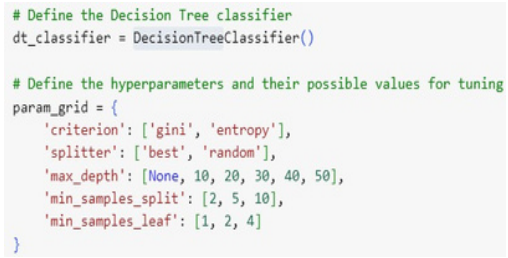
Model Optimization and Tuning Phase Report

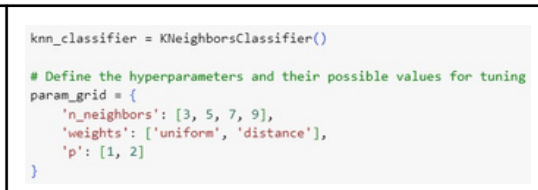
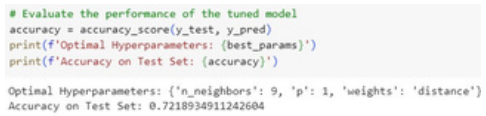
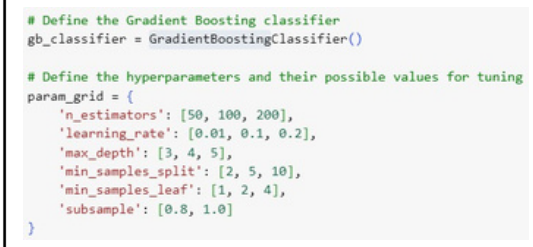
Date	27 January 2025
Team ID	SWUID20240011509
Project Title	Restaurant Recommendation System
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

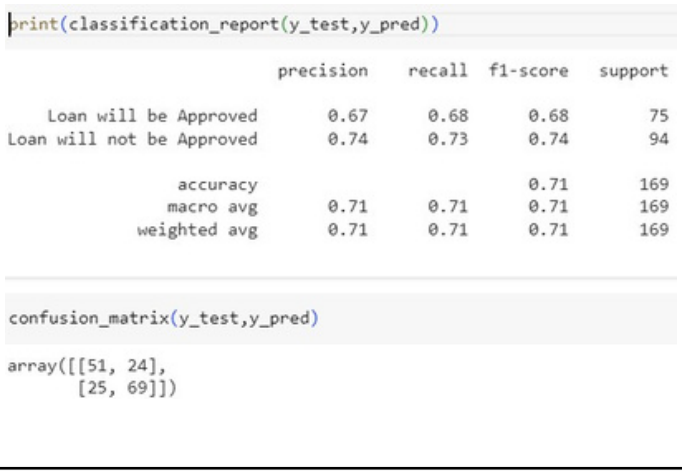
The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	TunedHyperparameters	Optimal Values
Decision Tree		
Random Forest		

KNN		
Gradient Boosting		

Performance Metrics Comparison Report (2 Marks):

Model	OptimizedMetric
Decision Tree	

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]])

KNN	`print(classification_report(y_test,y_pred))`
	
	precision recall f1-score support
	
	Loan will be Approved 0.73 0.59 0.65 75
	Loan will not be Approved 0.72 0.83 0.77 94
	
	accuracy 0.72 169
	macro avg 0.72 0.71 0.71 169
	weighted avg 0.72 0.72 0.72 169
	
	`confusion_matrix(y_test,y_pred)`
	
	array([[44, 31],
	[16, 78]])

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.