DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
Approved by AICTE & Affiliated to Anna University, Chennai
Re-Accredited with 'A' Grade by NAAC, Accredited by TCS
Accredited by NBA(AERO, CSE, IT & MECH)
Re-Accredited by NBA(BME, ECE & EEE)
PERAMBALUR – 621 212, Tamil Nadu

LABORATORY COURSE PLAN

COURSE – INFORMATION:

LAB COURSE TITLE	**MACHINE LEARNING LABORATORY**			
LAB COURSE CODE	**P23CSP11**			
LAB COURSE STRUCTURE	**LECTURE**	**TUTORIAL**	**PRACTICAL**	**CREDIT**
	0	0	4	2
REGULATION	**BRANCH**	**YEAR**	**SEMESTER**	**ACADEMIC YEAR**
2023	CSE	I	I	2023-2024
COURSE INCHARGE				

SYLLABUS

COURSE OBJECTIVE:

The student should be made to:

- To introduce R programming environment and Python
- To implement machine learning algorithms
- To understand different categories of existing algorithms
- To choose appropriate algorithm for a given application

LIST OF EXPERIMENTS

1. Apply Principal Component Analysis on a high dimensional data set to reduce dimension.
2. Implement and study K-Nearest Neighbour classifier.
3. Illustrate Linear Discriminant Analysis for classification.
4. Apply Linear Regression on datasets.

5. Demonstrate Logistic Regression and compare with Linear Regression.

6. Implement Bayesian Classifier.

7. Apply Support Vector Machine with different kernels.

8. Demonstrate Relevance Vector Machine and compare with SVM.

9. Implement Multi-Layer Feed Forward Neural Network.

10. Apply Regularization techniques.

11. Apply Convolutional Neural Network for image classification.

12. Demonstrate Hidden Markov Model for sequential modelling.

TOTAL: 60 PERIODS

TEXT/REFERENCE BOOKS:

1. **Tom M. Mitchell** *Machine Learning* McGraw-Hill Education, 1997.

2. *Introduction to Machine Learning (3rd Edition)*MIT Press, 2014. **Aurélien Géron** *Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow (2nd Edition)* O'Reilly Media, 2019.
3. **Christopher M. Bishop***Pattern Recognition and Machine Learning* Springer, 2006. **Kevin P. Murph** *Machine Learning: A Probabilistic Perspective* MIT Press, 2012.
4. **Trevor Hastie, Robert Tibshirani, Jerome Friedman***The Elements of Statistical Learning* Springer, 2009.

HARDWARE& SOFTWARE:

- Standalone desktops
- C / C++ / Java / Python / Equivalent Compiler
- Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

VIRTUAL LAB LINK:

https://www.studytonight.com/operating-system
https://hubpages.com/technology/Communication-Engineering-FAQs
https://www.nptelvideos.in/2012/11/computer-networks.html
https://www.tecmint.com/linux-network-configuration-and-troubleshooting-commands
https://www.comptechdoc.org/os/linux/commands/linuxcrspfiles.html

EXP. NO.	NAME OF THE EXPERIMENTS	NO. OF PERIODS	CUMULATIVE PERIODS
	CYCLE I		
1	Apply Principal Component Analysis on a high dimensional data set to reduce dimension.	8	8
2	Implement and study K-Nearest Neighbour classifier.	4	12

3	Illustrate Linear Discriminant Analysis for classification.	8	20
4	Apply Linear Regression on datasets.	4	24
5	Demonstrate Logistic Regression and compare with Linear Regression.	4	28
6	Implement Bayesian Classifier.	8	36
7	Apply Support Vector Machine with different kernels.	4	40
8	Demonstrate Relevance Vector Machine and compare with SVM.	8	48
9	Apply Convolutional Neural Network for image classification.	4	52
10	Demonstrate Hidden Markov Model for sequential modelling.	8	60

ADDITIONAL EXPERIMENTS		
EXP. NO.	**NAME OF THE EXPERIMENTS**	**Identified Resource link**
1	Implement PCA using Python (NumPy/Scikit-learn) and visualize dimensionality reduction	https://scikit-learn.org/stable/modules/decomposition.html
2	Implement KNN classifier from scratch and compare with library implementation	https://machinelearningmastery.com/tutorial-to-implement-k-nearest-neighbors-in-python-from-scratch/
3	Implement Linear and Logistic Regression using real-world datasets (e.g., Iris, Housing)	https://scikit-learn.org/stable/supervised_learning.html
4	Perform model evaluation using Confusion Matrix, Accuracy, Precision, Recall, F1-score	https://scikit-learn.org/stable/modules/model_evaluation.html
5	Implement Naive Bayes classifier for text classification (spam detection)	https://www.datacamp.com/tutorial/naive-bayes-scikit-learn

MODEL LAB DETAILS

BATCH	REGISTER NO.	MODE OF LAB CONDUCT	DATE	TIMING
1		Offline Mode		

LIST OF QUESTIONS

1. Apply Principal Component Analysis (PCA) on a high-dimensional dataset and analyze the variance retained after dimensionality reduction.

2. Implement K-Nearest Neighbor (KNN) classifier for a given dataset and evaluate its performance for different values of K.
3. Compare the performance of KNN using different distance metrics such as Euclidean and Manhattan distance.
4. Implement Linear Discriminant Analysis (LDA) for binary classification and visualize class separation.
5. Extend LDA for multi-class classification and compare results with binary classification.
6. Apply Linear Regression on a dataset and interpret the model coefficients and error metrics.
7. Compare Linear Regression with Logistic Regression for classification tasks and analyze differences.
8. Implement Logistic Regression and evaluate using confusion matrix and ROC curve.
9. Implement Naive Bayes classifier for a multi-class dataset and analyze classification accuracy.
10. Compare probabilistic classifiers (Naive Bayes) with discriminative models (Logistic Regression, SVM).
11. Implement Support Vector Machine (SVM) with linear kernel and evaluate performance.
12. Apply SVM with non-linear kernels (RBF, Polynomial) and compare results.
13. Analyze the effect of kernel parameters (gamma, C) in SVM performance.
14. Implement Relevance Vector Machine (RVM) and compare results with SVM.
15. Design and implement a Multi-Layer Feed Forward Neural Network for classification.
16. Analyze the effect of different activation functions (ReLU, Sigmoid, Tanh) in neural networks.
17. Evaluate neural network performance for different numbers of hidden layers and neurons.
18. Apply regularization techniques (L1, L2) and compare model performance before and after regularization.
19. Implement Convolutional Neural Network (CNN) for image classification and evaluate accuracy.
20. Compare CNN performance with traditional machine learning models for image data.
21. Implement Hidden Markov Model (HMM) for sequence prediction and analyze results.
22. Compare supervised and unsupervised learning techniques used in the experiments.
23. Perform cross-validation and analyze model generalization ability.
24. Evaluate models using metrics such as accuracy, precision, recall, F1-score, and ROC curve.
25. Develop a complete machine learning pipeline from data preprocessing to model evaluation.

PREPARED BY **VERIFIED BY**

APPROVED B