

**Project Development Phase
Model Performance Test**

Date	18 November 2022
Team ID	PNT2022TMID37408
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
1.	Metrics	Regression Model: Logistic Regression MAE – 0.26142017186793304 MSE - 0.5228403437358661 RMSE - 0.7230769971004928 R2 score - -2.888673182487615 Classification Model: Decision Tree Classifier Confusion Matrix - array([[61, 249], [26, 1875]]) Accuracy Score- 0.8756218905472637 Classification Report – refer screenshot	Attached Below
2.	Tune the Model	Hyperparameter Tuning - Validation Method -	Attached Below

1. METRICS:

REGRESSION MODEL: LOGISTIC REGRESSION

```
Working with Logistic Regression model

[35] #splitting data into train and test
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)

[30] #fitting the data
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression()
lr.fit(x_train,y_train)

LogisticRegression()

[36] pred=lr.predict(x_test)

[37] pred
array([1, 1, 1, ..., 1, 1, 1])
```

EVALUATION METRICS:

Here are some evaluation metrics used for regression they are,

- R2 Score
- Mean Square Error(MSE)
- RMSE(Root Mean Square Error)
- Mean Absolute Error(MAE)

```
evaluation metrics

[50] from sklearn.metrics import mean_squared_error,r2_score,mean_absolute_error
mse=mean_squared_error(pred,y_test)

[51] mean_absolute_error(pred,y_test)
0.26142017186793304

[39] mse
0.5228403437358661

[40] rmse=np.sqrt(mse)

[41] rmse
0.7230769971004928

[42] r2=r2_score(pred,y_test)

[43] r2
-2.888673182487615
```

CLASSIFICATION MODEL: DECISION TREE CLASSIFIER

```
building the Decision Tree Classifier model

[44] # Decision Tree model
from sklearn.tree import DecisionTreeClassifier

# instantiate the model
tree = DecisionTreeClassifier(max_depth = 5)
# fit the model
tree.fit(x_train, y_train)

DecisionTreeClassifier(max_depth=5)

[45] #prediction on test data
pred2=tree.predict(x_test)
pred2

array([1, 1, 1, ..., 1, 1, 1])
```

EVALUATION METRICS:

Some of the evaluation metrics is as follows

- Confusion matrix
- Accuracy score
- Classification report

```
evaluation metrics

[63] from sklearn import metrics

[47] metrics.confusion_matrix(y_test,pred2)

array([[ 61, 249],
       [ 26, 1875]])

[53] print('DT model Accuracy Score:',metrics.accuracy_score(y_test,pred2))

DT model Accuracy Score: 0.8756218905472637

[54] acc=metrics.accuracy_score(y_test,pred2)
acc

0.8756218905472637

[55] #error
1-acc

0.12437810945273631
```

```
[65] from sklearn.metrics import classification_report

report = classification_report(y_test,pred2)
print("Classification report:")
print(report)

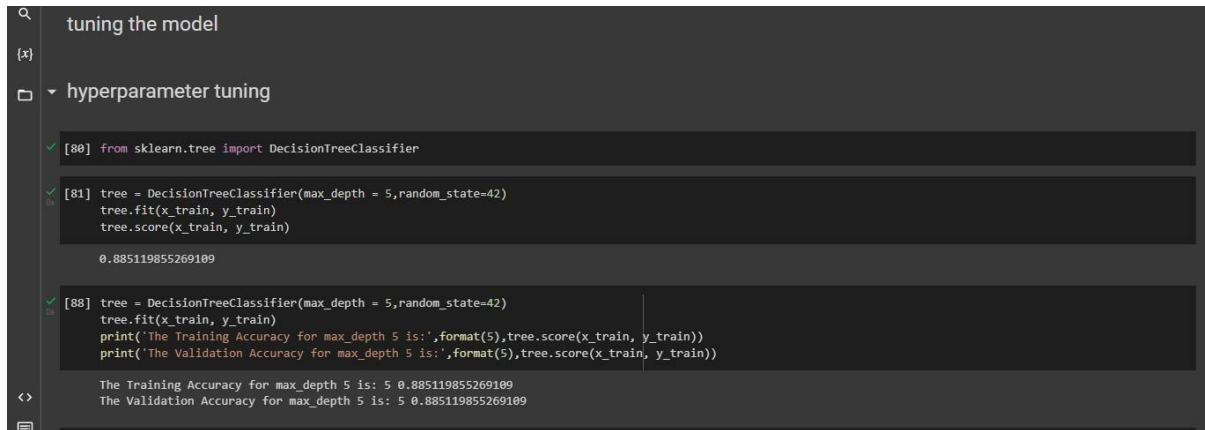
Classification report:
precision    recall  f1-score   support

   -1       0.70     0.20     0.31       310
    1       0.88     0.99     0.93      1901

 accuracy          0.79          0.59          0.62       2211
  macro avg       0.79          0.59          0.62       2211
 weighted avg     0.86          0.88          0.84       2211
```

2. TUNE THE MODEL: DECISION TREE CLASSIFIER

HYPERPARAMETER TUNING:



The image shows a Jupyter Notebook interface with a search bar at the top containing the text "tuning the model". Below the search bar, a folder icon is followed by the text "hyperparameter tuning". The notebook contains three code cells, each with a green checkmark icon on the left. The first code cell (cell [80]) imports the DecisionTreeClassifier from sklearn.tree. The second code cell (cell [81]) creates a DecisionTreeClassifier object with max_depth = 5 and random_state = 42, fits it to the training data (x_train, y_train), and prints the score. The output of this cell is 0.885119855269109. The third code cell (cell [88]) is similar to the second but includes print statements to display the training and validation accuracies. The output of this cell is "The Training Accuracy for max_depth 5 is: 5 0.885119855269109" and "The Validation Accuracy for max_depth 5 is: 5 0.885119855269109".

```
[80] from sklearn.tree import DecisionTreeClassifier

[81] tree = DecisionTreeClassifier(max_depth = 5, random_state=42)
tree.fit(x_train, y_train)
tree.score(x_train, y_train)

0.885119855269109

[88] tree = DecisionTreeClassifier(max_depth = 5, random_state=42)
tree.fit(x_train, y_train)
print('The Training Accuracy for max_depth 5 is:', format(5), tree.score(x_train, y_train))
print('The Validation Accuracy for max_depth 5 is:', format(5), tree.score(x_train, y_train))

The Training Accuracy for max_depth 5 is: 5 0.885119855269109
The Validation Accuracy for max_depth 5 is: 5 0.885119855269109
```