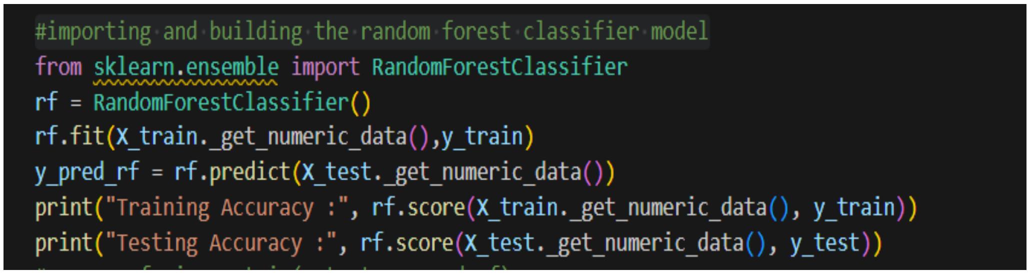
Model Development Phase Template

Date	July 2024
Team ID	team-739937
Project Title	Prosperity Prognosticator : Machine Learning for Startup success Prediction
Maximum Marks	10 Marks

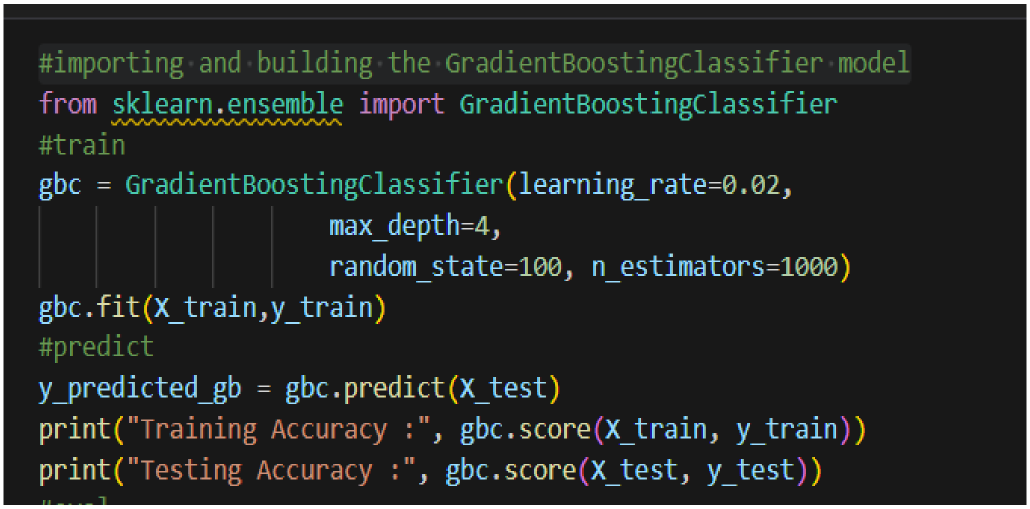
Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include a summary and training and validation performance metrics for multiple models, presented through respective screenshots.

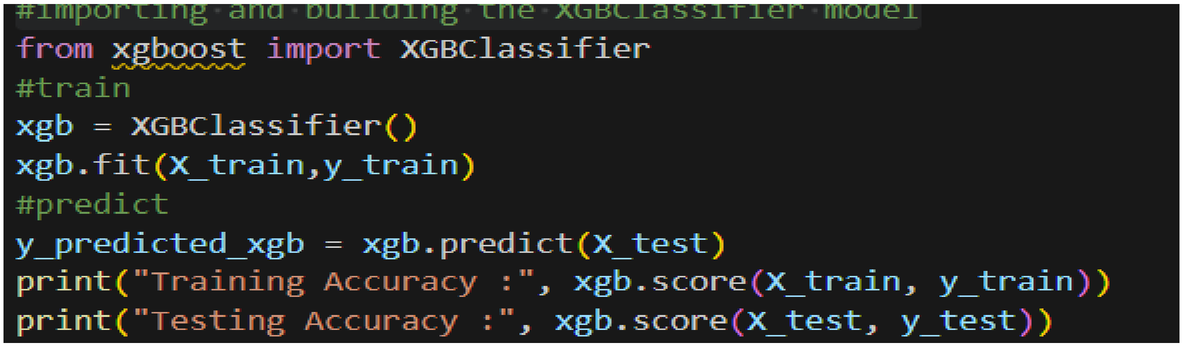
Initial Model Training Code (5 marks):



