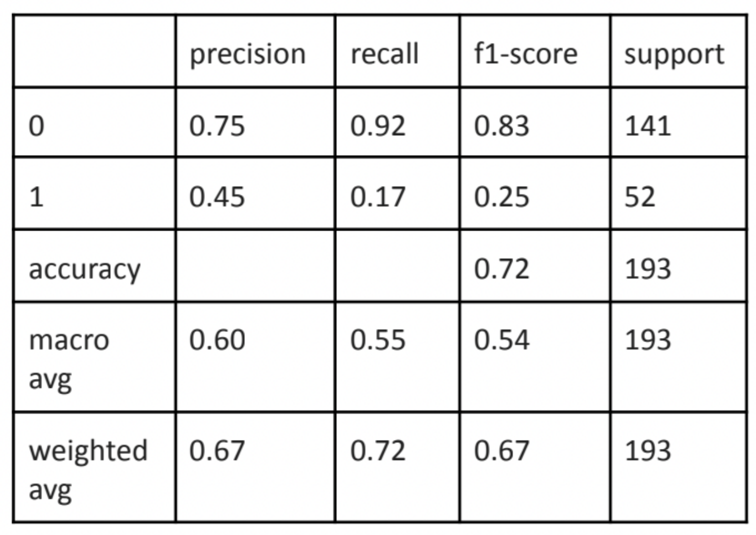
Project Development Phase
Model Performance Test

Date - 18 November 2022
Team ID - **PNT2022TMID26244**
Project Name - Statistical Machine Learning Approaches To Liver Disease Prediction
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:** Confusion Matrix - [[130 11] [43 9]] Accuracy Score- 72% Classification Report -	Attached below

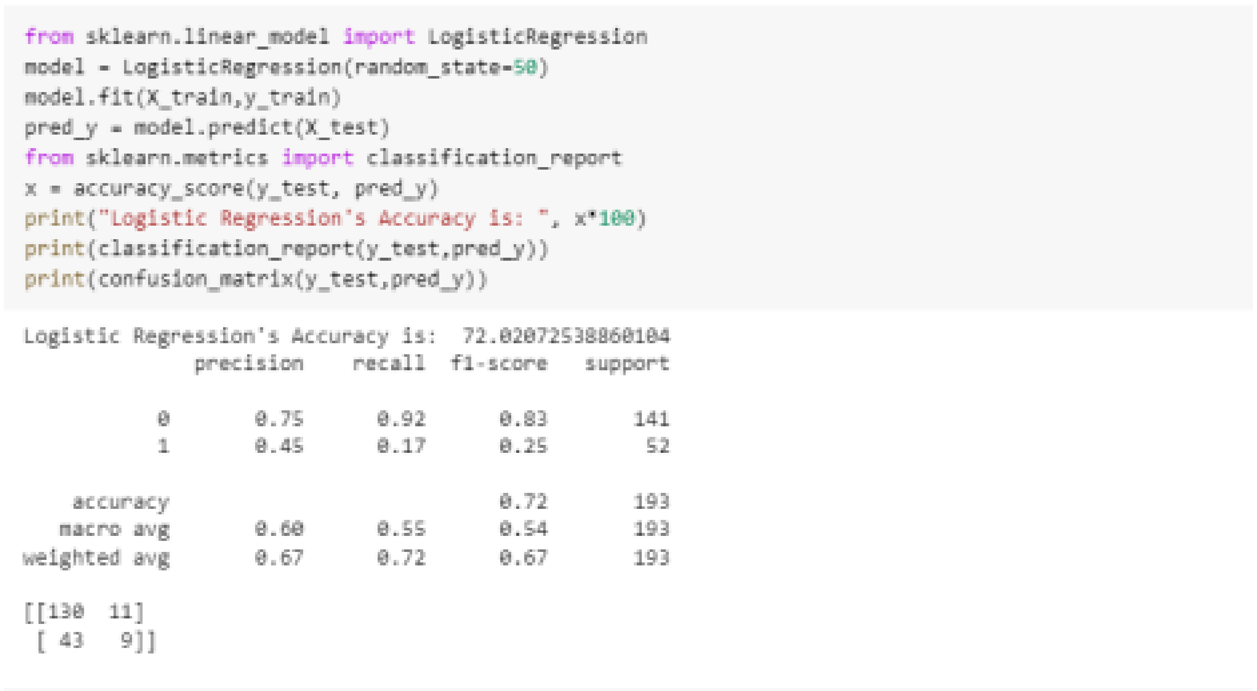


	precision	recall	f1-score	support
0	0.75	0.92	0.83	141
1	0.45	0.17	0.25	52
accuracy			0.72	193
macro avg	0.60	0.55	0.54	193
weighted avg	0.67	0.72	0.67	193

