CSAI3017	Artificial Intelligence & Machine Learning	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Basic knowledge of mathematics and artificial intelligence				
Co-requisites	--				

Course Objectives

1. Understand the fundamental concepts, usage and impact of machine learning algorithms in various domain.
2. Discuss various machine-learning algorithms to solve real life problems.

Course Outcomes

On completion of this course, the students will be able to

CO1. To know the fundamentals of artificial intelligence and Machine Learning.
CO2. Comprehend the contemporary techniques of classification in machine learning.
CO3. Analyse the concept of clustering and its usage.
CO4. Analyse and discuss the industry applications and social connection of ML.

Catalog Description

This course provides a broad introduction to machine learning and statistical pattern recognition. This course enables the concepts like supervised learning, unsupervised learning, learning theory, reinforcement learning, Linear Regression, classification, methods for designing systems. Fundamental concepts of information retrieval is included.

Course Content

Unit 1. Introduction to Artificial Intelligence and Machine learning

History of Artificial Intelligence, What is AI? Emergence of AI, Cognitive Science & AI. The Origins of Machine Learning, Uses and Abuses of Machine Learning, How do Machines Learn? - Abstraction and Knowledge Representation, Generalization, Assessing the Success of Learning, Steps to Apply Machine Learning to Data, Choosing a Machine Learning Algorithm - Thinking about the Input Data, Thinking about Types of Machine Learning Algorithms, Matching Data to an Appropriate Algorithm

Unit 2. Logical Approach to AI, Regression Models and Association Rules in ML

Basics of Propositional Logic: Syntax, Semantics, Tautologies and Logical Implication, Introduction to Simple Linear Regression, Simple Linear Regression Model Building, Estimation of Sum of Squared Error, Interpretation of Simple Linear Regression Coefficients, Validation of Simple Linear Regression Model, Multiple Linear Regression, Partial Correlation and Regression Model Building, Logistic Regression Model and its mathematical derivation, Market Basket Analysis, Apriori Algorithm, FP Growth Algorithm.

Unit 3. Classification Algorithms

Introduction to Classification Algorithms, k-Nearest Neighbor Algorithm, Decision Trees, Naive Bayesian Classifier, Ensemble Methods: Bagging, Boosting and AdaBoost and XBoost, Random Forests, Advanced Classification Methods: Backpropagation in Multilayer Feed-Forward Neural Networks, Support Vector Machines, Classification Model Evaluation and Selection: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, Lift Curves and Gain Curves, ROC Curves.

Unit 4. Clustering Methods

The Clustering Task and the Requirements for Cluster Analysis, Overview of Some Basic Clustering Methods, Hierarchical Methods: Agglomerate versus Divisive Hierarchical Clustering, Distance Measures, Probabilistic Hierarchical Clustering, Multiphase Hierarchical Clustering Using Clustering Feature Trees, Partitioning Methods: k-Means Clustering, k-Medoids Clustering, Density-Based Clustering: DBSCAN - Density-Based Clustering Based on Connected Regions with High Density, Measuring Clustering Goodness.

Unit 5. Case Studies (Industry/Social)

Industry applications: ML for Cybersecurity, ML for IoT, ML for Healthcare, ML for Banking and Finance, ML for Smart Cities, Application of ML to solve other social issues.

Text Book - Introduction to Business Analytics (IBM ICE Publication).

Reference Material:

1. Rich E., Artificial Intelligence, Tata McGraw Hills (2009).
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

3. Ryszard S. Michalski, Jaime G. Carbonell, Tom M. Mitchell, Machine Learning : An Artificial Intelligence Approach, Tioga Publishing Company, 1983.
4. “Data Mining Concepts and Techniques”, Jiawei Han and Micheline Kambe, Third Edition Elsevier Publications.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	MSE	Quiz/Assignment/ etc.	ESE
Weightage (%)	20%	30%	50%

Relationship between the Course Outcomes (COs), Program Outcomes (POs) and Program Specific Outcomes (PSOs):

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	1	-	-	-	-	-	-	-	-	-	1	1	3
CO2	2	2	1	-	-	-	-	-	-	-	-	-	1	1	3
CO3	2	2	1	-	-	-	-	-	-	-	-	-	1	1	3
CO4	2	2	1	-	-	-	-	-	-	-	-	-	2	1	3
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	1	3
Average	2	2	1	-	-	-	-	-	-	-	-	-	1.4	1	3

1=Weak 2=Moderate 3=Strong

CSAI3117	Artificial Intelligence and Machine Learning Lab	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basic Knowledge of statistics, probability, designing algorithm, logical interpretation with python programming language				
Co-requisites	--				

Course Objectives

Able to understand the algorithmic approach of different Machine Learning algorithms and can implement for solving the various domain problems.

Course Outcomes

At the end of this course student should be able to

CO1. To experiment classification algorithm like Regression, Decision Trees, k-NN, Neural Network etc.

CO2. To implement clustering algorithm like Hierarchical Clustering, Partition based Clustering,
Density based Clustering.

CO3. To implement Deep Learning Models on associated dataset.

Catalog

This course provides a broad introduction to machine learning and statistical pattern recognition. This course enables and implement the concepts like supervised learning, unsupervised learning, learning theory, reinforcement learning, linear regression, classification, methods for designing systems using python programming language.

List of Experiments:

S.No	Lab Exercise	Contents
1	Experiment No 1	Introduction to Weka Tool
2	Experiment No 2	Perform basic algorithm with inbuilt data on Weka Tool
3	Experiment No 3	Linear and Multiple Linear Regression
4	Experiment No 4	Logistics Regression Analysis

5	**Experiment No 5**	**Decision Tree**
6	**Experiment No 6**	**Naïve Bayes**
7	**Experiment No 7**	**KNN (k-Nearest Neighbor) Algorithm**
8	**Experiment No 8**	**SVM(Support Vector Machine)**
9	**Experiment No 9**	**k-Means Clustering**
10	**Experiment No 10**	**DBSCAN (Density Based Spatial Clustering of Applications with Noise)**
11	**Experiment No 11**	**Learn to Configure Google Colab and with support of google drive**
12	**Experiment No 12**	**Implement deep Learning model on Google Colab**

TEXT BOOKS:

1. Book provided by IBM- Data Mining & Prediction Modeling (Course code BAO2SG01 V1.0), Introduction to Machine Learning (Course Code AIML03G01 V1.0)

REFERENCE BOOKS

1. Book provided by IBM

2. Research methodology – Methods & Techniques by C.R. Kothari

Continuous Evaluation- There will be continuous evaluation for all practical subjects of SoCS during the semester w.e.f. January 2016. The performance of a student in a Practical subject will be evaluated as per process given below:

4. Components of evaluation
   a. Viva voce / Quiz (50%) + Performance & Records (50%).
   b. Lab performance and record evaluation shall be a continuous process throughout the semester.
   c. Minimum three Viva voce/ Quiz based on practical sessions shall be conducted during the semester.

Relationship between the Program Outcomes (POs), Course Outcomes (COs) and Program Specific Outcome (PSOs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	1	2	-	-	-	-	-	-	-	-	-	-	3
CO2	1	1	1	1	1	-	-	-	-	-	-	-	2	-	3
CO3	1	1	1	1	1	-	-	-	-	-	-	-	2	-	3
Average	0.67	1	1	1.33	1	-	-	-	-	-	-	-	1.33	-	3

1= Weak 2= Moderate 3=Strong