

Project Development Phase Model Performance Test

Date	13 November 2022
Team ID	PNT2022TMID26156
Project Name	Web Phishing Detection
Maximum Marks	10 Marks

Model Performance Testing:

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

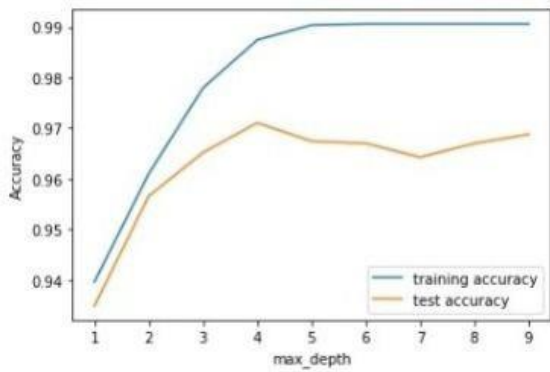
S.No.	Parameter	Values	Screenshot																														
1.	Metrics	Classification Model: Gradient Boosting Classification Accuray Score- 97.1%	<pre>[] print(metrics.classification_report(y_test, y_test_gbc))</pre> <table><thead><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr></thead><tbody><tr><td>-1</td><td>0.98</td><td>0.95</td><td>0.97</td><td>956</td></tr><tr><td>1</td><td>0.96</td><td>0.99</td><td>0.97</td><td>1255</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.97</td><td>2211</td></tr><tr><td>macro avg</td><td>0.97</td><td>0.97</td><td>0.97</td><td>2211</td></tr><tr><td>weighted avg</td><td>0.97</td><td>0.97</td><td>0.97</td><td>2211</td></tr></tbody></table>		precision	recall	f1-score	support	-1	0.98	0.95	0.97	956	1	0.96	0.99	0.97	1255	accuracy			0.97	2211	macro avg	0.97	0.97	0.97	2211	weighted avg	0.97	0.97	0.97	2211
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2.	Tune the Model	Hyperparameter Tuning - 97% Validation Method – KFOLD & Cross Validation Method	<p>Wilcoxon signed-rank test</p> <pre>In [76]: #KFOLD and Cross Validation Model from scipy.stats import wilcoxon from sklearn.datasets import load_iris from sklearn.ensemble import GradientBoostingClassifier from sklearn.metrics import cross_val_score from sklearn.model_selection import cross_val_score, kfold # Load the dataset X = load_iris().data y = load_iris().target # Prepare model and select your CV method model = GradientBoostingClassifier(n_estimators=100) model = GridSearchCV(model, {'n_estimators': 100}) kf = KFold(n_splits=10, random_state=None) # Extract results for each model on the new folds results_model1 = cross_val_score(model, X, y, cv=kf) results_model2 = cross_val_score(model, X, y, cv=kf) stat, p = wilcoxon(results_model1, results_model2, zero_method='logit') stat</pre> <p>Out[76]: 99.8</p>																														

1. METRICS: CLASSIFICATION REPORT:

```
[ ] print(metrics.classification_report(y_test, y_test_gbc))
```

	precision	recall	f1-score	support
-1	0.98	0.95	0.97	956
1	0.96	0.99	0.97	1255
accuracy			0.97	2211
macro avg	0.97	0.97	0.97	2211
weighted avg	0.97	0.97	0.97	2211

PERFORMANCE :



	ML Model	Accuracy	f1_score	Recall	Precision
0	Support Vector Machine	0.957	0.963	0.982	0.966
1	Logistic Regression	0.924	0.933	0.947	0.927
2	K-Nearest Neighbors	0.953	0.959	0.990	0.989
3	Decision Tree	0.958	0.963	0.992	0.991
4	Gradient Boosting Classifier	0.971	0.975	0.992	0.985
5	Random Forest	0.964	0.969	0.992	0.989

2. TUNE THE MODEL – HYPERPARAMETER TUNING

```
gbc.fit(X_train,y_train)
```

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

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)
```

VALIDATION METHODS: KFOLD & Cross Folding

Wilcoxon signed-rank test

In [78]: *#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[78]: 95.0

5x2CV combined F test

In [89]:

```
from mlxtend.evaluate import combined_ftest_5x2cv
from sklearn.tree import DecisionTreeClassifier, ExtraTreeClassifier
from sklearn.ensemble import GradientBoostingClassifier
from mlxtend.data import iris_data
```

```
# Prepare data and clfs
X, y = iris_data()
clf1 = GradientBoostingClassifier()
clf2 = DecisionTreeClassifier()

# Calculate p-value
f, p = combined_ftest_5x2cv(estimator1=clf1,
                             estimator2=clf2,
                             X=X, y=y,
                             random_seed=1)
```

```
print('f-value:', f)
print('p-value:', p)
```

```
f-value: 1.727272727272733
p-value: 0.2840135734291782
```