B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19

Autonomous Institute, Affiliated to VTU

Department of CSE (Data Science)

Sem	IV		
Course Title:	**Machine Learning**		
Course Code:	**23DS4PCMLG**	**Total Contact Hours: 40 hours**	
L-T-P:	**3-0-1**	**Total Credits:**	**4**

Unit No.	Topics	Hours
1	**Machine Learning Landscape:** Introduction, Types of Machine Learning, Challenges of Machine Learning, Testing and Validating. **Supervised Learning** **Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, Issues in Decision tree learning, CART Training algorithm	8
2	**Support Vector Machines:** Linear SVM, Non Linear SVM, SVM Regression, Under the Hood. **Instance Based Learning:** Introduction, k-Nearest Neighbor learning	8
3	**Probabilistic Learning** Bayesian Learning: Bayes Theorem and Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm.	8
4	**Ensemble Learning and Random Forests:** Voting Classifiers, Bagging and Pasting, Random Patches and Random Subspaces, Random Forests, Boosting, Stacking	8
5	**Unsupervised Learning Techniques** Clustering – Kmeans, DBSCAN, Other Clustering Algorithms, Gaussian Mixtures – Anomaly Detection, Selecting Clustering, Bayesian Gaussian Mixture Models, Other algorithms for anomaly and novelty detection **Reinforcement Learning:** Markov Decision Process, Introduction, Learning Task, Q Learning	8

Prescribed Text Book					
Sl. No.	**Book Title**	**Authors**	**Edition**	**Publisher**	**Year**
1.	Machine Learning	Tom M. Mitchell	First	McGraw Hill Education	2013
2	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurelien Geron	Second	O'Reilly	2020

Reference Text Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Machine Learning with Python	Andreas C Muller & Sarah Guido	First	Shroff Publishers	2019
2.	Thoughtful Machine learning	Mathew Kirk	First	Shroff Publishers	2019

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome H. Friedman	Second	-	2009	https://web.stanford.edu/~hastie/Papers/ESLII.pdf
2.	Machine Learning in Action	Peter Harrington	First	Manning	2017	http://www2.ift.ulaval.ca/~chaib/IFT-4102-7025/public_html/Fichiers/Machine_Learning_in_Action.pdf

MOOC Course

Sl. No.	Course name	Course Offered By	Year	URL
1.	Machine Learning	Coursera	--	https://www.coursera.org/learn/machine-learning
2.	Introduction to Machine learning	NPTEL	2016	https://swayam.gov.in/nd_noc20_cs29/preview

Course Outcomes

At the end of the course the student will be able to

CO1	Apply different learning algorithms for various complex problems
CO2	Analyze the learning techniques for given dataset
CO3	Design a model using machine learning to solve a problem.
CO4	Ability to conduct practical experiments to solve problems using appropriate machine learning techniques.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		2										
CO3			3									
CO4				3								

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
Internals	2	25
QUIZ	1	5
Lab Component	CIE + 2 Lab Tests	25
Total		**50**

Lab Program	Unit#	Program Details
1	1	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
2	2	Develop a program to construct Support Vector Machine considering a Sample Dataset
3	2	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions
4	3	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets
5	3	Write a program to construct a Bayesian network considering training data. Use this model to make predictions.
6	3	Apply EM algorithm to cluster a set of data stored in a .CSV file. Compare the results of k-Means algorithm and EM algorithm.
7	4	Implement Boosting ensemble method on a given dataset.
8	4	Write a program to construct random forest for a sample training data. Display model accuracy using various metrics
9	5	Implement tic tac toe using reinforcement learning
10	5	Consider a sample application. Deploy machine learning model as a web service and make them available for the users to predict a given instance.

SEE Exam Question paper format

Unit-1	Mandatory	One Question to be asked for 20Marks
Unit-2	Mandatory	One Question to be asked for 20Marks
Unit-3	Internal Choice	Two Questions to be asked for 20Marks each
Unit-4	Internal Choice	Two Questions to be asked for 20Marks each
Unit-5	Mandatory	One Question to be asked for 20Marks