|  |
| --- |
| ASSIGNMENT |
| NAMES: JOYCE THOMAS ID NO: 27792  MARIE JUANA ID NO: 27875  HABIBATU SOWE ID NO: 27774 |
| MODULE: INTELLIGENT SYSTEMS |
| COURSE: BSC. INFORMATION TECHNOLOGY |
| YEAR: FOUR (4) |

Wine Recognition Classification

Introduction

Purpose

This Python script is designed for classifying wines into different categories using three machine learning models: Logistic Regression, Decision Trees, and Support Vector Machines (SVM). The script explores the Wine Recognition Dataset, performs data preprocessing, and evaluates the performance of each classification model.

**Code Overview**

Libraries Used

* numpy: For numerical operations.
* pandas: For data manipulation and analysis.
* sklearn.datasets: Provides the Wine Recognition Dataset.
* sklearn.model\_selection: For train-test splitting.
* sklearn.preprocessing: Standardizes features using StandardScaler.
* sklearn.linear\_model: Implements Logistic Regression.
* sklearn.tree: Implements Decision Trees.
* sklearn.svm: Implements Support Vector Machines.
* sklearn.metrics: Calculates classification metrics.

**Code Structure**

* Importing Libraries: Importing necessary libraries for data manipulation and model implementation.
* Loading Dataset: Loading the Wine Recognition Dataset using load\_wine() from scikit-learn.
* Dataset Exploration: Printing dataset information, displaying the first 5 rows, and showing the distribution of target labels.
* Data Preprocessing: Checking for missing values in the dataset.
* Feature Scaling: Standardizing features using StandardScaler.
* Train-Test Split: Splitting the dataset into training and testing sets.

Model Implementation:

* Logistic Regression
* Decision Trees
* Support Vector Machines (SVM)

**Model Evaluation:**

Defining a function (evaluate\_model) for evaluating models based on accuracy, precision, recall, F1 score, and confusion matrix.

Evaluating all three models using the test set.

**Printing Results:**

Displaying evaluation metrics for each model.

Results and Evaluation

**Logistic Regression Results:**

* Accuracy: [1.0]
* Precision: [1.0]
* Recall: [1.0]
* F1 Score: [1.0]
* Confusion Matrix:[ [14 0 0]

[0 14 0]

[0 0 8] ]

**Decision Tree Results:**

* Accuracy: [0.944444444444444]
* Precision: [0.951388888888888]
* Recall: [0.944444444444444]
* F1 Score: [0.9448559670781894]
* Confusion Matrix:[ [13 1 0]

[0 14 0]

[0 1 7]]

**SVM Results:**

* Accuracy: [1.0]
* Precision: [1.0]
* Recall: [1.0]
* F1 Score: [1.0]
* Confusion Matrix:[ [14 0 0]

[0 14 0]

[0 0 8]]

**Conclusion**

**Key Findings**

* Logistic Regression achieved [1.0]% accuracy.
* Decision Tree and SVM results are provided with detailed metrics.
* Future Considerations
* Further hyperparameter tuning.
* Explore additional classification algorithms.

**Usage Instructions**

* Ensure all necessary libraries are installed (numpy, pandas, scikit-learn).
* Run the script to perform wine classification using Logistic Regression, Decision Trees, and SVM.
* Analyze the printed results for each model.