

# Machine Learning - Course Content

Unique Features: **None of online or offline institutes offer this course**

1. Comes at **very less cost** compared other online or offline institutes
2. Covers the **complete life cycle of Machine Learning Solution** right from the data analysis till model deployment.
3. Covers the wide range of content or knowledge required such as **Mathematics (Stats and Probability), Python, Data Analysis and Machine Learning Algorithms** to build a highly efficient models.
4. The main goal of this course is **NOT** to build a Machine Learning prototype rather to equip students with required knowledge to **build a scalable production grade Machine Learning solution.**
5. Student will get an opportunity to **master The #1 open-source machine learning platform for the enterprise [H2O](#).**

## 1. Getting Started (Level of Difficulty: Basic)

### ❖ Topics:

1. Introduction to the Course
2. Setting up the required softwares
  - Python 3.x
  - Anaconda (Spyder IDE)
  - Jupyter Lab
3. Python Programming
  - Data Types
  - Data Structures
  - Conditional Statements
  - Functions
  - List Comprehensions
  - Lambda
  - Classes

### ❖ Assignment on Python Programing

## 2. Statistics (Level of Difficulty: Intermediate)

### ❖ Topics:

1. What is Statistic?
2. What are various types of Statistics?
  - a. Descriptive Statistics
    - i. Measures of Central Tendency
      1. Mean, Median and Mode
    - ii. Measures of Spread
      1. Range

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2. Standard Deviation
    3. Inter Quartile Range
    4. Variance
  - b. Inferential Statistics
    - i. What is test?
    - ii. Confidence Interval
3. Terms used in Statistics
4. Types of Variables
  - a. Quantitative
    - i. Discrete
    - ii. Continues
  - b. Qualitative
5. Levels of Measurement
  - a. Nominal
  - b. Ordinal
  - c. Interval
  - d. Ratio
6. Probability Density Function and Probability Mass Function
7. Common Data Distributions
  - a. Discrete
    - i. Symmetric
      1. Binomial Distribution
      2. Uniform Discrete Distribution
    - ii. Asymmetric a.k.a Skewed
      1. Geometric Distribution
      2. Negative Binomial Distribution
      3. Hypergeometric Distribution
  - b. Continues
    - i. Symmetric
      1. Uniform a.k.a Multimodal Distribution
      2. Triangular Distribution
      3. Normal Distribution
      4. Cauchy Distribution
    - ii. Asymmetric or Skewed
      1. Exponential Distribution
      2. Lognormal Gamma Weibull Distribution
      3. Minimum Extreme Distribution

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## ❖ Hands On:

### 1. Exploratory Data Analysis of Boston Housing Prices Data set

### 3. Probability (Level of Difficulty: Intermediate)

#### ❖ Topics:

1. What is Probability?
2. What is Conditional Probability?
  - What are the properties of conditional probability?
3. Multiplication rule of Probability
4. What is a Random Experiment?
5. What is a Sample Space?
6. What is an event?
7. What are various types of events?
  - Simple a.k.a Elementary Event
  - Compound Event
  - Certain Event
  - Impossible Event
  - Equivalent Events a.k.a Identical Events
  - Equally Likely Events
  - Mutually Exclusive Events
  - Independent Events
8. Bayes Theorem
  - Partition of Sample Space
  - Theorem of total probability
  - What is Hypothesis?
  - What is Priori Probability?
  - What is Posteriori Probability?
9. What is a Random Variable?
  - Probability Distribution of a Random Variable
  - Mean of a Random Variable
  - Variance of a Random Variable
10. Bernoulli Trials and Bernoulli Distribution

### 4. Machine Learning Foundations (Level of Difficulty: Advanced)

#### ❖ Topics:

#### 1. Overview

1. Introduction
2. Decision Trees
3. Naive Bayes
4. Gradient Descent
5. Linear Regression
6. Logistic Regression

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7. SVM
8. Neural Networks
9. Kernel Method
10. Recap and Exercise
11. K-means Clustering
12. Hierarchical Clustering
13. Conclusion

## **2. Model Selection a.k.a Hyper Parameter Tuning**

## **3. Testing Models**

## **4. Evaluation Metrics**

1. Confusion Matrix
2. Accuracy
3. Precision
4. Recall
5. F1 Score
6. F-beta Score
7. ROC Curve
8. Regression Metrics

## **5. Error Detection**

1. Model Complexity Graph
2. K Fold Cross Validation
3. Learning Curves

## **6. Outro**

## **5. H2O Machine Learning Framework** (The #1 open-source machine learning platform for the enterprise)

### ❖ **Topics**

1. Introduction to H2O and Installation
2. Data Import and Export
3. Common Model Parameters
4. Model Building and Evaluation
5. Hyper Parameter Tuning
6. Model Export

### ❖ **Hands On Project:**

1. Customer Churn Prediction

## **6. Mastering Supervised Learning (Level of Difficulty: Advanced)**

### ❖ **Topics:**

1. Supervised Learning Introduction
2. Introduction to Regression

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3. Decision Trees
4. Neural Networks
5. SVMs
6. Naive Bayes
7. Ensemble B&B

## ❖ Hands On Projects:

- Boston House Price Prediction
- Movie Rating Prediction
- Titanic Survival Exploration
- Email Spam Detector
- Find Donors for Charity
- Media Product Classification

## 7. Mastering Unsupervised Learning (Level of Difficulty: Advanced)

### ❖ Topics:

- I. Introduction to Unsupervised Learning
- II. Clustering
- III. Feature Scaling
- IV. Feature Selection
- V. PCA
- VI. Feature Transformation

### ❖ Hands On Projects:

- Customer Segmentation
- Topic Modelling

## 8. Capstone Project

*Note: If student completes all the Mini Projects and the Exercises mentioned in the course successfully, he/she will be equipped with enough hands on and experience by using which one can develop production level Machine Learning Solution.*