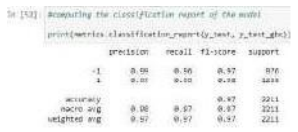
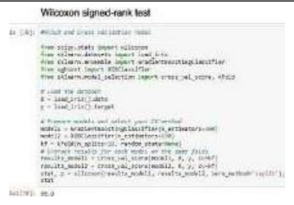
Project Development Phase
Model Performance Test

Date	13 November 2022
Team ID	PNT2022TMlD08772
Project Name	Project — Web Phishing Detection
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
I.	Metrics	Classification Model: Gradient Boosting Classification Accuray Score- 97.4%	
2.	Tune the Model	Hyperparameter Tuning - 97% Validation Method — KFOLD & Cross Validation Method	

```
In [52]: #computing the classification report of the model

print(metrics.classification_report(y_test, y_test_gbc))

              precision    recall  f1-score   support

          -1       0.99      0.96      0.97       976
           1       0.97      0.99      0.98      1235

    accuracy                           0.97      2211
   macro avg       0.98      0.97      0.97      2211
weighted avg       0.97      0.97      0.97      2211
```

Wilcoxon signed-rank test

```
In [[illegible]]: #KFold and Cross validation model

from scipy.stats import wilcoxon
from sklearn.datasets import load_iris
from sklearn.ensemble import GradientBoostingClassifier
from xgboost import XGBClassifier
from sklearn.model_selection import cross_val_score, KFold

# Load the dataset
X = load_iris().data
y = load_iris().target

# Prepare models and select your CV method
model1 = GradientBoostingClassifier(n_estimators=100)
model2 = XGBClassifier(n_estimators=100)
kf = KFold(n_splits=20, random_state=None)
# Extract results for each model on the same folds
results_model1 = cross_val_score(model1, X, y, cv=kf)
results_model2 = cross_val_score(model2, X, y, cv=kf)
stat, p = wilcoxon(results_model1, results_model2, zero_method='zsplit');
stat

Out[[illegible]]: 95.0
```

1. METRICS:

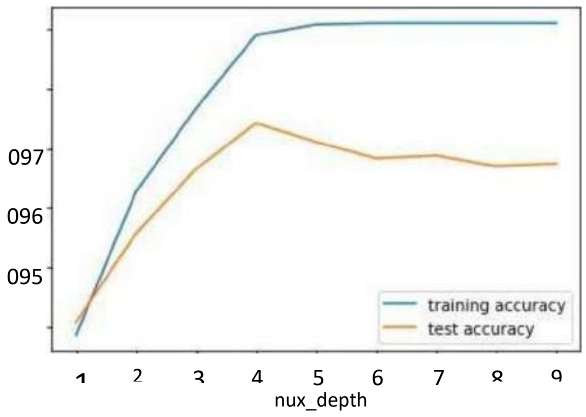
CLASSIFICATION REPORT:

```
In       #computing the classification report of the model
[52]:
         print(metrics. lassification_report(y_test, y_test_gbc))
```

```
              precision   recall  fl-score   support

         -1     e. gg     o. 96     0.97       976
          1     e. 97     0.99      e. 98     1235

   accuracy                         e.97      2211
  macro avg     e.98      e. 97     e.97      2211
```

```
weighted avg      e. 97      0.97      0.97      2211
```

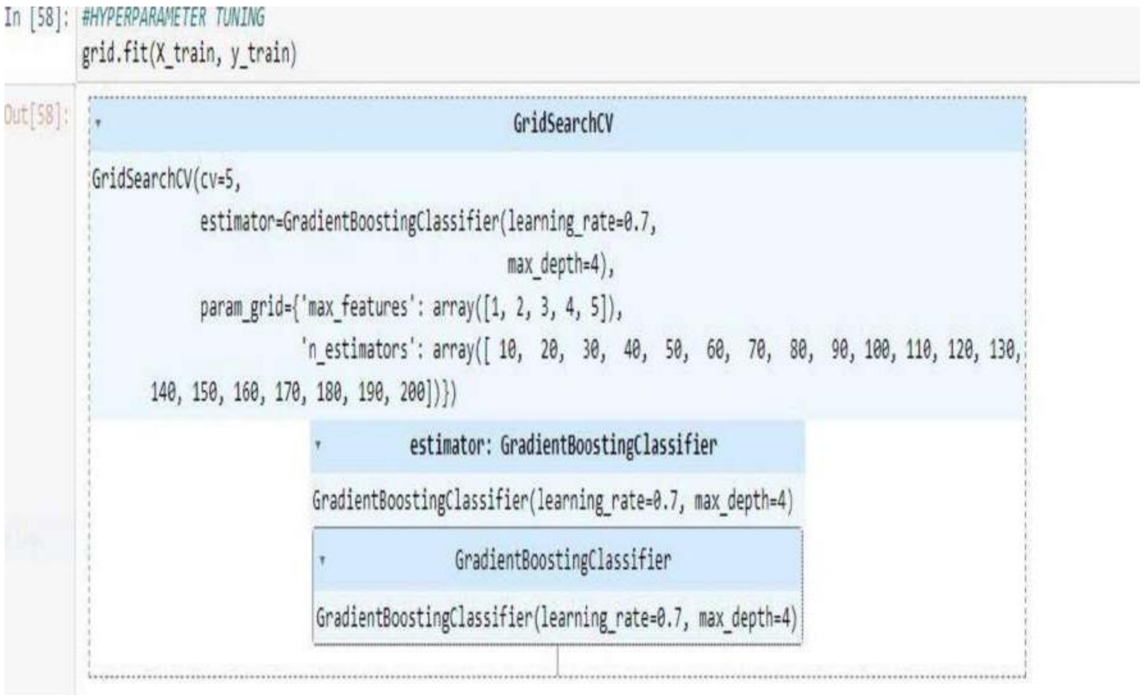
PERFORMANCE :