2.	Tune the Model	Hyperparameter Tuning - GridSearchCV Validation Method - GridSearchCV, XGBClassifier Accuracy after Hyperparameter Tuning- 76%	Attached below

Screenshots:

Confusion Matrix and Classification Report:



```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression(random_state=50)
model.fit(X_train,y_train)
pred_y = model.predict(X_test)
from sklearn.metrics import classification_report
x = accuracy_score(y_test, pred_y)
print("Logistic Regression's Accuracy is: ", x*100)
print(classification_report(y_test,pred_y))
print(confusion_matrix(y_test,pred_y))
```

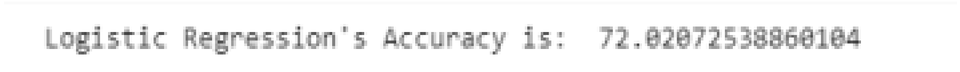
```
Logistic Regression's Accuracy is:  72.02072538860104
              precision    recall  f1-score   support

           0       0.75      0.92      0.83       141
           1       0.45      0.17      0.25        52

    accuracy                           0.72       193
   macro avg       0.60      0.55      0.54       193
weighted avg       0.67      0.72      0.67       193

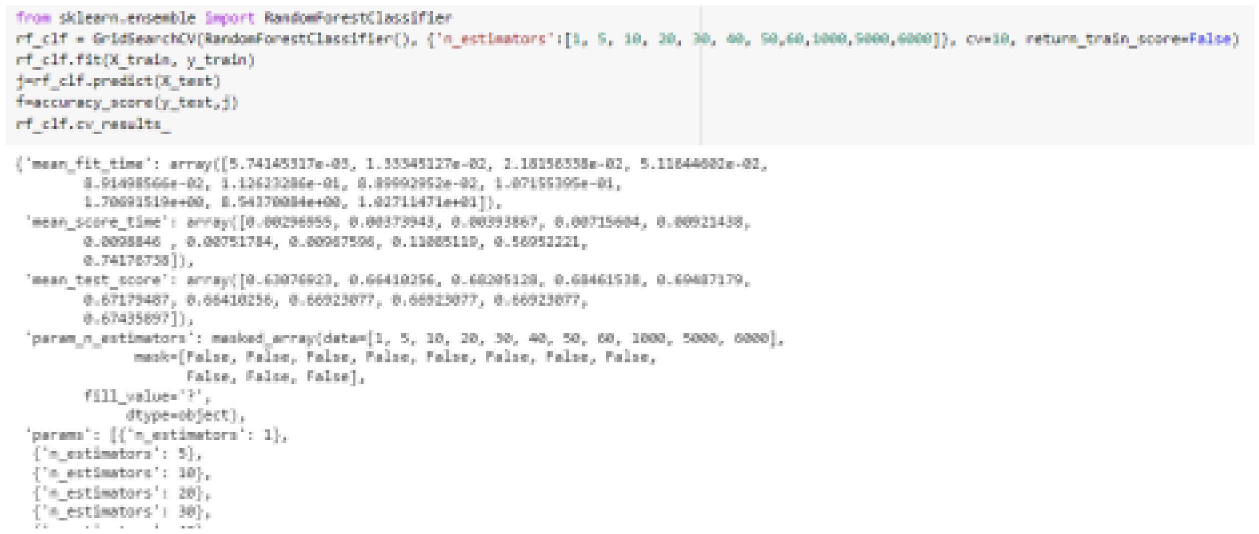
[[130  11]
 [ 43   9]]
```

Accuracy Before Hyperparameter Tuning:



