

CS22402

MACHINE LEARNING TECHNIQUES

(Common to CS and AD)

L	T	P	C
3	0	0	3

OBJECTIVES

- To understand the basic concepts of machine learning and parametric estimation methods.
- To gain knowledge on supervised learning methods.
- To provide insights on unsupervised learning methods and ensemble models.
- To introduce basic graphical models and advanced machine learning techniques.
- To apply various metrics to evaluate the performance of the models.

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Machine learning concepts - Need for Machine Learning - Types of Machine Learning - Supervised Learning - Unsupervised Learning - Reinforcement Learning.

Learning Theory - Learning Types - Computation Learning - Concept Learning - Design of learning system - Bias and Variance, Modelling - Learning frameworks.

UNIT II SUPERVISED LEARNING 9

Classification models - Naïve Bayes Classifier - K-Nearest Neighbor model - Perceptron - Backpropagation Algorithm - Multilayer Perceptron – Linear and Logistic Regression - Support Vector Machines.

UNIT III UNSUPERVISED LEARNING AND ENSEMBLE MODELS 9

Clustering - K-Means clustering - Hierarchical Clustering - Dimensionality Reduction - Principal Component Analysis (PCA) - Linear Discriminant Analysis (LDA). Ensemble Methods: Bagging - Boosting - Gradient boosting.

UNIT IV GRAPHICAL MODELS AND REINFORCEMENT LEARNING 9

Markov random fields - Hidden Markov Models - Representation - Learning - Decoding - Inference in graphical models - Monte Carlo models – Sampling.

Reinforcement Learning - Model Based - Model Free - Q learning - Introduction to Deep learning - Introduction to Evolutionary Computing.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments - Cross Validation (CV) and Resampling – K-fold Cross Validation – Bootstrapping - Measuring classifier performance – Assessing a single classification algorithm – Comparing two classification algorithms – t test, McNemar's test.

TOTAL (L:45): 45 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT Level
CO1	Illustrate basics of the machine learning concepts and Learning theory	2
CO2	Demonstrate the usage of supervised learning models.	3
CO3	Demonstrate the usage of unsupervised learning models and ensemble models.	3
CO4	Illustrate the graphical models and graphical learning techniques.	3
CO5	Analyse the performance of machine learning models.	4

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Sridhar S, Vijayalakshmi M, "Machine Learning", Oxford University Press, First Edition, 2021.
3. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERENCES

1. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
2. Peter Flach, "Machine Learning", First Edition, Cambridge University Press, 2012.
3. Tom Mitchell, "Machine Learning", First Edition, McGraw Hill, 1997.
4. Kevin P. Murphy. "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
5. Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer, 2020.