

Year: M. Tech. I (Semester - II)

Subject Name: Machine Learning

Subject Code: MTCO23201

Type of course: Professional Core

Prerequisite (if any): Basics of Python Programming, Data Structure and Algorithms, Probability and Statistics

List of Courses where this course will be prerequisite: --

Rationale: Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. This subject will help students to learn patterns and concepts from data without being explicitly programmed and also motivates them to design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs
1	Introduction to Machine Learning: Overview and types of Human Learning and Machine Learning, Applications of Machine Learning, Issues in Machine Learning	3
2	Preparing to Model: Machine Learning activities, Basic types of data in Machine Learning, Structures of data, Data quality and remediation, Data Pre-Processing - Dimensionality reduction, Feature subset selection.	4

3	Modelling and Evaluation: Selecting a Model - Predictive/Descriptive, Training a model for supervised learning, Model representation and interpretability, Evaluating performance of a model, Improving performance of a model.	4
4	Basics of Feature Engineering: Feature and Feature Engineering, Feature transformation - Construction and extraction, Feature subset selection - Issues in high-dimensional data, key drivers, measures of feature relevance, Overall feature selection process, Feature selection Approaches	4
5	Supervised Learning - Classification: Introduction, Classification Model, Classification Learning steps, Classification algorithms - Decision Tree : ID3, C4.5, and CART, Naïve Bayes, k - Nearest Neighbor, SVM	9
6	Supervised Learning - Regression: Introduction, Regression algorithms - Simple linear regression, Multiple linear regression, Logistic regression, Polynomial regression model	4
7	Unsupervised Learning: Introduction, Supervised Vs. Unsupervised Learning, Clustering - k-means clustering, k-mediod clustering, Hierarchical Clustering, Finding patterns using association rules, Applications of unsupervised learning	7
8	Neural Network: Introduction to neural network, Biological and Artificial Neurons, Types of Activation functions, Architecture of Neural Network, Implementation of Neural Network, Leaning process in Neural Network, Backpropagation	7
9	Ensemble Learning Models: Bagging - Random Forest Classifier, Boosting - Adaboost, Stacking	3

Reference Books:

Sr.No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Machine Learning	S. Chandramouli, Saikat Dutt, A. Das	Pearson ISBN: 978938958813 2	2018	First Edition
2	Machine Learning	Tom Mitchell	McGraw- Hill	1997	First Edition

3	Machine Learning with Python for Everyone	Mark Fenner	Pearson	2020	First Edition
4	Introduction to Machine Learning	Ethem Alpaydin	PHI Learning	2015	Second Edition
5	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Aurelin Geron	O-Reilly	2017	Second Edition

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Explore the fundamental issues in Machine Learning including data and model selection, model preparation and its evaluation.	24
CO-2	Understand the basics of feature engineering.	10
CO-3	Evaluate supervised learning algorithms using appropriate dataset.	35
CO-4	Evaluate unsupervised learning algorithms using appropriate dataset.	16
CO-5	Integrate the basic building blocks of neural network to construct models	15

List of Open learning website:

- https://onlinecourses.nptel.ac.in/noc19_cs85
- https://onlinecourses.nptel.ac.in/noc19_cs52
- <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs54/>

List of Open Source Software:

- Python
- Tensorflow
- Keras
- OpenCV
- Pytorch

FOR LAB SESSIONS:

List of Experiments:

Minimum 10 Experiments are to be designed covering various activities and algorithms in machine learning with datasets from different domains