Model Optimization and Tuning Phase Template

Date	15 July 2024
Team ID	739760
Project Title	SpaceX Falcon 9 First Stage Landing Success Predictor
Maximum Marks	10 Marks

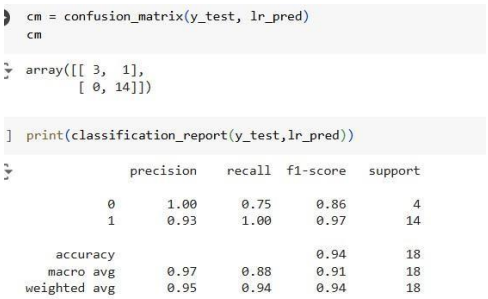
Model Optimization and Tuning Phase

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
-	-	-

Performance Metrics Comparison Report (2 Marks):

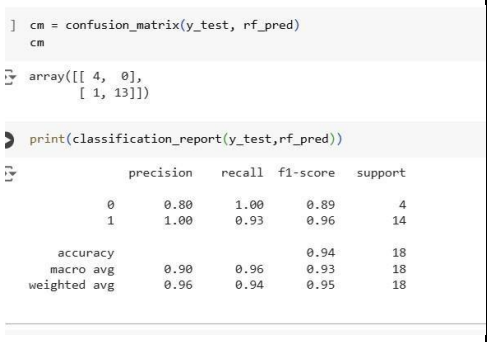
Model	Optimized Metric
Logistic Regression	

```
cm = confusion_matrix(y_test, lr_pred)
cm

array([[ 3,  1],
       [ 0, 14]])

print(classification_report(y_test,lr_pred))

              precision    recall  f1-score   support

           0       1.00      0.75      0.86         4
           1       0.93      1.00      0.97        14

    accuracy                           0.94        18
   macro avg       0.97      0.88      0.91        18
weighted avg       0.95      0.94      0.94        18
```

Final Model	Reasoning
Logistic Regression	Logistic Regression was selected due to its superior performance across all evaluated metrics, including high accuracy (95.4%), exceptional AUC score (99.9%), robust precision (95.2%) and recall (100%), and

Decision Tree	`cm = confusion_matrix(y_test, dt_pred)`
	`cm`
	
	`array([[ 4,  0],`
	`       [ 1, 13]])`
	
	`print(classification_report(y_test,dt_pred))`
	
	precision recall f1-score support
	
	0 0.80 1.00 0.89 4
	1 1.00 0.93 0.96 14
	
	accuracy 0.94 18
	macro avg 0.90 0.96 0.93 18
	weighted avg 0.96 0.94 0.95 18

KNeighbors Classifier	`cm = confusion_matrix(y_test, knn_pred)`
	`cm`
	
	`array([[ 4,  0],`
	`       [ 1, 13]])`
	
	`print(classification_report(y_test,knn_pred))`
	
	precision recall f1-score support
	
	0 0.80 1.00 0.89 4
	1 1.00 0.93 0.96 14
	
	accuracy 0.94 18
	macro avg 0.90 0.96 0.93 18
	weighted avg 0.96 0.94 0.95 18

Random Forest	

Final Model Selection Justification (2 Marks):

	balanced F1 score (97.5%). Its consistency in outperforming other models like Decision Tree, KNN, and Random Forest demonstrates reliability and suitability for predicting SpaceX Falcon 9 first stage landing success. Moreover, its interpretability and computational efficiency make it an optimal choice for this prediction task.