Model Optimization and Tuning Phase Report

Date	15 March 2024
Team ID	739642
Project Title	Customer shopping segmentation using machine learning
Maximum Marks	10 Marks

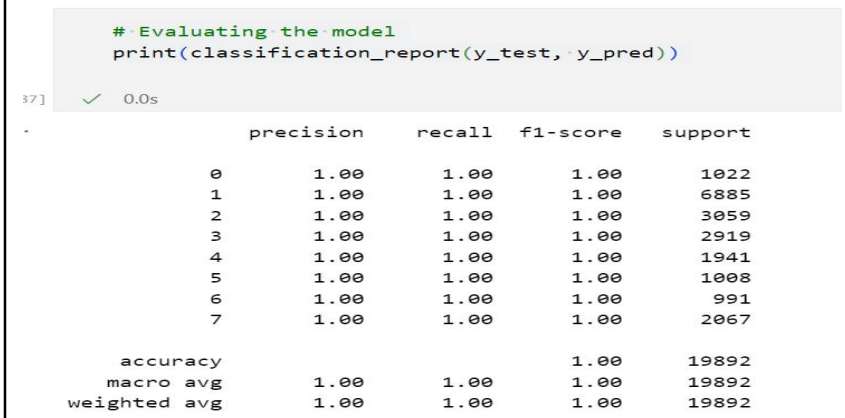
Model Optimization and Tuning Phase

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		
KNN		
Gradient Boosting		

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric
KNN	

```
# Evaluating the model
print(classification_report(y_test, y_pred))
```

37] ✓ 0.0s

```
                precision    recall  f1-score   support

             0       1.00      1.00      1.00      1022
             1       1.00      1.00      1.00      6885
             2       1.00      1.00      1.00      3059
             3       1.00      1.00      1.00      2919
             4       1.00      1.00      1.00      1941
             5       1.00      1.00      1.00      1008
             6       1.00      1.00      1.00       991
             7       1.00      1.00      1.00      2067

      accuracy                           1.00     19892
     macro avg       1.00      1.00      1.00     19892
  weighted avg       1.00      1.00      1.00     19892
```

Kmeans

```
# Evaluating the model
print(classification_report(y_test, y_pred))
```

37] ✓ 0.0s

```
                precision    recall  f1-score   support

             0       1.00      1.00      1.00      1022
             1       1.00      1.00      1.00      6885
             2       1.00      1.00      1.00      3059
             3       1.00      1.00      1.00      2919
             4       1.00      1.00      1.00      1941
             5       1.00      1.00      1.00      1008
             6       1.00      1.00      1.00       991
             7       1.00      1.00      1.00      2067

      accuracy                           1.00     19892
     macro avg       1.00      1.00      1.00     19892
  weighted avg       1.00      1.00      1.00     19892
```

Gradient Boosting

```
# Evaluating the model
print(classification_report(y_test, y_pred))
```

37] ✓ 0.0s

```
                precision    recall  f1-score   support

             0       1.00      1.00      1.00      1022
             1       1.00      1.00      1.00      6885
             2       1.00      1.00      1.00      3059
             3       1.00      1.00      1.00      2919
             4       1.00      1.00      1.00      1941
             5       1.00      1.00      1.00      1008
             6       1.00      1.00      1.00       991
             7       1.00      1.00      1.00      2067

      accuracy                           1.00     19892
     macro avg       1.00      1.00      1.00     19892
  weighted avg       1.00      1.00      1.00     19892
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
knn	The knn 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.