Machine Learning

Code	Credit Hours
SE-807	3-0

Course Description

The Machine Learning course is design to provide you with the basics of ML algorithms and their use in solving problems particularly related to engineering domains. The course will nurture and transform you into a skilled student with in-depth knowledge of various algorithms and techniques, such as regression, classification, supervised and unsupervised learning, etc. This course introduces principles, algorithms, and applications of machine learning from the point of view of modeling and prediction. It includes formulation of learning problems and concepts of representation, over-fitting, and generalization.

Textbooks:

1) Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann.
2) 2017 Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016
3) Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspective.

Reference Book:

1) Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014,
2) Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies, Dario Floreano and Claudio Mattiussi , 2008, The MIT Press. (ISBN: 978-0-262-06271-8)

Prerequisites:

Nil

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10-15%
Assignments	5-10%
Project (optional)	5-10%
Midterms	30-35%
Final Exam	40-50%

Teaching Plan

Week No	Topics	LearningOutcomes
1	Introduction	Machine Learning a) Supervised learning b) Unsupervised learning c) Reinforcement learning d) Probabilistic methods (Bayesian view)

2-6	Regression and Regularization	• Linear Regression
		  o With One Variable
		  o With Multiple Variable
		• Logistic Regression
		  o Simplified Cost Function
		  o Advanced Optimization
		  o Multiclass Classification
		• Regularization
		  o Problem of Overfitting
		  o Types

7-8	Dimensionality Reduction and Algorithms	• Support Vector Machine • Clustering Algorithms • Dimensionality Reduction • Anomaly Detection
9	**MIDTERMEXAM**	
10-12	Ensemble methods	Random Forest and Ada Boost
13-17	Machine Learning System Design	• Model evaluation and model selection • Recommender System • Large Scale Machine Learning • Machine Learning System Design • Brief Introduction to Neural Networks
18	**FINALEXAM**	