



## Skill - Innovate – Grow

### Training Division

#### **Course Name: Machine Learning & Industrial Python**

**Course Description:** A beginner to advanced level course to help you learn Data Processing, Machine Learning Arena, effective and efficient Machine Learning techniques using Python to make your coding journey easier.

#### **A. Topics covered: Python programming**

##### *1. Python Basics*

Know about background of Python, why do we need Programming Languages, Python ecosystem Installation and First Program in Python, Comments in Python etc.

##### *2. Variables and Data Types*

Learn about variables in Python, Swap two Variables, Tuples, Set, Dictionary in Python, Type conversion in Python etc.

##### *3. Input and Output in Python*

Get to know all about inputs, outputs and print in Python.

##### *4. Operators*

Get to know all about Arithmetic Operators, Logical Operators, Membership Test Operators, Bitwise Operators, Find Last Digit in Python etc.

##### *5. Flow Control*

Get to know all about if, else and elif, Even-Odd, Leap Year, Calculator Program in Python etc.

##### *6. Loops*

Get to know all about For loops, While loops, Nested loops, Break & Continue statements, Printing Triangle Pattern, Factorial, GCD, LCM, Fibonacci numbers, Prime numbers etc.

##### *7. Functions*

Get to know all about introduction to Functions, Applications of Functions, Default Arguments, Keyword Arguments, Parameter Passing in Python, Global Variables in Python etc.

##### *8. String*

Get to know all about Strings in Python, Escape Sequences and Raw Strings, Formatted String in Python, String Operations, Palindrome, Reverse a String, Decimal to binary etc.

## 9. Lists

Get to know more about Slicing (List, Tuple and String), Comprehensions in Python, Average or Mean of a List, Count Distinct Elements in a List, Sorted list etc.

## 10. File Input-Output

Read input from file, perform various operations, store output in file.

## B. Topics covered: Machine Learning

### 1. Basics for Machine Learning ecosystem

Basics of Linear Algebra, Calculus, Optimization theory, Statistics & Probability for Machine Learning, Gradient Descent, Batch Gradient Descent, Stochastic Gradient Descent.

### 2. Machine Learning Understanding

Get answers to all Machine Learning related questions, what is ML, Data in ML, Anaconda, Jupyter Notebook etc, Data visualization using Python, Supervised, Unsupervised, Semi-supervised Learning.

### 3. The Bias-Variance trade-off

What is Bias and Variance, Bias error, Variance error, Bias-Variance trade-off.

### 4. Overfitting and Underfitting

Generalization in ML, Statistical fit, Overfitting in ML, Underfitting in ML, A good fit in ML, How to limit overfitting.

### 5. Handling Data

Learn about NumPy, Pandas, Matplotlib, Array Dimension, Categorical Data, Data Splitting, Data Scaling, Handling Missing Data etc.

### 6. Load Machine Learning Data

Load CSV files with the Python standard library, Load CSV files with NumPy, Load CSV files with Pandas.

### 7. Statistical Performance Metrics

Confusion Matrix, Precision, Recall, F1-Score, Kappa measure, micro-Precision, micro-Recall, micro-F1 Score.

### 8. Prepare Data for Machine Learning

Need for data pre-processing, Data transforms, Data rescaling, standardize data, Normalize data, Binarize data.

### 9. Regression

Learn about Linear Regression, Polynomial Linear Regression, Support Vector, Decision Tree, Random Forest etc.

### 10. Classification

Binary-class classification, Multi-class classification, Multi-label classification, Know all about Logistic Regression, K-NN Intuition & Code, Naive Bayes, Linear Vector

Quantization, Support Vector Machines, Neural Networks, Decision Tree Intuition, Decision Tree code, Random Forest Code, etc.

#### 11. *Clustering*

Know all about K-Means Algo, K-Means Algo 2 Elbow Method, Agglomerative intuition & Code, etc.

#### 12. *Data Dimensionality*

Learn about Feature Selection - Correlation Matrix & ExtraTreeClassifier, Chi Square Test Intuition, K-Fold, Principal Component Analysis, TSNE, etc.

#### 13. *Association Mining*

Get to know all about Association Rule Mining Intuition, Apriori Code, etc.

#### 14. *Natural Language Processing*

Get to know all about Natural Language Processing Intuition, NLP, etc.

#### 15. *Improve Performance with Ensembles*

Combine models into ensemble predictions, Bagging algorithms, Boosting algorithms, Voting ensemble.

#### 16. *Ensemble Algorithms*

Bagging and Random Forest, Bagged Decision Tree, Boosting and AdaBoost.

#### 17. *Improve performance with Algorithm Tuning*

ML algorithm parameters, Grid search parameter tuning, Random search parameter tuning.

#### 18. *Graph Neural Networks*

Graph Fourier Transform, Spectral-based GNN layers, Spatial-based GNN layers, Pooling Schemes for Graph-level Representation Learning, Attacks and Robustness of Graph Neural Networks, Scalable Learning For Graph Neural Networks, Self-supervised Learning for Graph Neural Networks.

### **C. Live Projects**

Projects will be a part of AI & Data Science to consolidate your learning. It will ensure that you have real-world experience in Data Science.

#### 1. *Technology*

Python and its associated libraries

- NumPy
- SciPy
- Matplotlib
- Pandas

#### 2. *Get an insight about the projects –*

- Text Encoding Decoding, Text Summarisation
- Face recognition system
- AirBnB Case Study
- Spam detection and hate speech classification
- Medical documents summarization

- Recommendation system design
- Building intelligent Chatbot
- Human Activity Recognition
- Handwriting Recognition
- Music Genre Classification
- Automatic Image's Caption Generator
- Content based image retrieval
- Face detection
- AI Chatbot
- Restaurant revenue prediction
- Work with Pyspark & RDD
- Build the book remainder application
- Census project

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