

# MACHINE LEARNING-1

Course Code: 22CM1104

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## Course Outcomes:

At the end of the Course the student shall be able to

**CO1:** Understand the Basics of Learning methods in Machine learning.(L2)

**CO2:** Use various Supervised Learning techniques. (L3)

**CO3:** Apply Statistical approaches for multiple Learning techniques. (L3)

**CO4:** Construct models for Classification. (L3)

**CO5:** Build neural network models. (L3)

## UNIT-I

(8 Lectures)

**Introduction:** Towards Intelligent Machines, Well-Posed Machine Learning Problems, Examples of Applications in Diverse Fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured/Unstructured, Forms of Learning, Machine Learning and Data Mining.

**Learning Outcomes:** At the end of this unit students will be able to:

1. Summarize different learning problems with examples. (L2)
2. Explain various forms of learning. (L2)
3. Understand various data representations (L2)

## UNIT-II

(10 Lectures)

**Supervised Learning:** Learning from Observations, Bias and Variance, Occam's Razor Principle and Overfitting Avoidance, Heuristic Search in Inductive Learning, Estimating Generalization Errors, Metrics for Assessing Regression (Numeric Prediction) Accuracy, Metrics for Assessing Classification (Pattern Recognition) Accuracy, An Overview of the Design Cycle and Issues in Machine Learning.

**Learning Outcomes:** At the end of this unit students will be able to:

1. Understand the concepts of bias and variance.(L2)
2. Estimate generalization errors.(L2)
3. Use different metrics for Regression and Classification.(L3)

## UNIT-III

(12 Lectures)

**Statistical Learning:** Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in Learning Techniques, Bayesian Reasoning: A Probabilistic Approach to Inference, k-Nearest Neighbor (k-NN) Classifier, Discriminant Functions and Regression Functions, LinearRegression with Least Square Error Criterion, Logistic Regression for Classification Tasks

**Learning Outcomes:** At the end of this unit students will be able to:

1. Understand various inferential statistical analysis.(L2)
2. Apply probabilistic approach for inferential data.(L3)
3. Describe different Classification tasks. (L2)

## UNIT-IV

(10 Lectures)

**Learning with Support Vector Machines:** Introduction, Regression by Support Vector Machines, Decomposing Multiclass Classification Problem into Binary Classification Tasks, Variants of Basic SVM Techniques.

**Decision Tree Learning:** Introduction, Example of a Classification Decision Tree, Measures of Impurity for Evaluating Splits in Decision Trees, ID3, C4.5, and CART Decision Trees, Pruning the Tree, Strengths and Weaknesses of Decision-Tree Approach, Fuzzy Decision Trees.

**Learning Outcomes:** At the end of this unit students will be able to:

1. Understand the basics of SVM techniques.(L2)
2. Model decision trees using ID3, C4.5 and CART algorithms.(L3)
3. Understand strengths and weaknesses of various decision trees. (L2)

## UNIT-V

(10 Lectures)

**Learning With Neural Networks:**

Towards Cognitive Machine, Neuron Models: Biological Neuron, Artificial Neuron, Mathematical Model, Network Architectures: Feed forward Networks, Recurrent Networks, Perceptrons, Linear Neuron and the Widrow-Hoff Learning Rule, The Error-Correction Delta Rule, Multi-Layer Perceptron (MLP) Networks and the Error-Backpropagation Algorithm, Multi- Class Discrimination with MLP Networks

**Learning Outcomes:** At the end of this unit students will be able to:

1. Differentiate biological and artificial neuron. (L2)
2. Explain different Neural network architectures.(L2)
3. Apply Backpropagation algorithm.(L3)

## TEXT BOOK:

1. Dr. M Gopal, *Applied Machine Learning*, 1<sup>st</sup> Edition, McGraw-Hill,2018

## REFERENCES:

1. Tom M. Mitchell, *Machine Learning*, McGraw-Hill, 2010
2. Bishop, Christopher, *Neural Networks for Pattern Recognition* ,Oxford University Press, 1995
3. Ethem Alpaydin, *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, The MIT Press,2004
4. T. Astie, R. Tibshirani, J. H. Friedman, *The Elements of Statistical Learning*, Springer(2<sup>nd</sup> ed.), 2009
5. Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn and TensorFlow*,Oreilly, March 2017

## WEB REFEREFENCES:

<https://www.coursera.org/learn/machine-learning-with-python>