

GUJARAT TECHNOLOGICAL UNIVERSITY

MASTERS IN COMPUTER APPLICATION

Year – III (Semester – V) (W.E.F. JUNE 2017)

Subject Name: Machine Learning

Subject Code: 3650014

1. Learning Objectives :

- Basic concepts of various learning methods
- To learn mathematical concepts, and algorithms used in machine learning

2. **Prerequisites:** Basics of computer science including algorithms, data structure, Basic Linear algebra and Probability theory,

3. Contents :

Unit No.	Course Content	No Of Lectures
1	Introduction Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias	04
2	Supervised and Unsupervised learning Decision Tree Representation, Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Issues in Decision tree learning K- Nearest Neighbour Learning Locally Weighted Regression, Radial Bases, Functions, Case Based Reasoning	10
3	Artificial Neural networks and genetic algorithms Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Remarks on Back Propagation Algorithms Case Study: face Recognition	10
4	Bayesian Learning Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, MAXimum likelihood hypothesis for Predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm Case Study: Learning to classify text,	10
5	Overview of typical appliaction areas, such as Recommender System, etc	06

4. Text Book:

1. Tom M Mitchell, "Machine Learning", McGraw Hill
2. Peter Harrington, "Machine Learning in Action", DreamTech

5. Reference Books:

1. Henrik Brink, Joseph Richards, Mark Fetherolf, "Real-World Machine Learning", DreamTech
2. Christopher Bishop, "Pattern Recognition and Machine Learning"
3. Hastie, Tibshirani, and Friedman, "Elements of Statistical Learning". Springer
4. Jiawei Han and Michelline Kamber, "Data Mining: Tools and Techniques", 3rd Edition.
5. I H Witten, Eibe Frank, Mark A Hall, "Data Mining: A practical Machine Learning Tools and techniques", Elsevier

Couresera.org: Machine Learning by Andrew Ng, Stanford University

6. Chapter wise Coverage from Text Book:

Unit No	Chapters
1	Chapter 1.1 to 1.3 Chapter 2
2	Chapter 3 Chapter. 8.1 to 8.5
3	Chapter 4.2,4.3,4.4,4.5,4.6,4.7
4	Chapter 6
5	Online Sources

7. Accomplishments of the student after completing the course :

Student will be able to understand the concept of Machine learning and range of problems that can be solved by machine learning. They will be able to compare different types of learning algorithms and apply machine learning concepts in real life problems.

8. Suggestions for Lab Sessions :

Practicals to implement following ten algorithms, using Python

- 1) Classifying with distance measures,
- 2) Constructing Decision trees and Classification using Decision Trees
- 2) K-means,
- 3) Classification with k-Nearest Neighbors,
- 4) Random Forest
- 5) Support vector machines,
- 6) Expectation Maximization,

- 7) PageRank,
- 8) AdaBoost,
- 9) Naïve Bayes Classification
- 10) CART.

Few Examples which apply above algorithms:

- 1) Improving a handwriting recognition system
- 2) Using decision trees to predict contact lens type
- 3) Classifying text
- 4) Classifying spam mail with naïve Bayes
- 5) Using naïve bayes to reveal local attitudes from personal ads

Book for Practical:

- 1. Peter Harrington, “Machine Learning in Action”, DreamTech