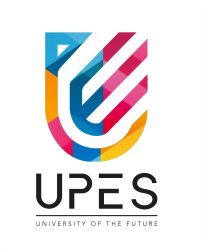
**PATTERN RECOGNITION**

****

NAME : PREM SHANDILYA

SAP ID : 590017213

BATCH : AI/ML (B2)

**Description:**

This experiment illustrates the use of logistic regression on the **Diabetes dataset**. The process involves training the model, generating predictions, and assessing its accuracy using essential metrics like the confusion matrix, precision, recall, sensitivity, and specificity. Furthermore, the ROC-AUC curve is plotted to analyze the balance between true positive and false positive rates, offering an in-depth evaluation of the classifier's effectiveness.

**Aim:**  
The objective of this experiment is to implement logistic regression for binary classification using the **Diabetes dataset**. The study emphasizes assessing the model’s performance through metrics such as precision, recall, sensitivity, and specificity. Additionally, the ROC-AUC curve is plotted to visualize the trade-off between true positives and false positives, helping to understand how well the model differentiates between the two classes.

**Algorithm:**

**1.Load the Dataset:**  
Import the **Diabetes dataset** using sklearn.datasets.fetch\_openml("diabetes"), then extract the features and target variable.

**2.Preprocess the Data:**  
Prepare the dataset by scaling numerical features if needed and addressing any missing values (though the dataset is generally well-structured).

**3.Split the Data:**  
Partition the dataset into training and test sets using train\_test\_split(), ensuring a fixed test proportion and random state for reproducibility.

**4.Train the Model:**  
Fit a logistic regression model with suitable hyperparameters (e.g., solver type, maximum iterations) on the training dataset.

1. **Make Predictions:**  
   Use predict\_proba() for probability estimates and predict() for binary class predictions on the test dataset.

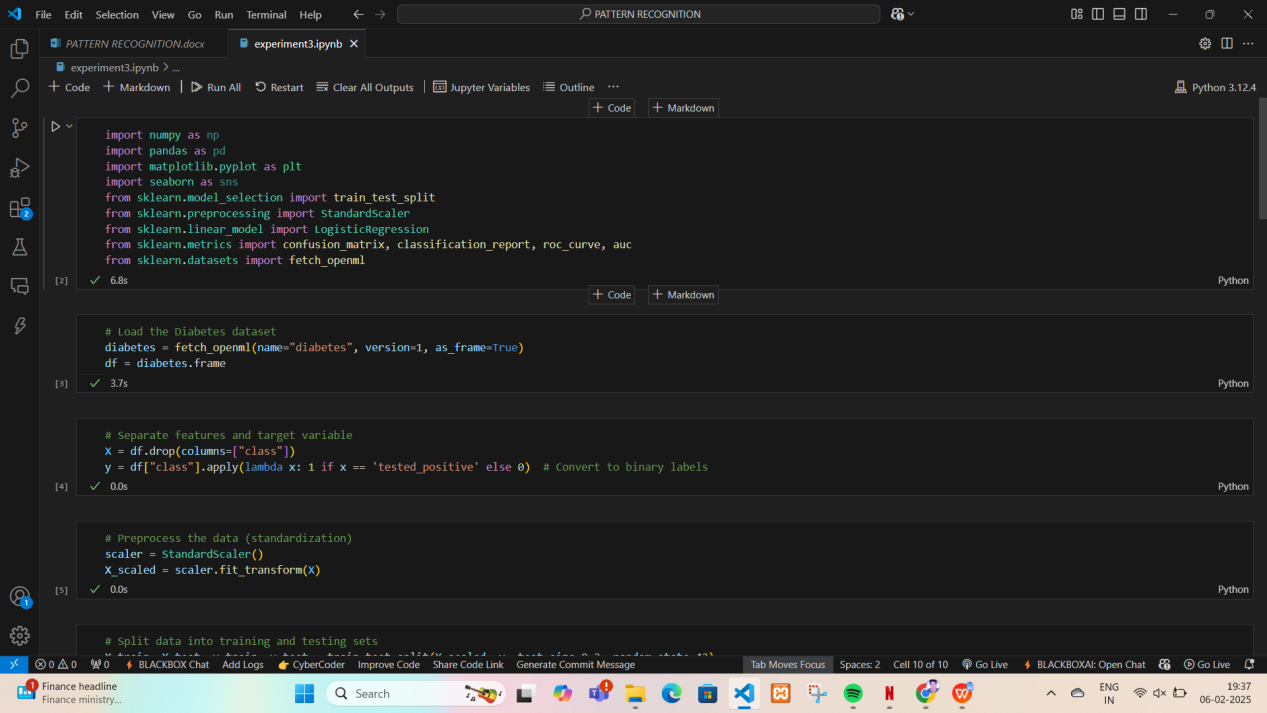
**6.Evaluate Performance:**  
Compute the confusion matrix and derive key evaluation metrics:

