

DAV AUTONOMOUS COLLEGE TITILAGARH
Value Added Course
on
Machine Learning With Python
(Department of Computer Science)

			Total Hrs-30
Prerequisites:	<ol style="list-style-type: none"> 1. Design & Analysis of Algorithm 2. Discrete Mathematics 3. Probability & Statistics 		
Course Objectives			
<ol style="list-style-type: none"> 1. To make the students familiarize with fundamental understanding of Machine learning 2. Enable students to use machine learning techniques to solve some real life problems. 3. To evaluate the power and limitation of deep learning in solving computational problems. 			
Course Details			
Unit 1			
Introduction			(08 Hrs)
U1.1.	Basic concepts: Introduction to Machine Learning: Definition, History, applications and need, Learning: what is learning, Types of learning, Examples, Data/Features, Hypothesis space and inductive bias, Bias-variance Trade off, Loss function, Evaluation matrix Basic statistical concepts: Mean Median, Mode, Variance, Co-variance, Correlation, dispersion matrix.		
U1.2.	Self Study: Chebyshev's inequality, central limit theorem, machine learning system.		
Unit 2			
Supervised learning			(08 Hrs)
U2.1.	Supervised learning setup (training, testing). Classification and Regression, Regression: Linear regression. Logistic regression. Classification: Minimum distance classifier, k-nearest neighbor classifier, Perceptrons (single layer/multi-layer). Decision trees, Model selection, Over-fitting, Cross validation.		
U2.2.	Self Study: Learning curves and statistical hypothesis testing.		
Unit 3			
Classification & Dimensionality Reduction			
U3.1.	Basic concepts in probability theory such as Bayes theorem, Bayesian Learning, Naïve Bays Algorithm for prediction problem, Bayesian Classification. Support vector machines: Introduction, Linear and Non-Linear SVM, Role of Kernel function. Dimensionality reduction, and feature selection, Principal component Analysis		
U3.2.	Self Study: Mixture of Gaussian, Factor analysis.		
Unit 4			
Unsupervised learning			(08 Hrs)

U4.1.	Clustering. Similarity measures, Case Study for K-means algorithm, Hierarchical clustering - Divisive algorithm, Density based clustering (DBSCAN) , Inductive and deductive learning.
U4.2.	Self Study: Study of different kernel functions, Case study of Naïve Bays for classification and prediction.
Unit 5	
Semi-supervised and Reinforced Learning (06 Hrs)	
U5.1.	Ensemble Learning: One class classifier, Bagging, Boosting, Ensemble classifier, Random Forest Model (RFM): A case study for prediction, Reinforcement learning: Basic Idea, Q-Learning
U5.2.	Self Study: Exploring and using some open source Reinforcement learning libraries for designing a simple learning model.
Notes:	Five assignments to be given to the students on self study, comprising of one assignment from each unit.
Course Outcome:	
At the end of the Course, the students will be able to	
CO1:	Use mathematical concepts required for machine learning
CO2:	Identify and differentiate different types of supervised learning
CO3:	Identify and differentiate different types of unsupervised learning
CO4:	Apply learning mechanisms like Bayesian Classifier, SVM etc.
CO5:	Explore advanced methods of machine learning
Text Books:	
T1.	Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
T2.	Introduction to Machine Learning Edition 2, by Ethem Alpaydin
Reference Books:	
R1.	Stephen Marsland, Machine Learning: An Algorithmic Perspective, Second Edition
R2.	Optimization for Machine Learning by Suvrit Sra, Sebastian Nowozin, Stephen J. Wright.
R3.	Pattern Recognition and Machine Learning by Christopher M. Bishop
Open Sources	
O1.	Machine Learning https://nptel.ac.in/courses/106106139/