Model Optimization and Tuning Phase Template

Date	11 July 2024
Team ID	740023
Project Title	SmartLender - Applicant Credibility Prediction for Loan Approval
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	……..	……..
KNN	…..…...	……..
Gradient Boosting	……. ……	……..

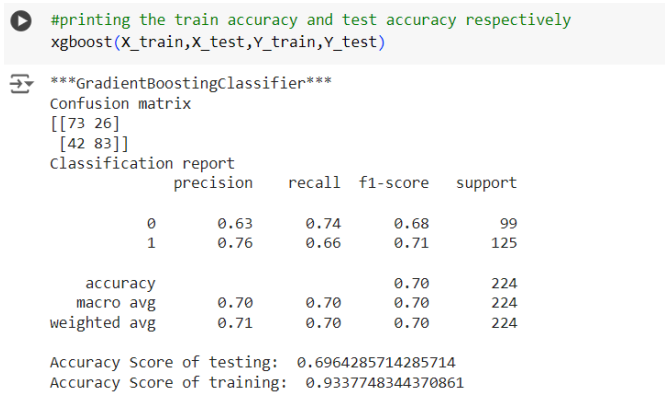
Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric

Decision Tree	`#printing the train accuracy and test accuracy respectively`
	`DecisionTree(X_train,X_test,Y_train,Y_test)`
	
	DecisionTreeClassifier
	Confusion matrix
	[[74 25]
	[49 76]]
	Classification report
	precision recall f1-score support
	
	0 0.60 0.75 0.67 99
	1 0.75 0.61 0.67 125
	
	accuracy 0.67 224
	macro avg 0.68 0.68 0.67 224
	weighted avg 0.69 0.67 0.67 224
	
	Accuracy Score of testing: 0.6696428571428571
	Accuracy Score of training: 1.0

Random Forest	`#printing the train accuracy and test accuracy respectively`
	`RandomForest(X_train,X_test,Y_train,Y_test)`
	
	RandomForestClassifier
	Confusion matrix
	[[78 21]
	[35 90]]
	Classification report
	precision recall f1-score support
	
	0 0.69 0.79 0.74 99
	1 0.81 0.72 0.76 125
	
	accuracy 0.75 224
	macro avg 0.75 0.75 0.75 224
	weighted avg 0.76 0.75 0.75 224
	
	Accuracy Score of testing: 0.75
	Accuracy Score of training: 1.0

KNN	`#printing the train accuracy and test accuracy respectively`
	`KNN(X_train,X_test,Y_train,Y_test)`
	
	KNeighborsClassifier
	Confusion matrix
	[[68 33]
	[41 73]]
	Classification report
	precision recall f1-score support
	
	0 0.62 0.67 0.65 101
	1 0.69 0.64 0.66 114
	
	accuracy 0.66 215
	macro avg 0.66 0.66 0.66 215
	weighted avg 0.66 0.66 0.66 215
	
	Accuracy Score of testing: 0.6558139534883721
	Accuracy Score of training: 0.7511520737327189

Gradient Boosting	

Final Model Selection Justification (2 Marks):

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