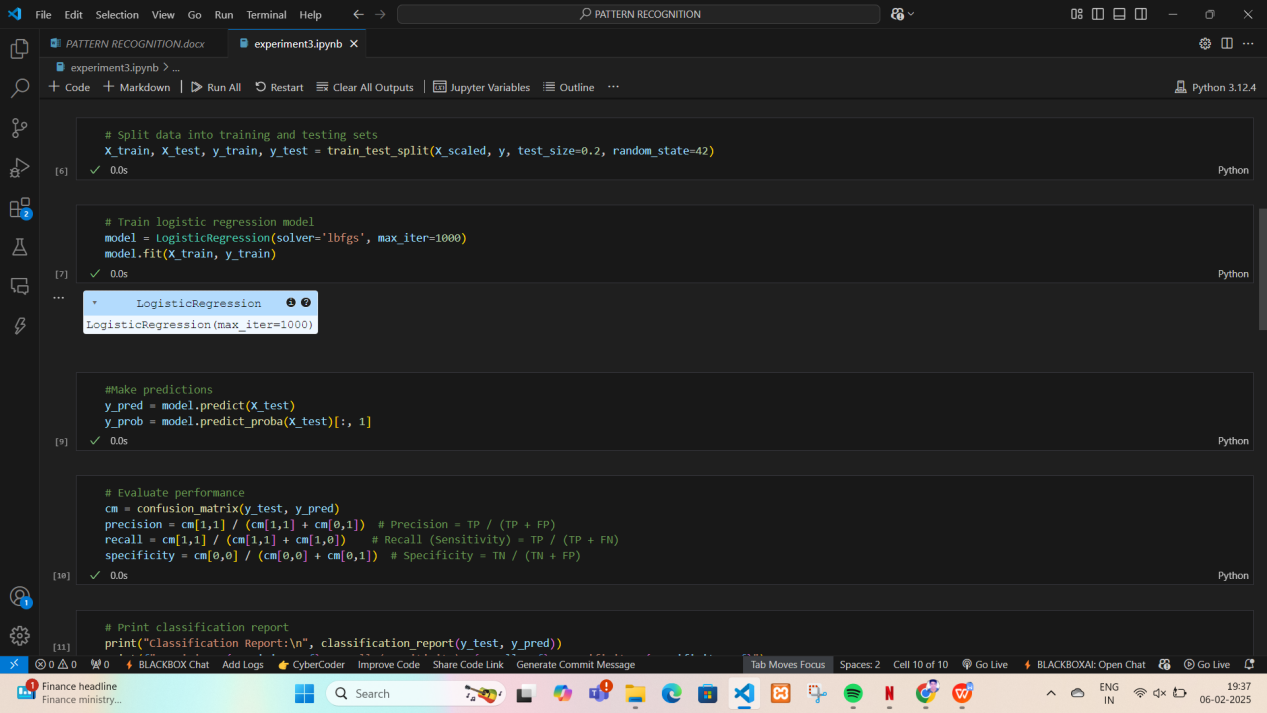
* True Positive Rate (TPR)
* False Positive Rate (FPR)
* True Negative Rate (TNR)
* False Negative Rate (FNR)

