**Lab 8**

**School of Computer Science Engineering and Technology**

| **Course: B. Tech.** | **Type: Core** |
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| Course Code: CSET301 | Course Name: Artificial Intelligence and Machine Learning |
| Year: 2025 | Semester: Odd |
| Date: [Insert Date] | Batch: 2023-2027 |

CO-Mapping

|  | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
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**AIML Lab 8 – Decision Tree Classification with K-Fold Cross-Validation on Iris Dataset**

**Objective: Total Marks:- 1.0**  
To implement Decision Tree classification on the Iris dataset and evaluate using K-Fold cross-validation. Students will learn to compute performance metrics and visualize the results for each fold.

**Problem Statement:**

* Use the Iris multiclass dataset from scikit-learn.
* Implement a Decision Tree classifier.
* Use KFold cross-validation (5 folds) to evaluate model performance.
* For each fold, compute accuracy, precision, recall, and F1-score.
* Visualize confusion matrices and class distribution per fold.
* Optionally explore learning curves.

**Explanation:**

* Step 1: Load the Iris dataset from scikit-learn, with features X and labels y.
* Step 2: Initialize a Decision Tree classifier with a fixed random state for reproducibility.
* Step 3: Use K-Fold cross-validation with 5 splits, enabling shuffling with a random seed.
* Step 4: For each fold, split the data into training and test sets, train the model, predict, and compute key metrics (accuracy, precision, recall, F1-score). We also track class distributions in test folds.
* Step 5: Print out the average performance over all folds.
* Step 6 & 7: Visualize confusion matrices for each fold, labelling axes with class names.
* Step 8: Visualize the class distribution in each fold’s test set to understand the data split.

#### **Helpful links**

1. Scikit Documentation for KFold Cross Validation

<https://scikit-learn.org/stable/modules/generated/sklearn.model_selection.KFold.html>

1. Scikit Documentation for Multiclass Classification

<https://scikit-learn.org/stable/modules/multiclass.html>

1. Scikit Documentation for Multiclass Classification

<https://scikit-learn.org/stable/modules/tree.html>