MANDSAUR UNIVERSITY - Faculty of Engineering and Technology

Department of Computer Science & Engineering

SYLLABUS FOR 3 Semester B.Tech PROGRAMME

Introduction to Machine Learning (CSE663 TR1)

Type of Course: B.Tech

Prerequisite:

Rationale: -

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lecture Hrs/ Week	Tutorial Hrs/ Week	Lab Hrs/ Week		External		Internal			
				TH-EST	PR-EST	Th - MST	CET	Pr - MST	
2	1	-	3	60	-	30	10	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit 1 Introduction to Machine Learning**: Introduction to Machine Learning, Definition and scope of machine learning, Historical developments and key milestones, Machine learning workflow and process. Issues in machine learning, Types of learning: supervised, unsupervised and Reinforcement learning, Concept learning.	20%	9
2	**Unit 2 Supervised Learning**: Supervised Learning, Linear Regression- Simple linear regression, Multiple linear regression, Support Vector Machines (SVM), Decision trees and Random Forests, Ensemble methods: Bagging and Boosting. Polynomial regression, Evaluation metrics: MSE, RMSE, MAE, confusion matrix, ROC curve, AUC, accuracy, precision, recall, F1-score, Cross-validation techniques, Bias-Variance tradeoff	20%	9
3	**Unit 3 Unsupervised Learning**: Unsupervised Learning, K-means clustering, Hierarchical clustering, Dimensionality Reduction: Principal Component Analysis (PCA), t-Distributed Stochastic Neighbor Embedding (t-SNE), Association Rules: Apriori algorithm, Market basket analysis.	20%	9
4	**Unit 4 Advanced Topics**: Ensemble Methods: Bagging (Random Forest) , Boosting: (AdaBoost, Gradient Boosting Machines (GBM), XGBoost), Support Vector Machines (SVM): Concepts and hyperplanes, Kernel trick, Neural Networks and Deep Learning: Basics of neural networks, Introduction to deep learning and neural network architectures, Natural Language Processing (NLP): Text preprocessing, Sentiment analysis, Introduction to wor	20%	9
5	**Unit 5 Genetic Algorithms (GAs)**: Genetic Algorithms (GAs): Motivation, Representing Hypotheses, Genetic operators, fitness Function and Selection, Working of Genetic Algorithm, Case studies of Machine Learning data sets.	20%	9

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Pattern Recognition and Machine Learning (TextBook)
   By Christopher Bishop | Springer
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" (TextBook)
   By AurélienGéron
3. Deep Learning (TextBook)
   By Ian Goodfellow, Yoshua Bengio, Aaron Courville | MIT Press
4. The Elements of Statistical Learning (TextBook)
   By Trevor Hastie, Robert Tibshirani, Jerome Friedman | Springer
5. Machine Learning: A Probabilistic Perspective
   By Murphy | MIT Press | Latest
6. Pattern Classification
   By Richard O. Duda, Peter E. Hart, and David G. Stork
7. Deep Learning with Python
   By Francois Chollet | Manning
8. Reinforcement Learning: An Introduction"
   By Richard S. Sutton and Andrew G. Barto

List of Practical:

1. Implement a linear regression model to predict housing prices based on features like area, number of rooms, etc.
2. Develop a program to analyze and predict stock market trends using linear regression
3. Build a spam email classifier using logistic regression to classify emails as spam or non-spam.
4. Create a program to predict customer churn for a subscription-based service using logistic regression.
5. Construct a decision tree model to classify different species of flowers based on their features.
6. Develop a program that predicts whether a credit card applicant is likely to default or not using decision trees.
7. Build a random forest classifier to classify images into different categories.
8. Develop a program that predicts customer satisfaction using gradient boosting and ensemble learning.
9. Implement an SVM model for sentiment analysis to classify movie reviews as positive or negative.
10. Build a program that detects anomalies in network traffic using SVM.
11. Develop a program to segment customer data into different groups using K-means clustering.
12. Implement hierarchical clustering to analyze and group documents based on their similarity
13. Use principal component analysis (PCA) to reduce the dimensionality of a dataset and visualize it.
14. Apply t-SNE (t-Distributed Stochastic Neighbor Embedding) to visualize high-dimensional data in a lower-dimensional space.
15. Build a convolutional neural network (CNN) for image recognition, such as classifying handwritten digits.
16. Develop a recurrent neural network (RNN) for sentiment analysis on text data.
17. Create a program that uses reinforcement learning to train an agent to play a game or solve a puzzle
18. Implement a reinforcement learning algorithm to control a robotic arm in a simulated environment.
19. Use a pre-trained deep learning model (e.g., VGG, ResNet) for image classification on a custom dataset.
20. Apply transfer learning to adapt a pre-trained language model for text generation or sentiment analysis.