Machine Learning

General Information

Course Number	CSC-572
Credit Hours	3 (Theory Credit Hour = 3, Lab Credit Hours = 0)
Prerequisite	Databases and Programming
Course Coordinator	None

Course Objectives

This course is designed to introduce machine learning and its techniques, algorithms and models. Machine Learning is an interdisciplinary field consists of computer algorithms and data handling techniques. It is applied in many fields such as speech recognition, image processing, internet searching trends, computer vision, bioinformatics, business and any other field having large and complex datasets. Machine leaning is collection of tools to handle data sets and to learn from them to make decision. These techniques include supervised learning, un-supervised learning, Bayesian decision theory, nonparametric methods, multivariate analysis and statistical testing.

Evaluation

1.	Semester Project	10%
2.	Assignments	10%
3.	Quizzes	05%
4.	CP & CB	05%
5.	First Mid Term Exam	15%
6.	Second Mid Term Exam	15%
7.	Final Term Exam	40%

Text BOOK:

S. No	Book Title
1.	E. Alpaydin, (2014). Introduction to machine learning. MIT press

REFERENCE BOOKS:

S. No	Book Title
1.	T. M. Mitchell, Machine Learning, McGraw-Hill Education.

Detailed Course Outline

Week No.	Topic	Reference Material
Week No. 1 (24-01-2019	❖ Introduction to Machine Learning ❖ Need of Machine Learning ❖ Importance of Machine Learning ❖ Types of Machine Learning ❖ Supervised Machine Learning ❖ Classification and Regression ❖ Unsupervised Machine Learning ❖ Clustering ❖ Semi-Supervised Machine Learning ❖ Applications of Machine Learning ❖ Growth of Machine Learning ❖ Machine Learning: State-of-the-art	Chapter 1 and Notes
Week No. 2 (31-01-2019)	❖ Classification ❖ Types of Classification Algorithms ❖ Binary or Binomial Classification ❖ Multi Class or Multinomial Classification ❖ Linear Classifiers ❖ Logistic Regression ❖ Naïve Bayes Classifier ❖ Perceptron ❖ Support Vector Machines ❖ Least Squares Support Vector Machines	Chapter 2 and Notes
Week No. 3 (07-02-2019)	❖ Quadratic Classifiers ❖ Kernel Estimation ❖ *k*NN ❖ Bagging and Boosting (Meta Algorithms) ❖ Decision Trees ❖ Random Forest ❖ Iris Dataset Prediction ❖ Scatter Plot of Iris Dataset ❖ Do we need to Hundreds of Classifiers?	Chapter 8, 9, and Notes
Week No. 4 (14-02-2019)	❖ Introduction to Neural Networks ❖ Transfer Function ❖ Activation Function ❖ Single Layer Perceptron ❖ Multi-layer Perceptron ❖ Feed Forward Neural Network	Chapter 11 and Notes
Week No. 5 (21-02-2019)	❖ Back Propagation Neural Network ❖ Stochastic Gradient Descent ❖ Ensemble Learning Techniques ❖ Voting and Averaging ❖ Stacking ❖ Bootstrap Aggregating / Bagging	Chapter 11, 17, and Notes

	❖ Boosting ❖ AdaBoost	
Week No. 6 (28-02-2019)	❖ Introduction to Regression ❖ Regression Theory ❖ How Regression works? ❖ Regression- Features and Labels ❖ Regression training and testing ❖ Linear Regression ❖ Regression- Forecasting and Prediction ❖ The best fit slope ❖ The best fit line ❖ Linear Regression - Cost Function ❖ Linear Regression – Gradient Descent	Chapter 2, 4, and Notes
Week No. 7 (07-03-2019)	❖ Regression Types ❖ Multivariate Linear Regression ❖ Polynomial Regression ❖ Logistic Regression ❖ None Linear Regression ❖ Multiple Features in Linear Regression ❖ Contour Plots ❖ Implementation of Regression	Chapter 4, 5, and Notes
Week No. 8 (14-03-2019)	❖ Clustering ❖ Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering	Chapter 7 and Notes
Week No. 9 (21-03-2019)	❖ Dimensionality Reduction ❖ Feature Selection and Reduction ❖ Chi-Square ❖ Information Gain ❖ PCA ❖ Gini Index	Chapter 6 and Notes
Week No. 10 (28-03-2019)	❖ NLP ❖ Word and Sentence Tokenization ❖ Stop words removal ❖ Stemming and Lemmatization ❖ POS tagging ❖ Named Entity Recognition ❖ Using Wordnet with NLP	Notes
Week No. 11 (04-04-2019)	❖ Text Classification ❖ Investigation Bias in Text Classification Task ❖ Sentiment Analysis ❖ Twitter Sentiment Analysis ❖ Graphing Live Twitter	Notes
Week No. 12 (11-04-2019)	❖ Image and Video Mining ❖ Image and Video Classification	Notes

Week No. 13 (18-04-2019)	❖ Speech Recognition	Notes
Week No. 14 (25-04-2019)	❖ Introduction to Deep Learning	Notes
Week No. 15 (02-05-2019)	❖ Introduction to Reinforcement Learning ❖ Introduction to Case Based Reasoning ❖ Introduction to Recommender Systems	Chapter 18 and Notes
Week No. 16 (09-05-2019)	❖ Introduction to Large Scale Machine Learning	Chapter 18 and Notes