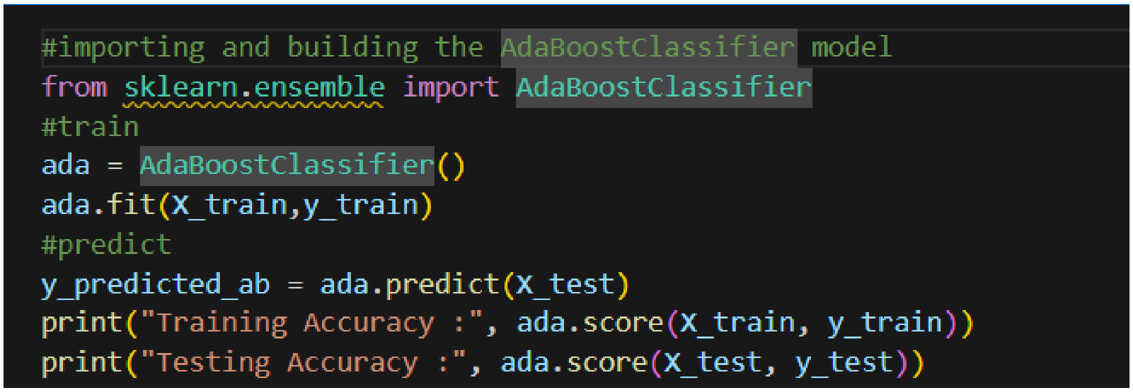
```
#importing and building the random forest classifier model
from sklearn.ensemble import RandomForestClassifier
rf = RandomForestClassifier()
rf.fit(X_train._get_numeric_data(),y_train)
y_pred_rf = rf.predict(X_test._get_numeric_data())
print("Training Accuracy :", rf.score(X_train._get_numeric_data(), y_train))
print("Testing Accuracy :", rf.score(X_test._get_numeric_data(), y_test))
```



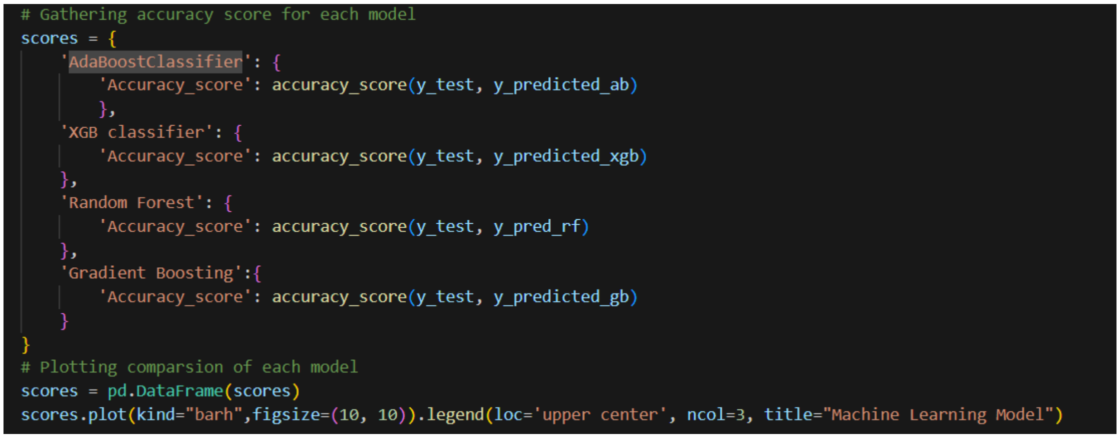
```
#importing and building the GradientBoostingClassifier model
from sklearn.ensemble import GradientBoostingClassifier
#train
gbc = GradientBoostingClassifier(learning_rate=0.02,
                    max_depth=4,
                    random_state=100, n_estimators=1000)
gbc.fit(X_train,y_train)
#predict
y_predicted_gb = gbc.predict(X_test)
print("Training Accuracy :", gbc.score(X_train, y_train))
print("Testing Accuracy :", gbc.score(X_test, y_test))
```



```
#importing and building the XGBClassifier model
from xgboost import XGBClassifier
#train
xgb = XGBClassifier()
xgb.fit(X_train,y_train)
#predict
y_predicted_xgb = xgb.predict(X_test)
print("Training Accuracy :", xgb.score(X_train, y_train))
print("Testing Accuracy :", xgb.score(X_test, y_test))
```

