

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Computer Science Engineering)			
Subject Code & Name	Instructions Hours per Week			Credits			
5RCPE1: Advance Machine Learning	L	R	P	L	R	P	Total
Duration of Theory Paper: 3 Hours	3	1	4	3	1	2	6

Learning Objectives:

1. Understand advanced machine learning algorithms and optimization techniques.
2. Apply advanced data mining techniques for knowledge discovery.
3. Develop Natural Language Processing (NLP) applications.
4. Optimize machine learning models using Genetic Algorithms.
5. Design and evaluate intelligent machine learning solutions for real-world applications.

Prerequisites:

The students are required to have some basic knowledge about Artificial Intelligence & Machine Learning Fundamentals, Data Structures, Probability & Statistics, Python Programming and Linear Algebra.

COURSE CONTENTS

UNIT-I: Advanced Machine Learning Foundations

Machine Learning Workflow , Data Pre-processing , Missing Value Handling , Feature Engineering , Feature Selection , Bias–Variance Trade-off ,Overfitting ,Cross Validation , Hyperparameters Tuning ,Model Evaluation Metrics.

UNIT-II: Advanced Supervised Learning

Classification, Decision Tree Classifier: Decision tree algorithm, Ensemble Learning, Advanced Classification: Support Vector Machine, Model Optimization, Model Selection, Holdout Method, Cross-Validation.

UNIT-III: Advanced Data Mining Techniques

Data Mining Concepts, Knowledge Discovery in Databases (KDD),Data Warehousing Concepts, OLAP Operations, Association Rule Mining, Frequent Pattern Mining, Apriori Algorithm, FP-Growth Algorithm , Rule Generation , Clustering, K-Means , Hierarchical Clustering , DBSCAN , Dimensionality Reduction, Outlier Detection, Density-Based Methods,

UNIT-IV: Evolutionary Computing & Natural Language Processing

Genetic Algorithm, Introduction to Evolutionary Computing, Genetic Algorithm Fundamentals, Chromosome Representation, Fitness Function, Selection Methods, Crossover Operators, Mutation Operators, Elitism, Applications of Genetic Algorithm, Natural Language Processing , NLP Fundamentals ,NLP Pipeline.

UNIT-V: Emerging Trends and Applications

Recommendation Systems, Content-Based Filtering, Collaborative Filtering, Hybrid, Recommendation Systems, Explainable Machine Learning, Reinforcement Learning, Markov Decision Process, Applications, Renewable Energy Forecasting.

Course Outcomes:

Students who have completed this course should be able to:

CO1: Explain advanced machine learning concepts, data pre-processing, feature engineering, model evaluation techniques, and hyperparameters optimization for developing robust predictive models.

CO2: Apply advanced supervised, unsupervised, and ensemble machine learning algorithms to solve classification, regression, clustering, and prediction problems using appropriate machine learning tools.

CO3: Analyse large datasets using advanced data mining techniques such as association rule mining, clustering, dimensionality reduction, and pattern discovery for knowledge extraction.

CO4: Design and optimize machine learning models using Genetic Algorithms (GA) and develop Natural Language Processing (NLP) applications for text pre-processing, text classification, sentiment analysis, and information extraction.

CO5: Develop and evaluate end-to-end machine learning solutions by integrating advanced algorithms, optimization techniques, explainable AI methods, and modern software tools for real-world applications.

Assessment methods of all of the above: quizzes, exams, assignments.

Co No.	CO	PO
CO1	Learn about advanced machine learning concepts, data pre-processing, feature engineering, model evaluation techniques,	PO1,PO9,PO11
CO2	Solve classification, regression, clustering, and prediction problems	PO2,PO3,PO5 ,PO11,
CO3	Analyse advanced data mining techniques such as association rule mining, clustering	PO2,PO4, PO6
CO4	Design and optimize machine learning models using Genetic Algorithms (GA) and Natural Language Processing	PO2,PO4,PO5,
CO5	Develop and evaluate end-to-end machine learning solutions	PO4,PO5 , PO12

CO PO Relationship

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3								2		3	
CO2		2	3		3						3	
CO3		3		3		2						
CO4		3		3	3							
CO5				3	3							3

Books Recommended:

- [1] Han, Kamber and Pi, Data Mining Concepts & Techniques, Morgan Kaufmann, 3rd Edition, India, 2012.
- [2] Tom Mitchell, *Machine Learning*, McGraw-Hill, 1997.
- [3] David E. Goldberg, *Genetic Algorithms in Search, Optimization and Machine Learning*, Kluwer Academic Publishers, Boston, MA, 1989.
- [4] Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer, 2nd Edition, 2011.
- [5] Sam Anahory and Dennis Murray, Data Warehousing in the Real World, Pearson Education Asia, 2000.
- [6] Manaranjan Pradhan, U Dinesh kumar, Machine Learning using Python. Wiley India, 2020.

List of Assignment in Advance Machine Learning Lab:

- Problem based on different machine Learning algorithm
- Works on different machine learning Tools such as Teachable tools, Orange data mining Tools.
- Case Study on different data sets.