

Statistical Learning

Learning objectives

In this module, you will learn the basics of statistics including:

- Basics of statistics like mean (expected value), median and mode
- Distribution of data in terms of variance, standard deviation, and interquartile range; and explore data and measures and simple graphics analyses
- Basics of probability via daily life examples
- Marginal probability and its importance with respect to Machine Learning
- Bayes' theorem and conditional probability including alternate and null hypotheses

Topics

- Statistical Analysis Concepts
- Descriptive Statistics
- Introduction to Probability
- Bayes' Theorem
- Probability Distributions
- Hypothesis Testing and Scores

Hands-on

- Learning to implement statistical operations in Excel

Python for Machine Learning

Learning objectives

In the Python for Machine Learning module, you will learn how to work with data using Python:

- How to define variables, sets, and conditional statements
- The purpose of functions and how to operate on files to read and write data in Python
- Understand how to use Pandas - a must have package for anyone attempting data analysis with Python
- Data Visualization using Python libraries like matplotlib, seaborn and ggplot

Topics

- Python Overview
- Pandas for pre-Processing and Exploratory Data Analysis
- NumPy for Statistical Analysis
- Matplotlib and Seaborn for Data Visualization
- Scikit Learn

Introduction to Machine Learning

Learning objectives

Get introduced to Applied Machine Learning in Python via real-life examples and the multiple ways in which it affects our society. You will learn:

- Various algorithms and models like Classification, Regression, and Clustering.
- Supervised vs Unsupervised Learning
- How Statistical Modelling relates to Machine Learning

Topics

- Machine Learning Modelling Flow
- How to treat Data in ML
- Types of Machine Learning
- Performance Measures
- Bias-Variance Trade-Off
- Overfitting and Underfitting

Optimisation

Learning objectives

Gain an understanding of various optimisation techniques such as:

- Batch Gradient Descent
- Stochastic Gradient Descent
- ADAM
- RMSProp

Topics

- Maxima and Minima
- Cost Function
- Learning Rate
- Optimization Techniques

Supervised Learning

Learning objectives

In this module you will learn about Linear and Logistic Regression with Stochastic Gradient Descent via real-life case studies

- Hyper-parameters tuning like learning rate, epochs, momentum, and class-balance
- The concepts of Linear and Logistic Regression with real-life case studies
- How KNN can be used for a classification problem with a real-life case study on KNN Classification
- About Naive Bayesian Classifiers through another case study
- How Support Vector Machines can be used for a classification problem
- About hyp

Topics

- Linear Regression Case Study
- Logistic Regression Case Study
- KNN Classification Case Study
- Naive Bayesian classifiers Case Study
- SVM - Support Vector Machines Case Study

Hands-on

- Build a regression model to predict the property prices using optimization techniques like gradient descent based on attributes describing various aspect of residential homes
- Use logistic regression, build a model to predict good or bad customers to help the bank decide on granting loans to its customers
- Predict if a patient is likely to get any chronic kidney disease based on the health metrics
- Use Naive Bayesian technique for text classifications to predict which incoming messages are spam or ham

- Build models to study the relationships between chemical structure and biodegradation of molecules to correctly classify if a chemical is biodegradable or non-biodegradable

Unsupervised Learning

Learning objectives

Learn about unsupervised learning techniques:

- K-means Clustering
- Hierarchical Clustering

Topics

- Clustering approaches
- K Means clustering
- Hierarchical clustering
- Case Study

Hands-on

- Perform a real-life case study on K-means Clustering
- Use K-Means clustering to group teen students into segments for targeted marketing campaigns

Ensemble Techniques

Learning objectives

Learn the ensemble techniques which enable you to build machine learning models including:

- Decision Trees for regression and classification problems through a real-life case study
- Entropy, Information Gain, Standard Deviation reduction, Gini Index, and CHAID
- Basic ensemble techniques like averaging, weighted averaging and max voting
- You will learn about bootstrap sampling and its advantages followed by bagging and how to boost model performance with Boosting
- Random Forest, with a real-life case study, and how it helps avoid overfitting compared to decision trees

- The Dimensionality Reduction Technique with Principal Component Analysis and Factor Analysis
- The comprehensive techniques used to find the optimum number of components/factors using scree plot, one-eigenvalue criterion
- PCA/Factor Analysis via a case study

Topics

- Decision Trees with a Case Study
- Introduction to Ensemble Learning
- Different Ensemble Learning Techniques
- Bagging
- Boosting
- Random Forests
- Case Study
- PCA (Principal Component Analysis)
- PCA
- Its Applications
- Case Study

Hands-on

- Build a model to predict the Wine Quality using Decision Tree (Regression Trees) based on the composition of ingredients
- Use AdaBoost, GBM, and Random Forest on Lending Data to predict loan status and ensemble the output to see your results
- Apply Reduce Data Dimensionality on a House Attribute Dataset to gain more insights and enhance modelling.

Recommendation Systems

Learning objectives

Learn to build recommendation systems. You will learn about:

- Association Rules

- Apriori Algorithm to find out strong associations using key metrics like Support, Confidence and Lift
- UBCF and IBCF including how they are used in Recommender Engines

Topics

- Introduction to Recommendation Systems
- Types of Recommendation Techniques
- Collaborative Filtering
- Content-based Filtering
- Hybrid RS
- Performance measurement
- Case Study

Hands-on

- Build a Recommender System for a Retail Chain to recommend the right products to its customers