

Machine Learning

Code	Credit Hours
CS-471	3-1

Course Description

Is it possible to train a machine to solve tasks on its own? Can a machine learn on its own? Can a machine learn with the help of guidance? How many examples are good enough for training? What if there are too many examples? These questions guide us to understand algorithms designed to train machines in supervised and unsupervised settings while keeping close eye on the pitfalls that accompany learning.

Text Book:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurelien Geron.
2. Pattern Recognition and Machine Learning by Christopher Bishop.

Reference Book:

1. Coursera ML course by Andrew Ng.

Prerequisites

CS 114 (Fundamental of P)

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	50%

ASSESSMENT SYSTEM FOR LAB

Quizzes	10%-15%
Assignments	5% - 10%
Lab Work and Report	70-80%
Lab ESE/Viva	20-30%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Introduction	Why Machine Learning? The State of the art in Machine Learning
2-6	Supervised ML	Understand fundamental concepts of ML like, nearest neighbor classifier, linear regression, gradient descent, logistic regression, regularization, bias-variance trade off, error metrics (precision, recall, F1 score, confusion matrix) and support vector machines.
7-8	Unsupervised ML	Understand fundamental concepts of unsupervised ML like k-means clustering, principal component analysis
9	MID TERM EXAM	
10-12	Neural Networks	Understand basic concepts related to neural network forward pass, back propagation.
13-17	Deep Neural Networks	Understand basics of CNNs, introduction to different layers (convolution, pooling), activation functions. Understanding limitations of AI systems (dataset bias, adversarial attacks).

18	End Semester Exams
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Practical:

Experiment No	Description
1	Introduction to Python
2	Introduction to Colab
3	Introduction to Python Imaging Library
4	Introduction to Pandas
5	Unsupervised Learning – Clustering
6	Linear Regression- I
7	Linear Regression- II
8	Logistic Regression- I
9	Introduction to Scikit Learn
10	Neural Network -I
11	Neural Network -II (CEP)
12	Exploratory Data Analysis
13	Bias Variance Tradeoff
14	Practical Implication of Regularization
15	Support Vector Machine Classification/Regression
16	Lab Exam