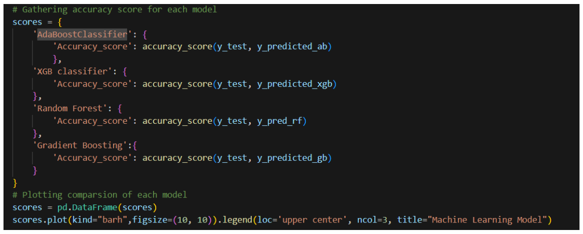
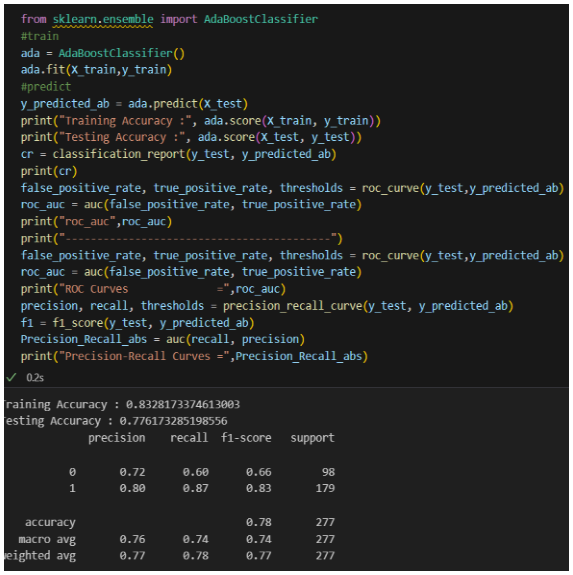
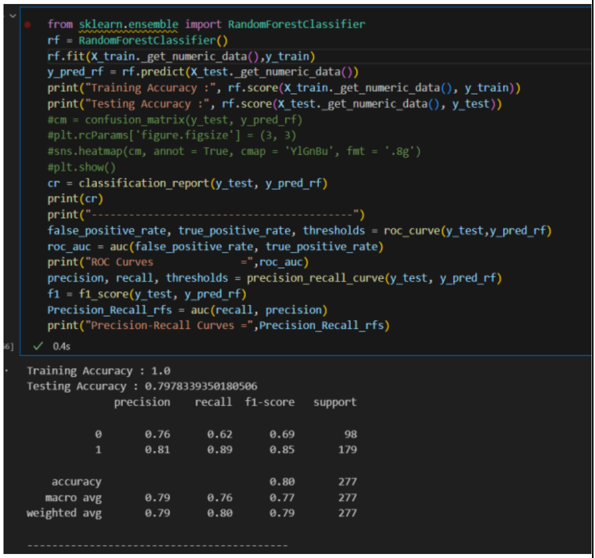


```
#importing and building the AdaBoostClassifier model
from sklearn.ensemble import AdaBoostClassifier
#train
ada = AdaBoostClassifier()
ada.fit(X_train,y_train)
#predict
y_predicted_ab = ada.predict(X_test)
print("Training Accuracy :", ada.score(X_train, y_train))
print("Testing Accuracy :", ada.score(X_test, y_test))
```



```
# Gathering accuracy score for each model
scores = {
    'AdaBoostClassifier': {
        'Accuracy_score': accuracy_score(y_test, y_predicted_ab)
        },
    'XGB classifier': {
        'Accuracy_score': accuracy_score(y_test, y_predicted_xgb)
    },
    'Random Forest': {
        'Accuracy_score': accuracy_score(y_test, y_pred_rf)
    },
    'Gradient Boosting':{
        'Accuracy_score': accuracy_score(y_test, y_predicted_gb)
    }
}
# Plotting comparsion of each model
scores = pd.DataFrame(scores)
scores.plot(kind="barh",figsize=(10, 10)).legend(loc='upper center', ncol=3, title="Machine Learning Model")
```