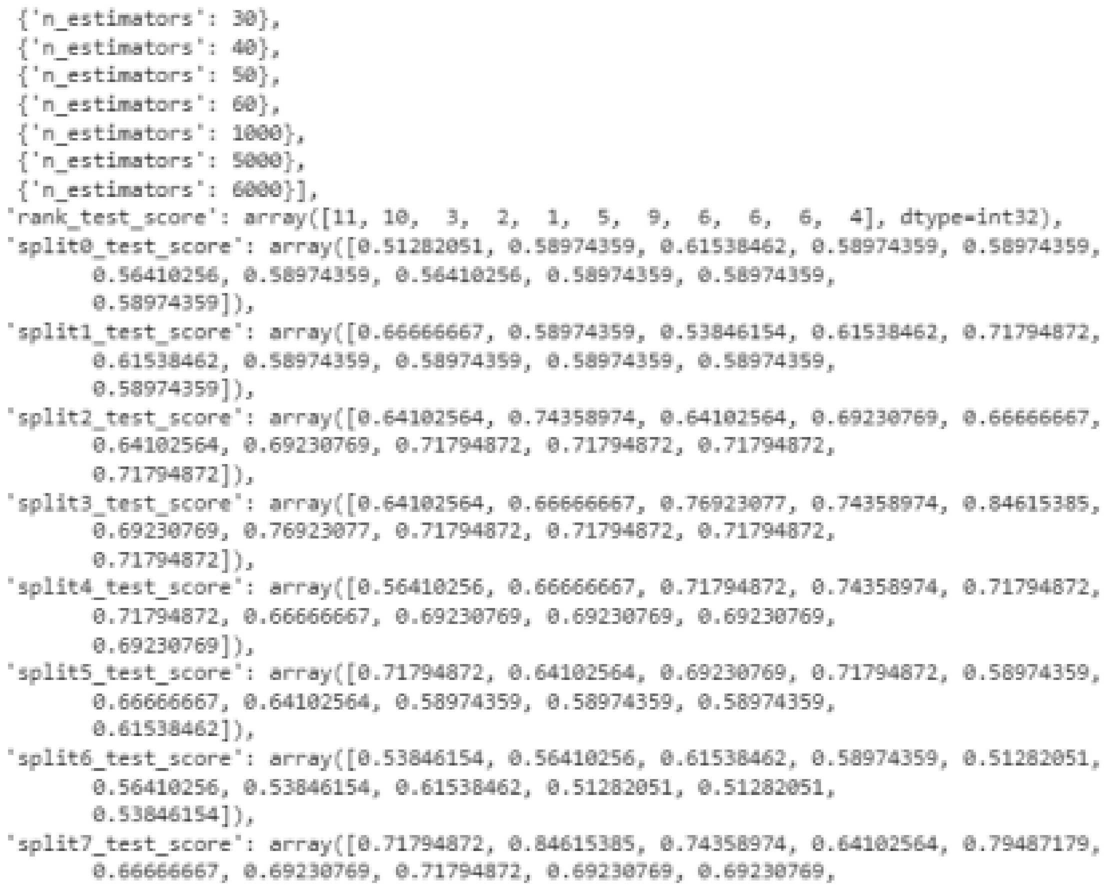
```
Logistic Regression's Accuracy is:  72.02072538860104
```

Hyperparameter Tuning:



