B.Tech III-Year II Semester
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS65a- INTRODUCTION TO MACHINE LEARNING
Open Elective-II

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Course Objectives:
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

UNIT – I: INTRODUCTION   **8hrs**

Introduction: An illustrative learning task, and a few approaches to it. What is known from algorithms? Theory, Experiment. Biology. Psychology. Overview of Machine learning, related areas and applications. Linear Regression, Multiple Regression, Logistic Regression, logistic functions.

Learning Outcomes:
At the end of this unit, the student will be able to
- Argue the importance and role of software architecture in large-scale software systems.   **L2**
- Design and motivate software architecture for large-scale software systems.   **L3**

UNIT – II: DECISION TREE LEARNING   **8hrs**

Decision Tree Learning: - Minimum Description Length Principle. Occam's razor. Learning with active queries Introduction to information theory, Decision Trees, Cross Validation and Over fitting. Neural Network Learning: Perceptions and gradient descent back propagation, multilayer networks and back propagation.

Learning Outcomes:
At the end of this unit, the student will be able to
- Design and motivate software architecture for large-scale software systems   **L3**
- Recognize major software architectural styles and frameworks.   **L4**

UNIT – III: SAMPLE COMPLEXITY AND OVER FITTING   **8hrs**

Sample Complexity and Over fitting: Errors in estimating means. Cross Validation and jackknifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning. Support Vector Machines: functional and geometric margins.

Learning Outcomes:
At the end of this unit, the student will be able to
- Recognize major software architectural styles and frameworks.   **L3**
- Describe a software architecture using various documentation approaches and architectural description languages.   **L4**

UNIT – IV: INSTANCE-BASED TECHNIQUES   **7 Hrs**

Instance-based Techniques: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning. Clustering and Unsupervised Learning: K-means clustering, Gaussian mixture density estimation, model selection

Learning Outcomes:
At the end of this unit, the student will be able to
- Describe a software architecture using various documentation approaches and architectural description languages.   **L5**

- Generate architectural alternatives for a problem and selection among them.   L3

UNIT – V: Genetic Algorithms

Genetic Algorithms: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity. Dimensionality reduction: feature selection, principal component analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems.   L3
- Identify and assess the quality attributes of a system at the architectural level.   L4

Text Books:

1. Tom Michel, Machine Learning, McGraw Hill, 1997
2. Trevor Has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically Learning, Springer Verlag, 2001.

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001 3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

Course Outcomes:

At the end of this Course the student will be able to

- Student should be able to understand the basic concepts such as decision trees and neural networks.Ability to formulate machine learning techniques to respective problems   L2
- Apply machine learning algorithms to solve problems of moderate complexity.   L3