Model Validation and Evaluation Report (5 marks):

Model	Summary	Training and Validation Performance Metrics
Model 1	Gradient Boosting Classifier model typically include accuracy, precision, recall, F1 score to evaluate its predictive performance and generalization capability.	
Model 2	AdaBoost classifier model commonly include accuracy, precision, recall, F1 score which help assess the model's prediction accuracy and generalizability	
Model 3	Random forest classifier model often encompass accuracy, precision, recall, F1 score to measure its prediction quality and robustness.	

```
# Gathering accuracy score for each model
scores = {
    'AdaBoostClassifier': {
        'Accuracy_score': accuracy_score(y_test, y_predicted_ab)
        },
    'XGB classifier': {
        'Accuracy_score': accuracy_score(y_test, y_predicted_xgb)
    },
    'Random Forest': {
        'Accuracy_score': accuracy_score(y_test, y_pred_rf)
    },
    'Gradient Boosting':{
        'Accuracy_score': accuracy_score(y_test, y_predicted_gb)
    }
}
# Plotting comparsion of each model
scores = pd.DataFrame(scores)
scores.plot(kind="barh",figsize=(10, 10)).legend(loc='upper center', ncol=3, title="Machine Learning Model")
```

```
from sklearn.ensemble import AdaBoostClassifier
#train
ada = AdaBoostClassifier()
ada.fit(X_train,y_train)
#predict
y_predicted_ab = ada.predict(X_test)
print("Training Accuracy :", ada.score(X_train, y_train))
print("Testing Accuracy :", ada.score(X_test, y_test))
cr = classification_report(y_test, y_predicted_ab)
print(cr)
false_positive_rate, true_positive_rate, thresholds = roc_curve(y_test,y_predicted_ab)
roc_auc = auc(false_positive_rate, true_positive_rate)
print("roc_auc",roc_auc)
print("------------------------------------------")
false_positive_rate, true_positive_rate, thresholds = roc_curve(y_test,y_predicted_ab)
roc_auc = auc(false_positive_rate, true_positive_rate)
print("ROC Curves                =",roc_auc)
precision, recall, thresholds = precision_recall_curve(y_test, y_predicted_ab)
f1 = f1_score(y_test, y_predicted_ab)
Precision_Recall_abs = auc(recall, precision)
print("Precision-Recall Curves =",Precision_Recall_abs)
```

✓ 0.2s

```
raining Accuracy : 0.8328173374613003
esting Accuracy : 0.776173285198556
             precision    recall  f1-score   support

           0       0.72      0.60      0.66        98
           1       0.80      0.87      0.83       179

    accuracy                           0.78       277
   macro avg       0.76      0.74      0.74       277
eighted avg       0.77      0.78      0.77       277
```

```
from sklearn.ensemble import RandomForestClassifier
rf = RandomForestClassifier()
rf.fit(X_train._get_numeric_data(),y_train)
y_pred_rf = rf.predict(X_test._get_numeric_data())
print("Training Accuracy :", rf.score(X_train._get_numeric_data(), y_train))
print("Testing Accuracy :", rf.score(X_test._get_numeric_data(), y_test))
#cm = confusion_matrix(y_test, y_pred_rf)
#plt.rcParams['figure.figsize'] = (3, 3)
#sns.heatmap(cm, annot = True, cmap = 'YlGnBu', fmt = '.8g')
#plt.show()
cr = classification_report(y_test, y_pred_rf)
print(cr)
print("------------------------------------------")
false_positive_rate, true_positive_rate, thresholds = roc_curve(y_test,y_pred_rf)
roc_auc = auc(false_positive_rate, true_positive_rate)
print("ROC Curves                =",roc_auc)
precision, recall, thresholds = precision_recall_curve(y_test, y_pred_rf)
f1 = f1_score(y_test, y_pred_rf)
Precision_Recall_rfs = auc(recall, precision)
print("Precision-Recall Curves =",Precision_Recall_rfs)
```

