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

Course Summary:

This course provides a hands-on introduction to machine learning using python. The course covers supervised learning and unsupervised learning. After covering the classical machine learning using linear regression, logistic regression, clustering the course moves on to more modern methods like gradient descent, decision trees and support vector machines.

- 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
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- What next
    - Understanding Deep Learning

        - How Google Photos classifies your photos
    - Understanding Reinforcement Learning
        - How does a self driving car work