



## **Python Programming**

### **Machine Learning Deep Learning concepts**

#### **Course Description**

Python is an easy-to-use interpreted language that has steadily gained in popularity over the last few years in a wide spectrum of applications, ranging from AI to Web Services. Python is also powerful, portable, object-oriented open source programming language for writing standalone programs, quick scripts, and prototypes for large applications.

This course provides an in-depth and hands-on introduction to the Python programming language, as well as the most common Python application domains and tool.

Machine learning and Deep learning are types of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed. This course provides a broad introduction to machine learning. We will present algorithms and approaches in a variety of topics like statistical supervised and unsupervised learning. We will walk through the necessary steps of building a machine learning project and run multiple exercises which demonstrates the process. Code samples and exercises will use Python.

#### **Target Population**

- Data analysts
- Developers

## Pre-requisites

- Knowledge of basic computer science principles and skills
- Recommended basic familiarity with building and using data pipelines

## Course Topics

### Python

#### Module 1 – Introduction to Python

- History of python
- Why python?
- Python is an OO language
- Python is a dynamic language (what does that mean?)
- Basic OO principles (for those who need them)
- Comparison of python with other programming languages

#### Module 2 - Your first python program

- How to install the python programming environment
- Your first script
- Running your script
- IDEs and tools for python

#### Module 3 - Types and operators

- Why do we need basic types
- Numbers
- Strings
- Lists
- Dictionaries
- Tuples
- Files
- Object properties

#### Module 4 - Basic statements

- Assignments
- Expressions
- Print
- Conditionals
- Loops (while, for)

## Module 5 - Functions

- Why do we need functions
- Basics
- Scoping
- Argument passing

## Module 6 - Modules

- Why do we need modules
- Basics
- Namespaces
- Importing modules
- Reloading modules

## Module 7 - Exceptions

- Why do we need exceptions
- Basics
- How are exceptions used
- Catching modes

## Module 8 - Using modules

- Built in python modules
- Downloading, installing and using modules off the net
- Writing your own module and uploading it

## Machine Learning and Deep Learning

### 1. Introduction:

- Why Machine Learning?
- Problems Machine Learning Can Solve
- Knowing Your Task and Knowing Your Data
- Main Challenges of Machine Learning
- Essential Libraries and Tools

### 2. Introduction to the Python libraries for data analysis

- The NumPy and SciPy packages
- The Matplotlib package
- The Pandas package

### 3. End-to-End Machine Learning Project

- Working with Real Data

- Discover and Visualize the Data to Gain Insights
- Prepare the Data for Machine Learning Algorithms
- Select and Train a Model
- Fine-Tune Your Model
- Using the scikit-learn package

#### 4. Supervised Learning:

- Classification and Regression
- Generalization, Overfitting, and Underfitting
- Supervised Machine Learning Algorithms

#### 5. Unsupervised Learning and Preprocessing:

- Types of Unsupervised Learning
- Challenges in Unsupervised Learning
- Preprocessing and Scaling
- Dimensionality Reduction, Feature Extraction, and Manifold Learning
- Clustering

#### 6. Representing Data and Engineering Features:

- Categorical Variables
- Binning, Discretization, Linear Models, and Trees
- Univariate Nonlinear Transformations
- Automatic Feature Selection

#### 7. Model Evaluation and Improvement:

- Cross-Validation
- Grid Search
- Evaluation Metrics and Scoring

#### 8. Algorithm Chains and Pipelines:

- Parameter Selection with Preprocessing
- Building Pipelines
- Using Pipelines in Grid Searches
- The General Pipeline Interface
- Grid-Searching

#### 9. Concepts of Neural Networks and Deep Learning

- Running with TensorFlow and Keras
- Introduction to Artificial Neural Networks
- Training Deep Neural Nets