✓ 0.4s

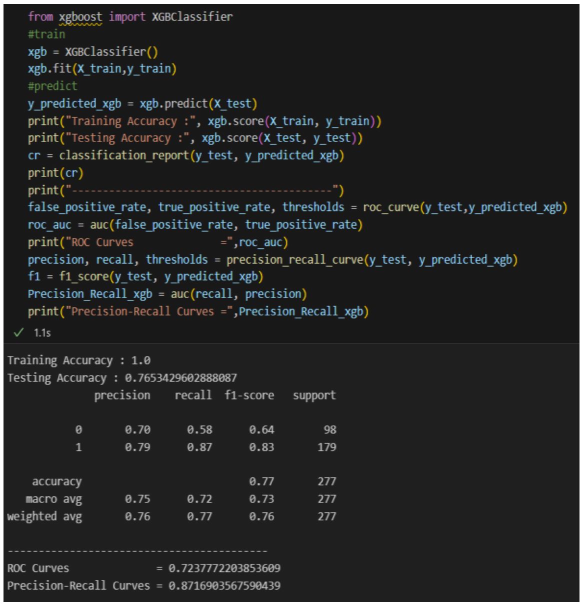
```
Training Accuracy : 1.0
Testing Accuracy : 0.7978339350180506
              precision    recall  f1-score   support

           0       0.76      0.62      0.69        98
           1       0.81      0.89      0.85       179

    accuracy                           0.80       277
   macro avg       0.79      0.76      0.77       277
weighted avg       0.79      0.80      0.79       277

------------------------------------------
```

<table>
<tr>
<td>Model 4</td>
<td>XGB Classifier model typically include accuracy, precision, recall, F1 score to evaluate its prediction performance and generalization ability</td>
<td>



```
from xgboost import XGBClassifier
#train
xgb = XGBClassifier()
xgb.fit(X_train,y_train)
#predict
y_predicted_xgb = xgb.predict(X_test)
print("Training Accuracy :", xgb.score(X_train, y_train))
print("Testing Accuracy :", xgb.score(X_test, y_test))
cr = classification_report(y_test, y_predicted_xgb)
print(cr)
print("----------------------------------------")
false_positive_rate, true_positive_rate, thresholds = roc_curve(y_test,y_predicted_xgb)
roc_auc = auc(false_positive_rate, true_positive_rate)
print("ROC Curves              =",roc_auc)
precision, recall, thresholds = precision_recall_curve(y_test, y_predicted_xgb)
f1 = f1_score(y_test, y_predicted_xgb)
Precision_Recall_xgb = auc(recall, precision)
print("Precision-Recall Curves =",Precision_Recall_xgb)
```

✓ 1.1s

```
Training Accuracy : 1.0
Testing Accuracy : 0.7653429602888087
              precision    recall  f1-score   support

           0       0.70      0.58      0.64        98
           1       0.79      0.87      0.83       179

    accuracy                           0.77       277
   macro avg       0.75      0.72      0.73       277
weighted avg       0.76      0.77      0.76       277

----------------------------------------
ROC Curves              = 0.7237772203853609
Precision-Recall Curves = 0.8716903567590439
```

</td>
</tr>
</table>