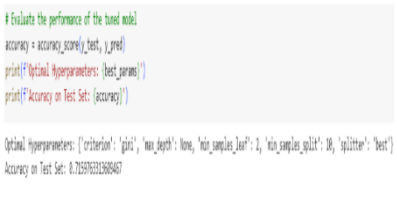
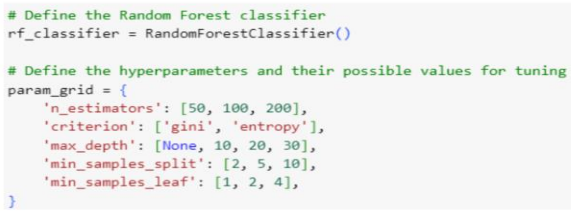
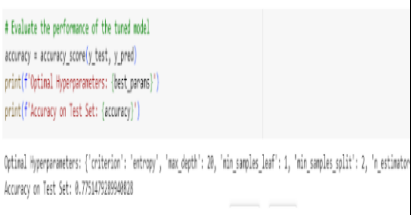
Model Optimization and Tuning Phase Template

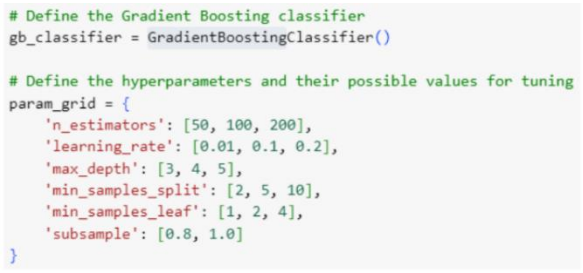
Date	July 5, 2024
Team ID	739838
Project Title	Customer segmentation using Machine Learning
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

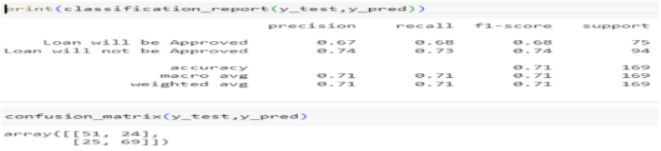
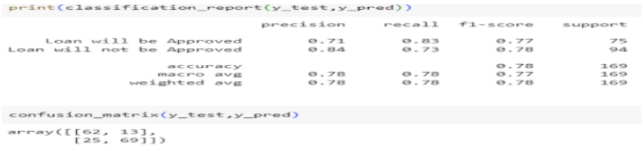
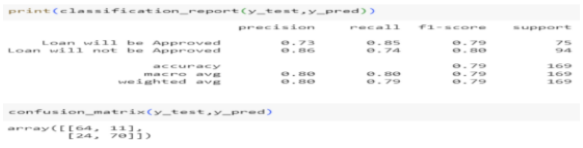
The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	Tuned Hyperparameters	Optimal Values
Decision tree		
Random forest		

Gradient Boosting		

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
Decision tree	 print(classification_report(y_test,y_pred)) precision recall f1-score support Loan will be Approved 0.67 0.68 0.68 75 Loan will not be Approved 0.74 0.73 0.74 94 accuracy 0.71 169 macro avg 0.71 0.71 0.71 169 weighted avg 0.71 0.71 0.71 169 confusion_matrix(y_test,y_pred) array([[51, 24], [25, 69]])
Random forest	 print(classification_report(y_test,y_pred)) precision recall f1-score support Loan will be Approved 0.71 0.83 0.77 75 Loan will not be Approved 0.84 0.73 0.78 94 accuracy 0.78 169 macro avg 0.78 0.78 0.77 169 weighted avg 0.78 0.78 0.78 169 confusion_matrix(y_test,y_pred) array([[62, 13], [25, 69]])
Gradient boosting	 print(classification_report(y_test,y_pred)) precision recall f1-score support Loan will be Approved 0.73 0.85 0.79 75 Loan will not be Approved 0.86 0.74 0.80 94 accuracy 0.79 169 macro avg 0.80 0.80 0.79 169 weighted avg 0.80 0.79 0.79 169 confusion_matrix(y_test,y_pred) array([[64, 11], [24, 70]])

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
Gradient boosting	The gradient Boosting model was selected for its superior performance, exhibiting high accuracy during hyperparameter tuning. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model