In this homework, you will work with the Wine dataset to perform preprocessing, handle data imbalance, train classification models, and evaluate their performance.

Dataset: https://scikit-learn.org/stable/datasets/toy_dataset.html#wine-recognition-dataset

- You can download the dataset using sklearn.datasets.load_wine() (see Task 1 for an example)

Task 1 (10 points): Load the Dataset

- Use sklearn.datasets.load_wine() to load the dataset.
- Convert it to a Pandas DataFrame for easier processing.
- Display basic info: number of rows, columns, feature names, and class distribution.

```
from sklearn.datasets import load_wine
import pandas as pd

wine = load_wine()
df = pd.DataFrame(wine.data, columns=wine.feature_names)
df['target'] = wine.target
print(df.head())
```

Task 2 (25 points): Data Preprocessing

- Check for missing values in the dataset.
- Perform outlier detection
- Apply normalization or standardization if necessary (state your reason)

Task 3 (25 points): Data Imbalance Check and Handling

- Check class distribution in the target variable.
- If the dataset is imbalanced, use SMOTE (Synthetic Minority Over-sampling Technique) to balance it.

Task 4 (30 points): Model Building and Evaluation

- Train and evaluate two classifiers: Naive Bayes, Logistic Regression
- Split the dataset into train/test sets (e.g., 80/20 split). Evaluate both models using: Accuracy, Precision, Recall, F1-score

Submission (10 points):

- (5 points) Submit a Jupyter Notebook (.ipynb) with clean, well-commented code and outputs. Each cell should be clearly labeled with the corresponding task.
- (5 points) Submit a formal PDF report summarizing your approach, analysis, visualizations, and interpretation of results.