Introduction to Machine Learning

SUBJECT: EE-107,Introduction to Machine Learning

CREDIT HOURS: **3-0**

CONTACT HOURS: **Theory:** 3 Hours per Week

REFERENCE BOOK: **"**Understanding Machine Learning: From Theory to Algorithms", Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, latest edition

PREREQUISITE: None

MODE OF TEACHING: Lectures and Demonstrations.

COURSE DESCRIPTION: This course is consists of topics pertaining to machine learning from introductory to a bit advanced level. The contents broadly cover two categories of machine learning techniques: supervised as well as unsupervised machine learning. The lectures may be supplemented by related demonstrations and home tasks using MATLAB (or other appropriate tools/languages).

COURSE OBJECTIVES:

a. The main objective of this course is to provide a comprehensive presentation of the fundamentals of machine learning and analysis both from a theoretical as well as practical point of view.
b. To familiarize the students with the supervised machine learning techniques in the context of computer vision problems.
c. To familiarize the students with the unsupervised machine learning techniques in the context of computer vision problems.
d. To enable students to implement all theoretical information gained during the lectures and also to program solutions to practical problems in MATLAB (or other appropriate tools/languages).

TOPICS COVERED:

S.No	Topic	Week/Lecture
1	Introduction to Machine Learning • Supervised vs. unsupervised machine learning	1
2	Feature Extraction	2-3
3	Dimensionality Reduction using Principle Component Analysis	4
4	Naïve Bayes Classification	5
5	k-Nearest Neighbors Classification	5
6	Support Vector Machines	6
7	Decision Trees	7
8	Regression	8-9
9	Random Forest Classification	10
10	Deep Neural Networks for Classification	11-12
11	Performance Evaluation of Classifiers	13
12	Clustering (K-means, Mean-Shift)	14-15
13	Applications of Machine Learning in Computer Vision	16

COURSE TARGETS:

		PLOs	**Learning Level**
CLO 1	Understanding of the supervised and unsupervised machine learning problems while utilizing prior mathematical and engineering knowledge	PLO 3	C2
CLO 2	Investigation and analysis of the experimental results of applying different machine learning techniques to real-world computer vision problems	PLO 4	C4

CLO 3	Investigate and report on a study that explores the effect of applying machine learning technique(s) on environment and/or sustainability	PLO 7	C4