

## Lab Assignment – Decision Trees

### Problem Statement:

Build a decision tree classifier to predict the type of wine based on its chemical characteristics such as alcohol content, pH, etc.

### Dataset:

The dataset used for this assignment is the Wine Quality dataset, which can be downloaded from the UCI Machine Learning Repository: <https://archive.ics.uci.edu/ml/datasets/Wine+Quality>

The dataset consists of 1599 records with 11 features (fixed acidity, volatile acidity, citric acid, residual sugar, chlorides, free sulfur dioxide, total sulfur dioxide, density, pH, sulphates, and alcohol) and a target variable (quality). The data is stored in a CSV file named 'winequality-red.csv'.

### Requirements:

- Load the dataset using the pandas library.
- Preprocess the data if necessary (e.g., handle missing values, scale the features, etc.).
- Split the dataset into training and testing sets.
- Train the decision tree classifier using the training data.
- Predict the target variable for the test data using the trained classifier.
- Evaluate the performance of the classifier using accuracy, precision, recall, and F1-score metrics.

### Useful Hints:

- You can use the DecisionTreeClassifier class from the sklearn library to build the decision tree classifier.
- You can use the train\_test\_split function from the sklearn library to split the data into training and testing sets.
- You can use the accuracy\_score, precision\_score, recall\_score, and f1\_score functions from the sklearn library to evaluate the performance of the classifier.