Course Code				**22ANDSP303**			
Title of the Course				**Machine Learning LAB**			
Offered to:				**MBA Business Analytics**			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	**Domain Specific Elective LAB**			**Course Relates to:**	**Global**		
Year of Revision:	**NA**			**Percentage:**	**NA**		
Type of the Course:				**Skill Development, Employability**			
Crosscutting Issues of the Course :							
Pre-requisites, if any				**Good Business Functionalities, Python Programming**			

Course Description: The aim of "Machine Learning Lab" is to provide hands-on experience with key machine learning concepts. Students will apply techniques such as feature engineering, model selection, training, and evaluation. The lab focuses on implementing algorithms like regression, classification, clustering, and ensemble methods, enabling students to develop practical skills for solving real-world data science problems through coding and experimentation.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Recall fundamental machine learning concepts, algorithms, and workflows for tasks like classification, regression, and clustering.
2	Interpret model outputs and evaluate the performance metrics of different algorithms.
3	Implement machine learning models using programming tools and techniques, applying them to real-world datasets.
4	Compare the effectiveness of different algorithms through model evaluation techniques such as cross-validation and confusion matrices.
5	Critically assess model performance and make data-driven decisions regarding model selection and optimization.

Course Outcomes

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO 1	Recall fundamental machine learning concepts, algorithms, and workflows for tasks like classification, regression, and clustering.	K1	PO1	1
CO 2	Interpret model outputs and evaluate the performance metrics of different algorithms.	K2	PO2	2
CO 3	Implement machine learning models using programming tools and techniques, applying them to real-world datasets.	K2, K3	PO3	1
CO 4	Compare the effectiveness of different algorithms through model evaluation techniques such as cross-validation and confusion matrices.	K3	PO3, PO1	2
CO 5	Critically assess model performance and make data-driven decisions regarding model selection and optimization.	K34 ,K5	PO7	2

Lab Component

Component 1: Feature Engineering and Model Selection
Experiment

1. **Feature Engineering**:
    - Perform basic feature transformation like scaling, encoding categorical variables, handling missing values.
    - Explore feature extraction techniques like PCA (Principal Component Analysis).
2. **Model Selection**:
    - Choose between models like Linear Regression, Decision Tree, and Random Forest.
3. **Evaluate**: Evaluate the model using metrics like accuracy, precision, recall, and confusion matrix.

Component2 : Bayesian Concept Learning and Regression : Understand Bayesian learning and explore regression algorithms.

5. **Bayesian Concept Learning**:
    - Create a simple Bayesian belief network using tools like pgmpy.
6. **Simple Linear Regression**:
    - Train a model to predict housing prices based on a single feature (e.g., size of the house).
    - Plot the regression line and calculate the residual sum of squares.
7. **Logistic Regression**:
    - Use a binary classification dataset (e.g., Breast Cancer dataset).
    - Train a Logistic Regression model and interpret the coefficients.

Component 3: Supervised Learning and Ensemble Methods : Learn how to implement common classification algorithms and explore ensemble learning methods.

8. **Classification**:
    - Implement k-Nearest Neighbor (KNN)
    - Decision Trees modeling
9. **Ensemble Learning**:
    - Implement a Random Forest classifier and understand the concept of bagging.

Component 4: Unsupervised Learning and Clustering
Steps:

10. **Clustering Introduction**:
    - Dataset: Use a customer segmentation dataset (e.g., Dmart a, Amazon Customer Segmentation).
    - Apply k-Means clustering and visualize clusters.

11. **Hierarchical Clustering**:
    - Apply Agglomerative clustering on a similar dataset.
    - Plot a dendrogram and compare with k-Means.
12. **Association Rules**:
    - Use the Apriori algorithm to find frequent itemsets in a dataset like Groceries dataset and generate association rules.

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Evaluation Procedure for Lab Examination

Internal Continuous Assessment (15 Marks)

- **Total**: 15 Marks
    - 15 marks will be awarded based on continuous assessment.
    - Day-to-day work in the laboratory will be evaluated by the concerned laboratory teacher based on rubrics, including results, regularity, record maintenance, and viva.
    - Laboratory teachers must ensure that every student completes at least 90% of the lab assessments.

Semester End Practical Examination (Max. Marks: 35)

- **Evaluation Procedure**: 35 Marks
    - **I. Experiments (Exam & Execution)**: 30 Marks
    - **II. Viva**: 3 Marks
    - **III. Record**: 2 Marks
