# Assignment 1: Classification on Wine Dataset

**Objective**:

Apply the machine learning techniques you've learned to classify wines into three classes based on their physicochemical properties.

**Instructions**:

* Load the Wine dataset from sklearn.datasets.
* Explore the dataset, understand the features, and examine the target classes.
* Split the dataset into training and testing sets with a 80-20 ratio.
* Implement and evaluate the following classifiers:
  + Logistic Regression
  + Decision Tree
  + Random Forest
* Compare the accuracy of the classifiers on the testing dataset.
* Conclude which classifier performs best and provide reasoning.

**Evaluation Criteria**:

1. Proper data exploration and understanding.
2. Correct implementation and evaluation of the three classifiers.
3. Clear presentation of accuracy comparison.
4. Sound reasoning behind the conclusion of the best model.

# Assignment 2: Advanced Classification with Hyperparameter Tuning and SVM

**Objective**:

Apply advanced machine learning techniques and delve into hyperparameter tuning to classify breast cancer as benign or malignant.

**Instructions**:

1. Load the Breast Cancer dataset from sklearn.datasets.
2. Explore and preprocess the data. Ensure the data is standardized.
3. Split the dataset into training, validation, and testing sets (60-20-20).
4. Implement the Random Forest classifier:
5. Conduct hyperparameter tuning using the validation set to find the optimal parameters (Consider hyperparameters like n\_estimators, max\_depth, etc.).
6. Implement the Support Vector Machine (SVM) classifier. You might need to research this.
7. Use the Radial Basis Function (RBF) kernel.
8. Conduct hyperparameter tuning using the validation set to find the best C and gamma values.
9. Compare the accuracy of the optimized Random Forest and SVM on the testing dataset.
10. Conclude which classifier performs best and provide reasoning.

*Hints:*

* *Consider using GridSearchCV or RandomizedSearchCV from sklearn for hyperparameter tuning.*
* *SVM with the RBF kernel can capture complex relationships but is sensitive to hyperparameters.*

**Evaluation Criteria**:

* Proper data exploration, preprocessing, and standardization.
* Correct implementation of hyperparameter tuning and classifiers.
* Clear presentation of accuracy comparison and hyperparameter choices.
* Sound reasoning behind the conclusion of the best model.
* Evidence of independent research and learning in SVM implementation.