Lab Assignment 5: Classification Decision Tree using the CART Algorithm

Duration: 2 **Hours Date: 26-03-2025**

Dataset: WineQT

Objective:

Implement the CART algorithm to classify wine quality as "Good" or "Not Good," using a decision tree based on the dataset's features.

Instructions:

- **Data Preprocessing:**
  - ➢ Load the Wine Quality dataset.
  - ➢ Convert quality scores into binary labels (Good ≥ 7, Not Good < 7).
  - ➢ Split data into training (80%) and testing (20%) sets.
- **CART Algorithm Implementation:**
  - ➢ Use **scikit-learn** to implement CART (criterion: **Gini Index** or **Entropy**). ➢ Build a decision tree, limiting depth to avoid overfitting.
- **Model Training and Evaluation:**
  - ➢ Train the model on the training set.
  - ➢ Evaluate performance using metrics: **Accuracy**, **Precision**, **Recall**, **F1-Score**, and **Confusion Matrix**.
  - ➢ Visualize the decision tree.
- **Conclusion:**
  - ➢ Analyze and summarize results based on evaluation metrics and tree structure. **Report**:

1-2 page summary with visualizations and model performance.