Out 33 J :

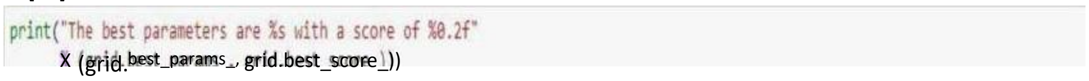
	ML Model	Accuracy	fl _score	Recall	Precision
0	Gradient Boosting Classifier	0.974	0.977	0.994	0.986
	CatBoost Classifier	0.972	0.975	0.994	0.989
2	Random Forest	0.969	0.972	0.992	0.991
3	Support Vector Machine	0.964	0.968	0.980	0.965
4	Decision Tree	0.958	0.962	0.991	0.993
5	K-Nearest Neighbors	0.956	0.961	0.991	0.989
6	Logistic Regression	0.934	0.941	0.943	0.927
	Naive Bayes Classifier	0.605	0454	0292	0.997
8	XGBoost Classifier	0.548	0.548	0.993	0.984
9	Multi-layer Perceptron	0.543	0.543	0.989	0983

2. TUNE THE MODEL - HYPERPARAMETER TUNING



```
In [58]: #HYPERPARAMETER TUNING
         grid.fit(X_train, y_train)

Out[58]:
GridSearchCV

GridSearchCV(cv=5,
             estimator=GradientBoostingClassifier(learning_rate=0.7,
                                                  max_depth=4),
             param_grid={'max_features': array([1, 2, 3, 4, 5]),
                         'n_estimators': array([ 10,  20,  30,  40,  50,  60,  70,  80,  90, 100, 110, 120, 130,
       140, 150, 160, 170, 180, 190, 200])})

estimator: GradientBoostingClassifier
GradientBoostingClassifier(learning_rate=0.7, max_depth=4)

GradientBoostingClassifier
GradientBoostingClassifier(learning_rate=0.7, max_depth=4)
```

In [59]:



```
print("The best parameters are %s with a score of %0.2f"
      X (grid.best_params_, grid.best_score_))
```

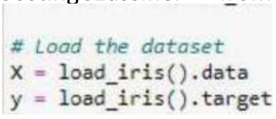
```
The best parneters are {'max_features': 5, 'n_estimators': 20) with a score of 0.97
```

VALIDATION METHODS: KFOLD & Cross Folding

Wilcoxon signed-rank test

In [78]: #KFOLD and Cross Validation

from scipy . stats import wilcoxon from sklearn. datasets
import load_iris from sklearn .ensemble import
GradientBoostingC1assifier from xgboost import



```
# Load the dataset
X = load_iris().data
y = load_iris().target
```

X6BC1assifier from sklearn
.model_selection import cross_val_score, KF01d

modell Prepare models and select your CV method
— = mode12
kf g

Extract results for each model on the same folds results_modell =
X, y, cv=kf) results_mode12 — cross_va1_score(mode12, X, y, cv=kf) p =
stat, results_mode12, zsplit•);
stat

outt78J: 9S.ø

5x2CV combined F test

In [891: from mlxtend. evaluate import combined ftest_5x2cv from sklearn. tree
import DecisionTreeClassifier, ExtraTreeClassifier from sklearn.ensemble
import GradientBoostingC1as5ifier from mlxtend.data import iris_data #
Prepare data and c Ifs

clfl GradientBoostingC1assifier() clf2 •
DecisionTreeClassifier()

# CaLcuLate p-vaLue f, p cortined
estimator2=c1f2,

j print(f) print(
•p-value: ' , p)

```
f-value: 1.727272727272733 p-value:
0.284ø135734291782
```