Machine Learning

**General Information**

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| 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**

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| 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:**

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

**REFERENCE BOOKS:**

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

**Detailed Course Outline**

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| **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 * Classification and Regression * 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 * Logistic Regression * Support Vector Machines | Chapter 2 and Notes |
| Week No. 3  (07-02-2019) | * *K*NN * Decision Trees * Random Forest * Iris Dataset Prediction using Scikit-Learn * Scatter Plot of Iris Dataset using matplotlib | Chapter 8, 9, and Notes |
| Week No. 4  (14-02-2019) | * Introduction to Neural Networks * Activation Functions * Single Layer Perceptron * Multi-layer Perceptron * Feed Forward Neural Network | Chapter 11 and Notes |
| Week No. 5  (21-02-2019) | * Back Propagation Neural Network * Ensemble Learning Techniques * Voting and Averaging * Stacking * Bootstrap Aggregating / Bagging | Chapter 11, 17, and Notes |

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|  | * Boosting |  |
| Week No. 6  (28-02-2019) | * Introduction to Regression * Regression Theory * How Regression works? * Regression- Features and Labels * Linear Regression * Regression training and testing * 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 * Multiple Features in Linear Regression * Implementation of Regression (Scikit-learn) | Chapter 4, 5, and Notes |
| Week No. 8  (14-03-2019) | * Introduction to Clustering * k-means clustering, * hierarchical clustering, | Chapter 7 and Notes |
| Week No. 9  (21-03-2019) | * Introduction to Dimensionality Reduction * PCA Algorithm | 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 | Notes |
| Week No. 11  (04-04-2019) | * Text Classification * Sentiment Analysis | Notes |
| Week No. 12  (11-04-2019) | * Image and Video Mining * Image and Video Classification | Notes |

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| Week No. 13  (18-04-2019) | * Introduction to 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 Recommender Systems | Chapter 18 and Notes |
| Week No. 16  (09-05-2019) | * Introduction to Large Scale Machine Learning | Chapter 18 and Notes |