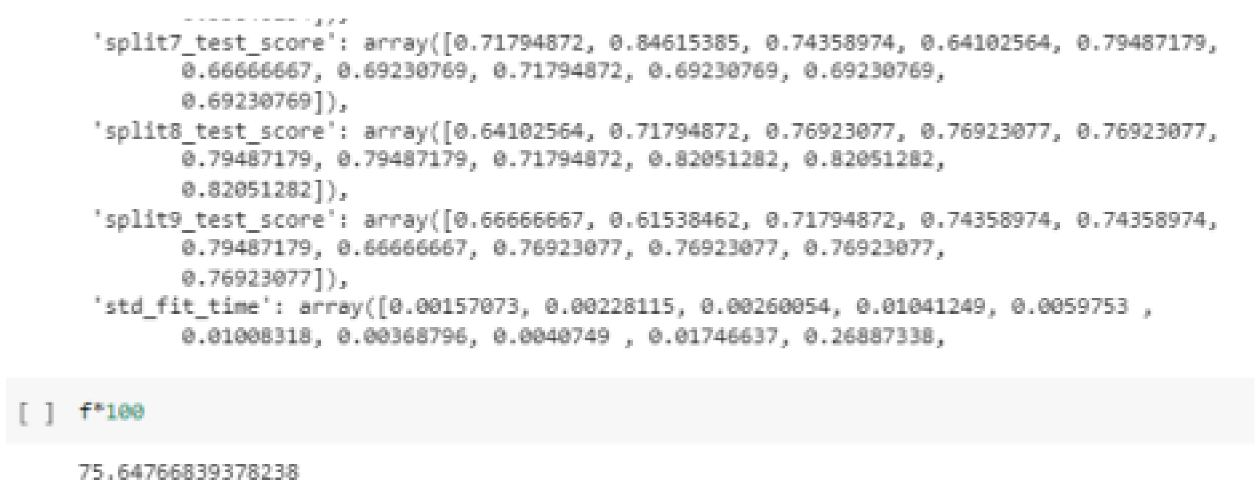
```
from sklearn.ensemble import RandomForestClassifier
rf_clf = GridSearchCV(RandomForestClassifier(), {'n_estimators':[1, 5, 10, 20, 30, 40, 50,60,1000,5000,6000]}, cv=10, return_train_score=False)
rf_clf.fit(X_train, y_train)
j=rf_clf.predict(X_test)
f=accuracy_score(y_test,j)
rf_clf.cv_results_
```

```
{'mean_fit_time': array([5.74145317e-03, 1.33345127e-02, 2.18156338e-02, 5.11644602e-02,
        8.91498566e-02, 1.12623286e-01, 8.89992952e-02, 1.07155395e-01,
        1.70691519e+00, 8.54370084e+00, 1.02711471e+01]),
 'mean_score_time': array([0.00296955, 0.00373943, 0.00393867, 0.00715604, 0.00921438,
        0.0098846 , 0.00751784, 0.00967596, 0.11085119, 0.56952221,
        0.74176738]),
 'mean_test_score': array([0.63076923, 0.66410256, 0.68205128, 0.68461538, 0.69487179,
        0.67179487, 0.66410256, 0.66923077, 0.66923077, 0.66923077,
        0.67435897]),
 'param_n_estimators': masked_array(data=[1, 5, 10, 20, 30, 40, 50, 60, 1000, 5000, 6000],
              mask=[False, False, False, False, False, False, False, False,
                    False, False, False],
        fill_value='?',
             dtype=object),
 'params': [{'n_estimators': 1},
  {'n_estimators': 5},
  {'n_estimators': 10},
  {'n_estimators': 20},
  {'n_estimators': 30},
```



```
  {'n_estimators': 30},
  {'n_estimators': 40},
  {'n_estimators': 50},
  {'n_estimators': 60},
  {'n_estimators': 1000},
  {'n_estimators': 5000},
  {'n_estimators': 6000}],
 'rank_test_score': array([11, 10,  3,  2,  1,  5,  9,  6,  6,  6,  4], dtype=int32),
 'split0_test_score': array([0.51282051, 0.58974359, 0.61538462, 0.58974359, 0.58974359,
        0.56410256, 0.58974359, 0.56410256, 0.58974359, 0.58974359,
        0.58974359]),
 'split1_test_score': array([0.66666667, 0.58974359, 0.53846154, 0.61538462, 0.71794872,
        0.61538462, 0.58974359, 0.58974359, 0.58974359, 0.58974359,
        0.58974359]),
 'split2_test_score': array([0.64102564, 0.74358974, 0.64102564, 0.69230769, 0.66666667,
        0.64102564, 0.69230769, 0.71794872, 0.71794872, 0.71794872,
        0.71794872]),
 'split3_test_score': array([0.64102564, 0.66666667, 0.76923077, 0.74358974, 0.84615385,
        0.69230769, 0.76923077, 0.71794872, 0.71794872, 0.71794872,
        0.71794872]),
 'split4_test_score': array([0.56410256, 0.66666667, 0.71794872, 0.74358974, 0.71794872,
        0.71794872, 0.66666667, 0.69230769, 0.69230769, 0.69230769,
        0.69230769]),
 'split5_test_score': array([0.71794872, 0.64102564, 0.69230769, 0.71794872, 0.58974359,
        0.66666667, 0.64102564, 0.58974359, 0.58974359, 0.58974359,
        0.61538462]),
 'split6_test_score': array([0.53846154, 0.56410256, 0.61538462, 0.58974359, 0.51282051,
        0.56410256, 0.53846154, 0.61538462, 0.51282051, 0.51282051,
        0.53846154]),
 'split7_test_score': array([0.71794872, 0.84615385, 0.74358974, 0.64102564, 0.79487179,
        0.66666667, 0.69230769, 0.71794872, 0.69230769, 0.69230769,
```

Accuracy After Hyperparameter Tuning :



```
 'split7_test_score': array([0.71794872, 0.84615385, 0.74358974, 0.64102564, 0.79487179,
        0.66666667, 0.69230769, 0.71794872, 0.69230769, 0.69230769,
        0.69230769]),
 'split8_test_score': array([0.64102564, 0.71794872, 0.76923077, 0.76923077, 0.76923077,
        0.79487179, 0.79487179, 0.71794872, 0.82051282, 0.82051282,
        0.82051282]),
 'split9_test_score': array([0.66666667, 0.61538462, 0.71794872, 0.74358974, 0.74358974,
        0.79487179, 0.66666667, 0.76923077, 0.76923077, 0.76923077,
        0.76923077]),
 'std_fit_time': array([0.00157073, 0.00228115, 0.00260054, 0.01041249, 0.0059753 ,
        0.01008318, 0.00368796, 0.0040749 , 0.01746637, 0.26887338,
```

```
[ ] f*100
```

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75.64766839378238
```