SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

(Established under section 3 of the UGC Act 1956)

Re - accredited by NAAC with 'A' Grade

Founder: Prof. Dr. S. B. Mujumdar, M.Sc.,Ph.D. (Awarded Padma Bhushan and Padma Shri by President of India)

Course Name : Unsupervised Learning
Course Code : TE7760
Faculty : Engineering
Course Credit : 3
Course Level : 3
Sub-Committee (Specialization) : Computer Science
Learning Objectives :

1.Explain various types of machine learning methods , feature selection and dimensionality reduction techniques.
2.Describe theories, concepts and algorithms related to standard unsupervised learning and how to select them
3.Explain various advanced clustering algorithms
4.Discuss advanced clustering algorithms
5.Understand the various deep learning based clustering approaches

Books Recommended :

Book	Author	Publisher
Machine Learning A Probabilistic Perspective	Kevin P Murphy	MIT Press, August 2012.
Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Cambridge University Press, Edition 2012

Course Outline :

Sr. No.	Topic	Actual Teaching Hours	Contact Hours Equivalence
1	**Introduction to Unsupervised Learning - Introduction to Machine Learning, applications, Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning.** **Data Types and distance measures Numeric Data and Euclidean Distance, Categorical data, Graph data, Spatial data, Trajectory data, Time Series Data and Distance measures, Manhattan, Minkowski, Chessboard and others.**	**10**	**10**
2	**Dimensionality Reduction Techniques- Data size, Feature size and scalability issues in Machine Learning. Linear Discriminate Analysis, Principal Component Analysis, Independent Component Analysis, Non-Negative Matrix Factorization and types, Singular Value Decomposition, Manifold Learning methods: MDS and T-SNE, normalization of input data, Density estimation**	**8**	**8**
3	**Clustering Algorithms and their selection- Clustering Patterns and techniques- static and incremental clustering algorithms, k-means, agglomerative, Partitional Clustering and types, Hierarchical Clustering and types. Performance evaluation measures in clustering techniques. Computational issues with clustering algorithms and how different clustering implementations try to overcome them. Comparison and Selection of algorithm based on applications**	**11**	**11**

4	**Advanced Clustering Algorithms- BIRCH Algorithm, CURE Algorithm, Spectral Clustering, Canopy Clustering, Density Based Clustering- DBSCAN Algorithm. Mixture Models- Gaussian Mixture Models, Expectation Maximization**	**12**	**12**
5	**Deep Unsupervised Learning Approaches- Introduction to autoencoders and GAN**	**4**	**4**
	Total	**45**	**45**

Pre Requisites :

1. Machine Learning Concepts

Evaluation :

A) Continuous Assessment (75 marks)
Quiz
Assignment
Class test
Viva
B) End Semester Examination: N.A

Pedagogy :

1. Online Video lectures
2. Webinars
3. Online activities

Expert :

Dr Rahee Walambe,Associate Professor,SIT