

SCSA1601	MACHINE LEARNING	L	T	P	Credits	Total Marks
		3	*	0	3	100

**COURSE OBJECTIVES**

- To focus on the construction and study of algorithms that can learn from data.
- To emphasize on the logical, knowledge-based approach.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research.

**UNIT 1 INTRODUCTION TO MACHINE LEARNING****9 Hrs.**

Machine learning - examples of machine learning applications - Learning associations - Classification -Regression - Unsupervised learning - Supervised Learning - Learning class from examples - PAC learning -Noise, model selection and generalization - Dimension of supervised machine learning algorithm.

**UNIT 2 DECISION THEORY****9 Hrs.**

Bayesian Decision Theory- Introduction- Classification - Discriminant function-Bayesian networks-Association rule - Parametric Methods - Introduction - Estimation -Multivariate methods-Data Parameter estimation-Dimensionality Reduction- PCA-Linear discriminant analysis.

**UNIT 3 CLUSTERING AND REGRESSION****9****Hrs.**

Clustering - Mixture densities - k-means clustering - Supervised Learning after clustering - Hierarchical clustering - Nonparametric Methods - Density estimation - Generalization of multivariate data - Smoothing models -Decision Trees - Univariate trees - Multivariate trees - Learning rules from data - Linear Discrimination-Gradient Descent.

**UNIT 4 MULTILAYER PERCEPTRONS****9 Hrs.**

Structure of brain - Neural networks as a parallel processing - Perceptron - Multilayer perceptron - Back propagation - Training procedures - Tuning the network size - Learning time.

**UNIT 5 LOCAL MODELS****9 Hrs.**

Competitive learning - Adaptive resonance theory - Self organizing map -Radial Basis functions - Bagging- Boosting- Reinforcement Learning.

**Max. 45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Understand complexity of Machine Learning algorithms and their limitations.
- CO2 - Understand modern notions in data analysis oriented computing.
- CO3 - Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
- CO4 - Be capable of performing distributed computations
- CO5 - Can demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- CO6 - Gain ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

**TEXT / REFERENCE BOOKS**

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 1997.
3. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions carrying 2 marks each – No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 marks**80 Marks**