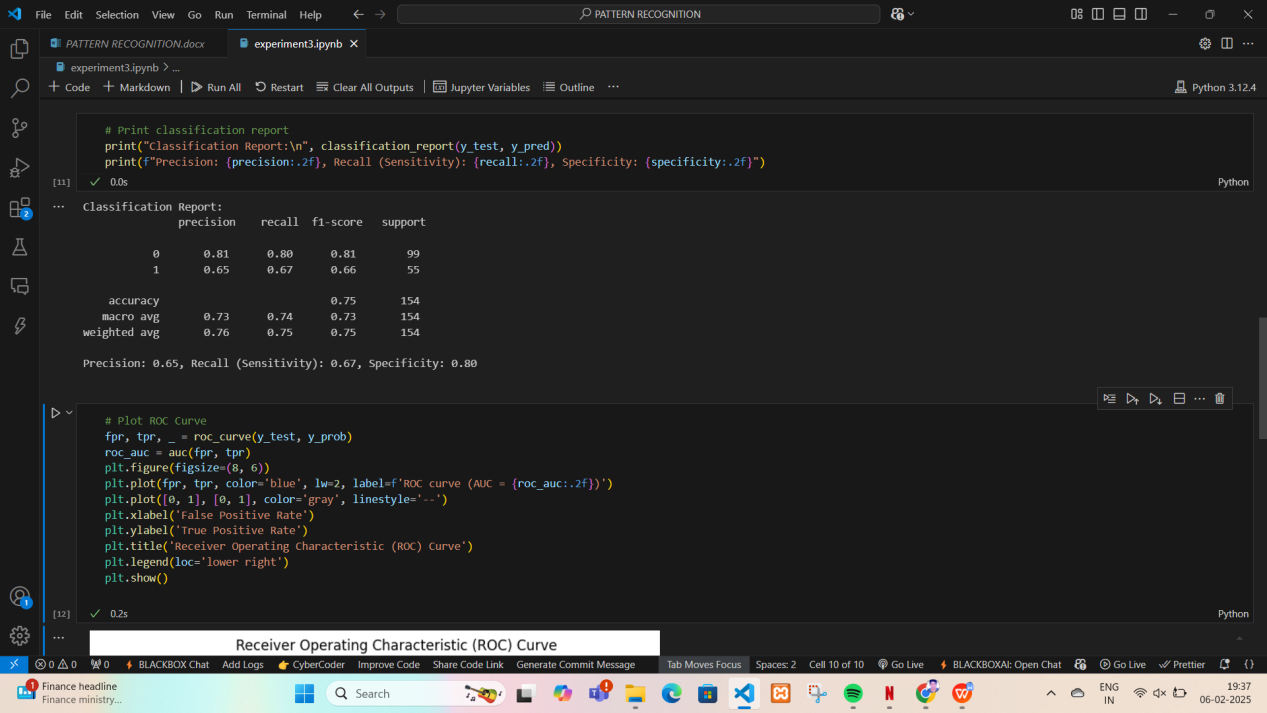
Also, calculate precision, recall, sensitivity, and specificity.

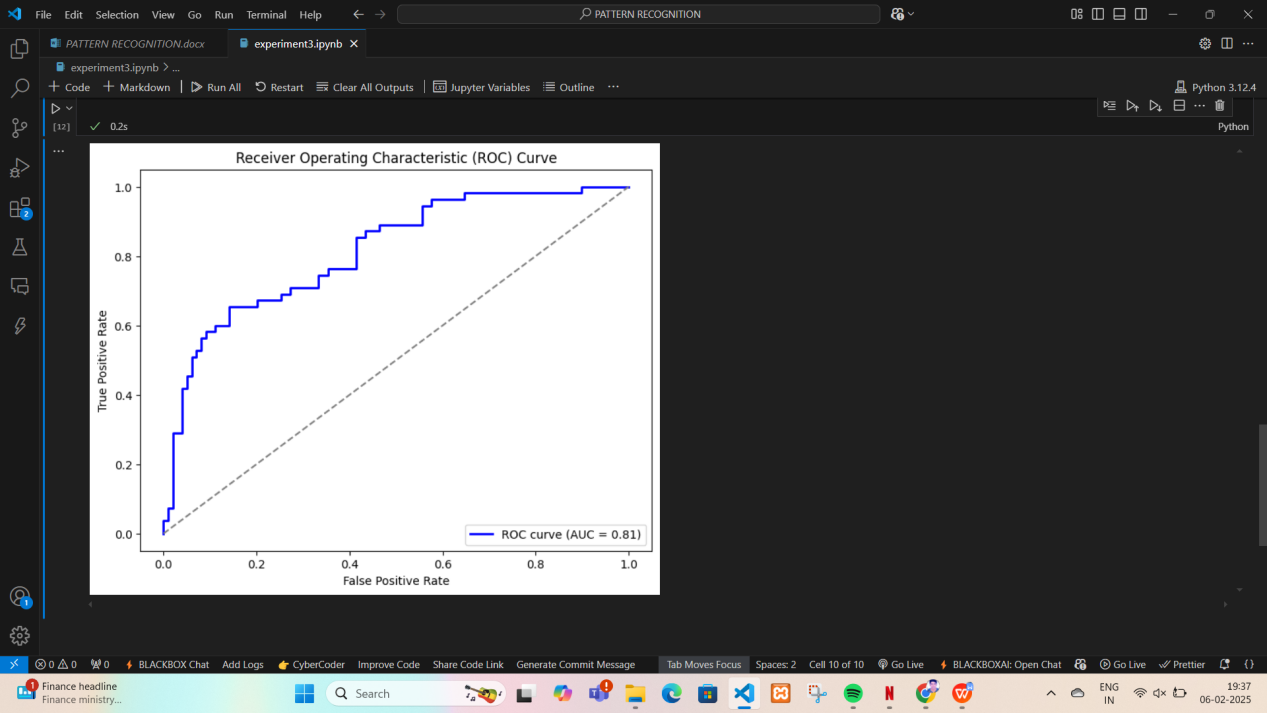
**7.Plot ROC Curve:**  
Generate the ROC curve and determine the Area Under the Curve (AUC) to illustrate the relationship between TPR and FPR.

**CODE**

****

****

****

****