*Mastering Machine Learning using Python*

*Duration : 3 days*

*Prerequisites : Programming experience in any language*

*Mode : Heavily hands on, based on case studies.*

*Lab Setup : Anaconda 3.7*

* What is Machine Learning, Data Science?
* Types of Machine Learning
* Practical Machine Learning use cases.

*Crash Course in Python*

* The Basics:
  + Functions,Modules
  + Lists,Strings,Tuples,Dictionaries,Sets
* Intermediate:
  + Enumerate
  + Sorting
  + List Comprehensions,
  + Generators & Iterators,
  + Exceptions,
  + Map, Reduce, Filter
  + zip & Argument Unpacking
* Data visualisation:
  + matplotlib,
  + Bar Charts,
  + Line Charts,
  + Scatterplots

*Math refresh for Machine Learning*

* Linear Algebra:
  + Vectors
  + Matrices

*Statistics Essentials*

* Statistics:
  + Central Tendencies
  + Standard Deviation
  + Dispersion
  + Correlation
  + Correlation and Causation

*Exploratory Data Analysis*

* Types of Data
* Getting Data:
  + Reading Files (Basics, Delimited Files)
  + Scraping the Web
* Working with Data:
  + Cleaning and Munging
  + Manipulating Data
  + Rescaling

*ML Python Libraries*

* NumPy, Pandas, Sci-kit Learn

*Machine Learning*

* Getting Started:
  + Modeling,
  + Overfitting and Underfitting
  + Correctness,
  + Bias-Variance Trade-off,
  + Feature Extraction and Selection
  + Curse of Dimensionality
* Steps involved in an actual ML Project:
  + Handling the complexities of real data
  + Data wrangling
  + Visualising data to gain insights
  + Data Preparation
  + Model selection
  + Model training
  + Model testing
  + Fine-tuning of model
  + Launch into production
* Simple Linear Regression:
  + The Model
  + Cost Functions
  + Sum of Least Squares
  + Variable Selection
  + Model Development and Improvement
  + Model Validation and Diagnostics
  + Case studies
* Multivariate Regression:
  + The Model
  + Fitting the Model
  + Interpreting the Model
  + Goodness of Fit
  + Digression
  + Standard Errors of Regression Coefficients
  + Regularization
  + Cross Validation
  + Case studies
* Classification:
  + What are classification problems and types of classification algorithms
  + Variable Selection Methods
  + Forward, Backward and Stepwise
  + Measurements of Accuracy
  + Interpretation and Implementation
* Logistic Regression:
  + The Problem,
  + The Logistic Function,
  + Applying the Model,
  + Goodness of Fit
  + Multiclass classification
  + Case studies
* Support Vector Machines:
  + Linear SVM Classification - Soft Margin Classification
  + Nonlinear SVM Classification - Polynomial Kernel
  + Adding Similarity Features
  + Gaussian RBF Kernel
  + Computational Complexity
  + SVM Regression
  + Case studies
* Decision Trees:
  + What is a Decision Tree?
  + Entropy
  + Entropy of a Partition
  + Creating a Decision Tree
  + Putting it All Together
  + Case studies
* CART Regression Trees
* Random Forests
* Tree Pruning
* Performance Metrics: Confusion Matrix
* Receiver Operating Characteristic AUC and Precision Recall AUC
* Clustering:
  + The Idea,
  + The Model
  + Proximity Matrices
  + Choice of attributes
  + Units of measure of attributes
  + Importance of Scaling
  + Determining number of Clusters
  + Choosing K
  + K-means Clustering
  + Bottom-up Hierarchical Clustering
  + Practical Issues in Clustering
  + Case studies
* Dimensionality Reduction
  + PCA
  + Other ways of dimensionality reduction
* What next
  + Understanding Deep Learning
    - How Google Photos classifies your photos
  + Understanding Reinforcement Learning
    - How does a self driving car work