# Introduction to Machine Learning

## Introduction

1. Machine learning terminologies.
2. Supervised, unsupervised, and semi-supervised learning,
3. Parametric and nonparametric models.
4. Bias, variance, overfitting, and underfitting.

## Supervised Methods

1. Regression analysis: linear, multilinear, and logistic.
2. Classification: Decision Trees, CART, KNN, Naïve Bayes.
3. Support Vector Machines- Large margin classifiers, Nonlinear SVM, kernel functions, evaluating classifiers.
4. Confusion matrix – sensitivity, specificity. ROC curve, threshold selection with ROC curve, predictions, area under the ROC curve (AUC).
5. Ensemble Methods: Bagging, Random Forest, Boosting, Adaboost, Gradient Boosting, and XG Boost.

## Unsupervised Methods

1. Clustering – Introduction, k-mean clustering
2. Partitioned, hierarchical, and density-based clustering.

## Modelling

1. Parameter selection
2. K-fold Cross Validation
3. Dimensionality Reduction
4. Linear Discriminant Analysis
5. Principal Component Analysis

## Neural Network Representation

1. Deep learning
2. Perceptron
3. Multilayer Networks and Back Propagation Algorithms