Model Optimization and Tuning Phase Template

Date	11-07-2024
Team ID	739736
Project Title	SMOKE DETECTION USING IOT DATASET
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):

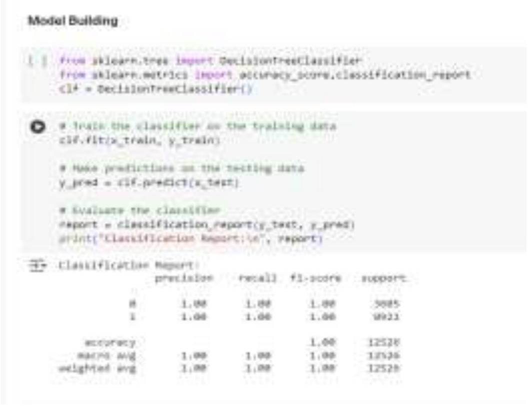
Model	Tuned Hyperparameters	Optimal Values
Model 1	------	----
Model 2	-----	-----
----	-----	-----

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric

Decicion Tree

Classifier



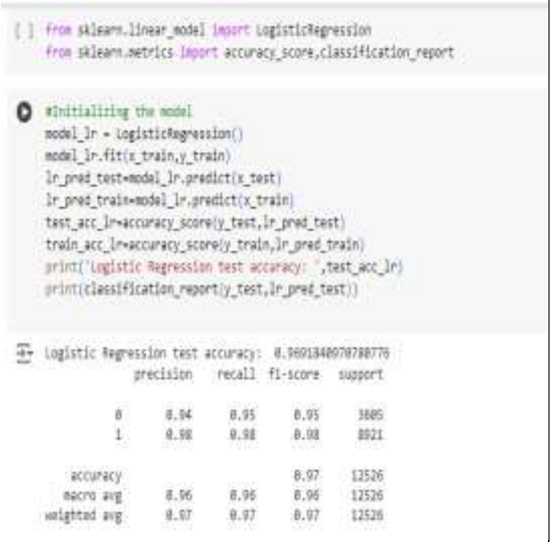
Model Building

```
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score,classification_report
clf = DecisionTreeClassifier()
```

```
# Train the classifier on the training data
clf.fit(x_train, y_train)

# Make predictions on the testing data
y_pred = clf.predict(x_test)

# Evaluate the classifier
report = classification_report(y_test, y_pred)
print("Classification Report:\n", report)
```

```
Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      3605
           1       1.00      1.00      1.00      8921

    accuracy                           1.00     12526
   macro avg       1.00      1.00      1.00     12526
weighted avg       1.00      1.00      1.00     12526
```

Logistic Regression

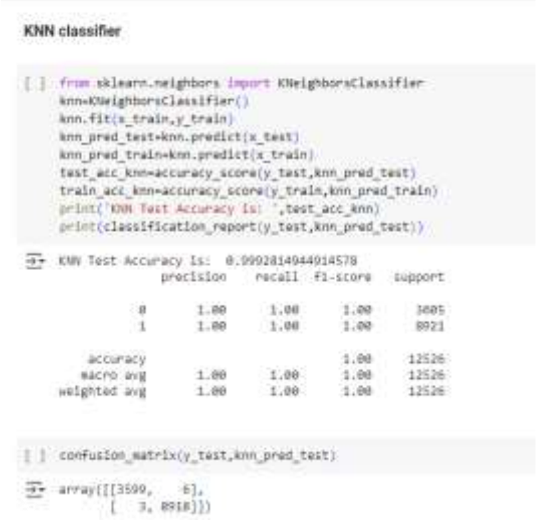


```
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score,classification_report
```

```
#Initializing the model
model_lr = LogisticRegression()
model_lr.fit(x_train,y_train)
lr_pred_test=model_lr.predict(x_test)
lr_pred_train=model_lr.predict(x_train)
test_acc_lr=accuracy_score(y_test,lr_pred_test)
train_acc_lr=accuracy_score(y_train,lr_pred_train)
print('Logistic Regression test accuracy: ',test_acc_lr)
print(classification_report(y_test,lr_pred_test))
```

```
Logistic Regression test accuracy:  0.9691340970788776
              precision    recall  f1-score   support

           0       0.94      0.95      0.95      3605
           1       0.98      0.98      0.98      8921

    accuracy                           0.97     12526
   macro avg       0.96      0.96      0.96     12526
weighted avg       0.97      0.97      0.97     12526
```

K-Nearest Neighbors



KNN classifier

```
from sklearn.neighbors import KNeighborsClassifier
knn=KNeighborsClassifier()
knn.fit(x_train,y_train)
knn_pred_test=knn.predict(x_test)
knn_pred_train=knn.predict(x_train)
test_acc_knn=accuracy_score(y_test,knn_pred_test)
train_acc_knn=accuracy_score(y_train,knn_pred_train)
print('KNN Test Accuracy Is: ',test_acc_knn)
print(classification_report(y_test,knn_pred_test))
```

```
KNN Test Accuracy Is:  0.9992814944914578
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      3605
           1       1.00      1.00      1.00      8921

    accuracy                           1.00     12526
   macro avg       1.00      1.00      1.00     12526
weighted avg       1.00      1.00      1.00     12526
```

```
confusion_matrix(y_test,knn_pred_test)
```

```
array([[3599,    6],
       [   3, 8918]])
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
K-Nearest Neighbors	KNN was selected as the final model for its high accuracy and exact prediction of the target outcome and it can be able to handle complex data.