GUJARAT TECHNOLOGICAL UNIVERSITY

Master in Computer Application (Integrated MCA)

Year IV (Semester-VII) (W.E.F. June 2016)

Subject Name: Machine Learning
Subject Code: 4470601

1. **Learning Objectives :**
   - Introduce the fundamental problems of machine learning
   - To be able to techniques, 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 Decision Tree learning – Representation Algorithm – Heuristic Space Search	08
2	**Neural networks and genetic algorithms** Neural Network Representation, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Advanced Topics (Genetic Algorithms, Hypothesism Space Search, Genetic Programming, Models of Evalution and Learning) Case Study: face Recognition	08
3	**Bayesian Learning** Bayes Theorem and Concept Learning, Maximum Likelihood – Minimum Description, Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm	09

	Probability Learning, Sample Complexity, Finite and Infinite Hypothesis Spaces, Mistake Bound Model Case Study: Learning to classify text,	
4	**Instance Based Learning** K- Nearest Neighbour Learning, Locally weighted Regression, Radial Bases, Functions, Case Based Learning	**04**
5	**Advanced Learning** Learning Sets of Rules: Sequential Covering Algorithm – Learning Rule Set, First Order Rules, Sets of First Order Rules, Induction on Inverted Deduction, Inverting, Resolution Analytical Learning: Perfect Domain Theories, Explanation Base Learning, FOCL Algorithm Reinforcement Learning: Task – Q-Learning, Temporal Difference Learning	**10**

4. Text Book:

1. Machine Learning, Tom M Mitchell, McGraw Hill

5. Reference Books:

1. Pattern Recognition and Machine Learning. Christopher Bishop.
2. Elements of Statistical Learning. Hastie, Tibshirani, and Friedman. Springer
3. Data Mining: Tools and Techniques, 3rd Edition. Jiawei Han and Michelline Kamber
4. Data Mining: A practical Machine Learning Tools and techniques, I H Witten, Eibe Frank, Mark A Hall, Elsevier

6. Chapter wise Coverage from Text Book:

Unit No	Chapters
1	1.1,1.2,1.3 , Chapter 2 and Chapter 3
2	Chapter 4
3	Chapter 6, 7
4	Chapter 8
5	Chapter 10, 11, 12, 13

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 handled by machine learning. They will be able to compare different types of learning algorithms and apply machine learning concepts in real life problems.

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8. Suggestions for Lab Sessions :

a) Suggested Lab Activities

- **Group Activity:**

i. **Team size: 2-3 students**
ii. **Identify Problem**
iii. **Identify an application (MATLAB, Weka, R Programming etc.) suitable to your problem**
iv. **Implement and analyse results**
v. **Outcome prepare presentation and Report (Max 40 Pages) with table of content as below**
    1. **Abstract**
    2. **Problem Definition**
    3. **Experiment**
    4. **Results**
    5. **Conclusion**

PS: For Data one may use large data available on wen like KDDCup etc.