Course Hand-out

Program	:	B.Tech
Academic session	:	Spring Semester- 2023 (Even Semester)
Subject Code	:	CS-3035
Subject name	:	Machine Learning (ML)
Semester	:	6th Semester
L-T-P Structure	:	3-0-0
Course Faculty	:	Dr. Suresh Chandra Satapathy

Course Objectives

- ✓ To introduce students to the basic concepts and techniques of Machine Learning.
- ✓ To understand a range of machine learning algorithms along with their strengths and weaknesses.
- ✓ To develop skills of using recent machine learning software for solving real-world problems.
- ✓ To gain experience of doing independent study and research.

Course Outcomes

CO 1: Ability to have a good understanding of the fundamental issues and challenges of machine learning.

CO 2: Ability to develop an appreciation for what is involved in learning from data.

CO 3: Ability to have an understanding of the strengths and weaknesses of many popular machine learning approaches

CO 4: Ability to appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and UN-supervised learning.

CO 5: Ability to apply the concept of regression methods, classification methods and clustering methods.

CO 6: Ability to design and implement various machine learning algorithms in a range of real-world applications

Lesson Plan

Week	Date	Class Number	Module Name	TOPIC TO BE COVERED(but not limited to)
1	12/01/23	**1**	**INTRODUCTION TO MACHINE LEARNING**	Basic Understanding of Machine Learning
	13/01/23	2		Formulating a Machine Learning Problem and Models: Special Emphasis on Target Function
	16/01/23	3		Type of Machine Learning Problem: Supervised, Unsupervised and Reinforced
2	18/01/23	**4**	**FUNDAMENTALS OF LEARNING**	Least Square Method
	19/01/23	5		Nearest Neighbor Method
	20/01/23	6		Distance Based Learning
3	23/01/23	**7**	**LINEAR MODEL-LINEAR REGRESSION**	Formulation & Mathematical Foundation of Regression Problem
	27/01/23	8		The Regression Model & The Concepts of Least Squares
	30/01/23	9		Error Reduction-Gradient Descent
ACTIVITY-I				
4	02/02/23	**10**	**GENERALISATION**	Over-fitting, Bias and Variance Relationship
	03/02/23	11		LASSO Regression
	06/02/23	12		RIDGE Regression
5	09/02/23	**13**	**CLASSIFICATION**	Nearest Neighbor Learning
	10/02/23	14		KNN Classification
	13/02/23	15		Numerical Discussion
6	16/02/23	**16**	**CLUSTERING**	Introduction to Unsupervised Learning, Distance Metrics used
	17/02/23	17		K-Means Approach for Clustering
	20/02/23	18		Performance Evaluation and Stopping Criteria for K Means

ACTIVITY-II				
7	23/02/23	**19**	**GENERALISEDLINEARMODEL**	Limitation of Linear Model and Max Likelihood Learning
	24/02/23	20		Link function and its Role in Handling Non Normal Kind of Data Distribution
	27/02/23	21		Logistic Regression Introduction
8	02/03/23	**22**	**LOGISTIC REGRESSION**	Likelihood Vs Probability
	03/03/23	23		Logistic Regression Implementation
	06/03/23	24		Logistic Regression Numerical
MID-SEMESTEREXAMINATION				
9	20/03/23	**25**	**TREE BASED LEARNER**	Idea of a tree based learner
	23/03/23	26		Steps in Decision Tree and Construction
	24/03/23	27		Parameters of Decision Tree Performance
10	27/03/23	28		Numerical on Decision Tree
	31/03/23	29		Stopping Criteria in Tree and Over-fitting Avoidance
	03/04/23	30		Random Forest
ACTIVITY-III				
11	06/04/23	**31**	**PCA**	Principal Component Analysis
	10/04/23	**32**	**SUPPORT VECTOR MACHINE**	The idea of support vectors and its importance
	13/04/23	33		Derivation of Support Vector Equation
12	17/04/23	34		KKT Condition
	20/04/23	35		Kernel Function: Dealing with nonlinearity
	21/04/23	36		Polynomial and Radial Basis Kernel
ACTIVITY-IV				
	24/04/23	**37**		McCullough-Pitts Neuron Model

13	27/04/23	38	**NEURALNETWORK**	Perceptron Learning
	28/04/23	39		Back-propagation
	01/05/23	40		Multi Layer Perceptron
	04/05/23	41		Non-linear Problem Solving
	05/05/23	42		A brief introduction to Deep Learning architecture
ACTIVITY-V				
END SEMESTER EXAM				

NOTE: Total number of classes is 42 which include lectures and tutorials etc.

Text Book:

1. ***Applied Machine Learning,*** *M. Gopal,* McGraw Hill Education

Reference Books:

1. ***Machine Learning March 1997****, Thomas M. Mitchell*, McGraw-Hill, Inc.
2. ***Neural Networks: A Comprehensive Foundation,*** *Simon Haykin*, Prentice Hall
3. ***Neural Network Design,*** *M. T. Hagan, H. B. Demuth, Mark Beale, Thomson Learning,*

Internal Evaluation (50 Marks):

- Activities [Continuous evaluation] (30 Marks)
  - Quiz(es)
  - Assignment(s)
  - Case Studies/Survey
  - Presentation(s) etc.
- Mid Semester Exam (20 Marks)

End Sem Exam (50 Marks):