

SEMSTER-I

(1) NAME OF THE COURSE: Introduction to Artificial Intelligence & Machine Learning

(2) OBJECTIVE OF THE COURSE:

Basic objectives of the course are the following:

- Detailed introduction to Artificial Intelligence (AI) & Machine Learning (ML)
- Overview of past, present and possible future status of AI & ML
- Understanding interconnections of AI, ML & Data Science

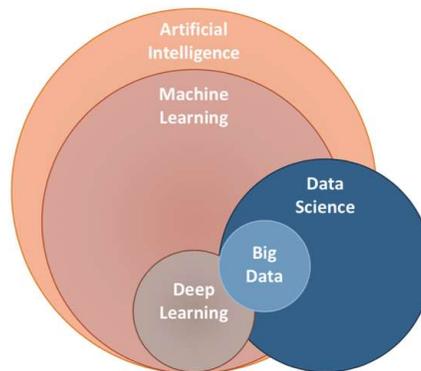


Figure 1: Interconnections of AI, ML, DL and Data science.

- Overview of fundamental aspects of Machine Learning and their classifications
- Different useful techniques for ML: Supervised & Unsupervised methods

A flow-chart of the teaching objectives is given in the following schematic diagram. A fundamental framework has been given. Students have been taught based on that framework. After analyzing results and assessing feedback, we shall try to modify/ improve the course.

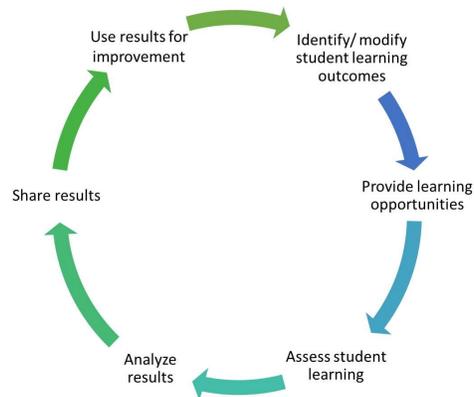


Figure 2: Schematics of teaching objectives of the present course.

(3) LEARNING OUTCOMES:

After successfully completing the course, students are expected to:

- Learn and understand fundamental mathematical methods required for practicing ML
- Distinguish between supervised and unsupervised learning processes
- Have a hands-on introduction to different techniques of ML
- Apply and solve optimization problems
- Solve various real-life problems using ML

(4) DETAILED SYLLABUS:

Section 1: Introduction AI & ML and Essential tools for ML

- Overview
- Introduction to Artificial Intelligence (AI): Cognitive science and perception problem- a brief history of AI and its applications
- What is Machine Learning?
- AI vs. ML
- Types and Applications of ML
- Introduction to Essential Math for ML:
 - Linear algebra and matrix decomposition
 - Multivariate Calculus and Optimization
 - Statistics & Probability theory
- Introduction to Python/ MATLAB for solving problems in ML

Section 2: Supervised Machine Learning

- Introduction to Supervised Machine Learning
 - Classification
 - Linear Regression
 - Logistic Regression
 - Gradient descent
 - Decision tree
 - Support Vector Machines

Section 3: Unsupervised Machine Learning

- Introduction to Unsupervised Machine Learning
 - Association Rules
 - Cluster Analysis
 - Reinforcement Learning
 - K-Means Clustering
 - Principal and Independent Component Analysis

Books & References:

1. T. Mitchell: Machine Learning, McGraw-Hill (1997)
2. Papoulis and Pillai: Probability, Random Variables, and Stochastic processes, McGraw-Hill Kogakush; 4th edition (1981)
3. Duda and Hart: Pattern Classification, Wiley-Blackwell; 2nd edition (21 November 2000)
4. Hastie, R. Tibshirani, J. Friedman: The elements of Statistical Learning, Springer (2008)
5. E. Rich: Arti cial Intelligence, McGraw Hill, New Delhi (1983)
6. P. H. Winston: Arti cial Intelligence, Addison-Wesley, Reading, Mass (1984)
7. S. J. Russell and P. Norvig: Articial Intelligence: A Modern Approach, Pearson; 3rd ed (2015)
8. S. Chakrabarti: Mining the Web: Discovering knowledge from hypertext data, Elsevier (2003)
9. J. Hertz, A. Krogh, and R. G. Palmer: Introduction to the Theory of Neural Computation, Addison-Wesley, California (1991)
10. C. D Manning, P. Raghavan and H. Schtze: An Introduction to Information Retrieval, Cambridge University Press (2009)

(5) EVALUATION METHODOLOGY:

- **Mid-Term Exam: 30%**
- **Final Exam: 30%**
- **Assignments: 40%**