of Matrix, Eigen decomposition of Matrix
  
- Algebra of Vectors
  - Scalar or dot product, Vector or Cross product
  - Scalar triple product



- directional cosines and ratios
- Vector Space

Day 36, 37, 38

#### **24. Data Analysis**

- T -testing
- Hypothesis Testing
- Significance Testing-P value
- Regression and Anova
- Visualization using matplotlib
- Example: Analyzing a sample data given in csv format

Day 39, 40, 41, 42

#### **25. Machine learning**

- Introduction to machine learning
- Types of machine learning
  - Supervised machine learning
  - Unsupervised Machine learning
- Machine learning models
- Supervised Learning Algorithms
  - Linear regression
  - Logistic Regression
  - Decision tree
  - Naïve Bayes
  - KNN



- SVM
- Unsupervised Learning Algorithms
  - K means –Clustering
- Implementation of machine learning using python
  - Scikit –learn
  - Implementing different Algorithms
  - Analyzing the algorithm using accuracy score and confusion matrix

Day 43 - 47

## **26. Project (5 days)**

Day 48, 49, 50

## **27. Python Web Development using Django - An Introduction**

- Web server
- Web client
- HTML

Django

- Installation
- Configuration
- Urls and Views
- App creation
- Model
- Database connection using MySQL



Day 51 onward

Deep Learning

- Neural Networks
- Convolutional Neural Networks
- Keras library for deep learning in Python
- Recurrent Neural Networks
- Generative Adversarial Networks
- Deploying a Sentiment Analysis Model
- Tensor Flow for Neural Networks & Deep Learning
- PyTorch

Visualization

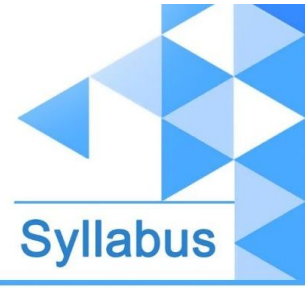
- Visualizing features & kernels
- TensorBoard – Visualizing Learning, Graph Visualization
- Synthesis and style transfer
- Case Study: Visualizing a convoluted neural network

Natural Language Processing

- Statistical NLP and text similarity
- Syntax and parsing techniques
- Text summarization techniques
- Semantics and Generation

Artificial Intelligence

- Speech Recognition



- Heuristic Search
- Genetic algorithms