# Model Development Phase Template

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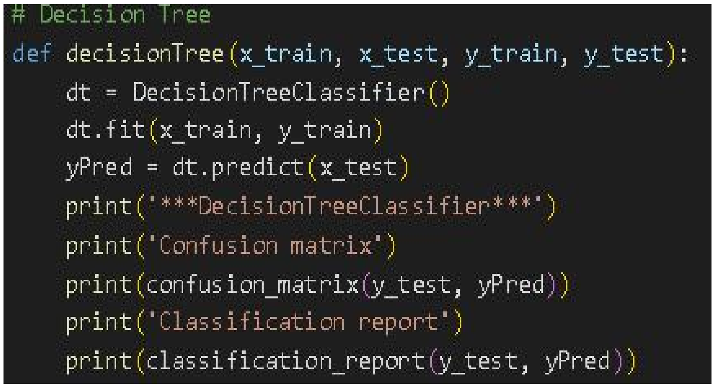
| Date | 15 March 2024 |
| Team ID | Advait Mahesh Shinde |
| Project Title | Human Resource Management: Predicting Employee Promotions Using Machine Learning |
| Maximum Marks | 10 Marks |

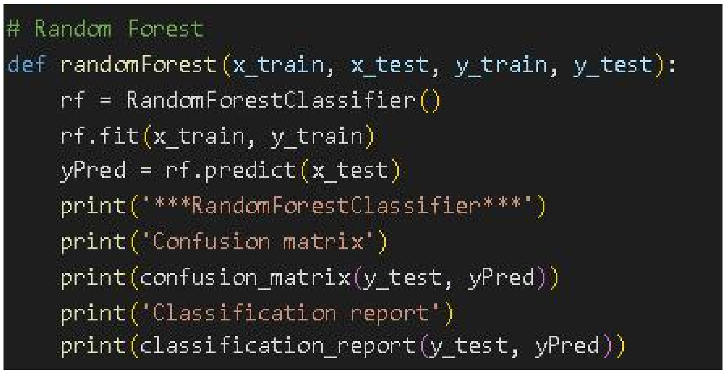
## Initial Model Training Code, Model Validation and Evaluation Report

The model validation and evaluation report will include a summary and training and validation performance metrics for multiple models. The details will be presented through respective screenshots.

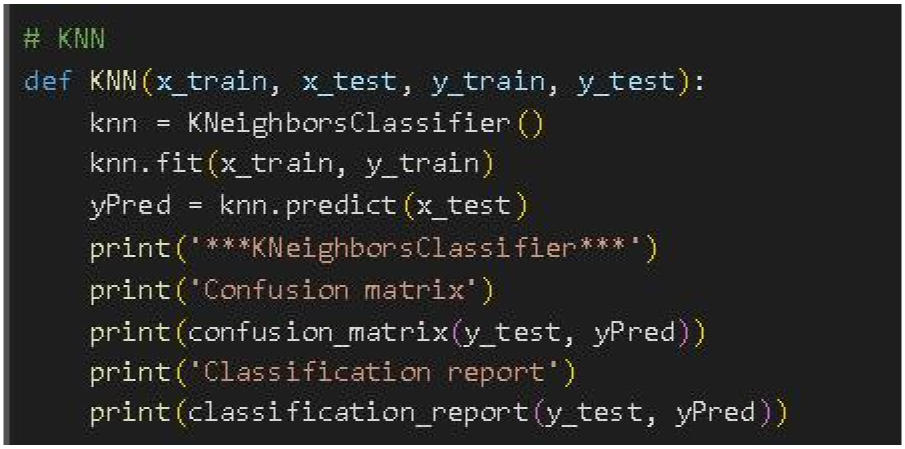
## Initial Model Training Code:



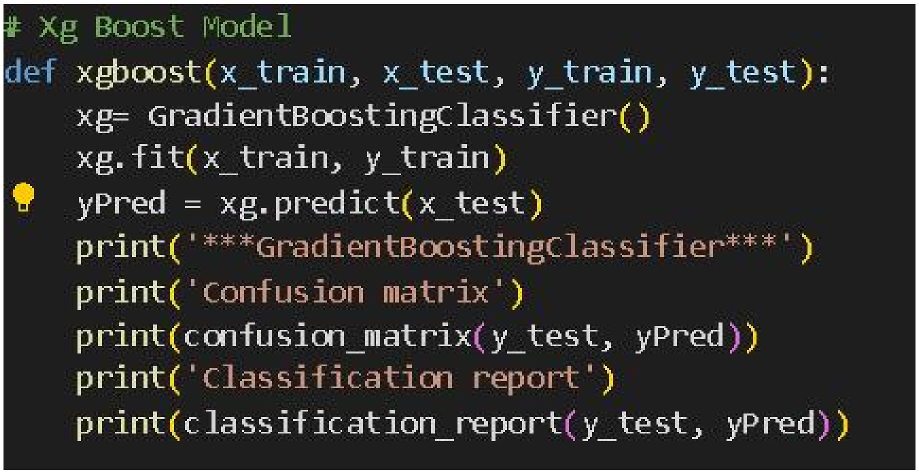
```
# Decision Tree
def decisionTree(x_train, x_test, y_train, y_test):
    dt = DecisionTreeClassifier()
    dt.fit(x_train, y_train)
    yPred = dt.predict(x_test)
    print('***DecisionTreeClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test, yPred))
    print('Classification report')
    print(classification_report(y_test, yPred))
```



```
# Random Forest
def randomForest(x_train, x_test, y_train, y_test):
    rf = RandomForestClassifier()
    rf.fit(x_train, y_train)
    yPred = rf.predict(x_test)
    print('***RandomForestClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test, yPred))
    print('Classification report')
    print(classification_report(y_test, yPred))
```

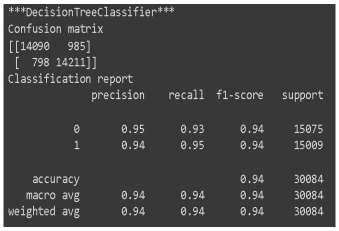
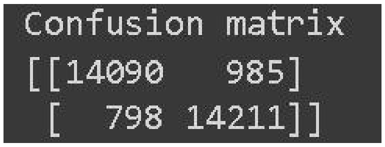


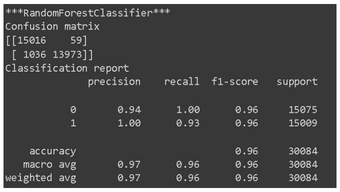
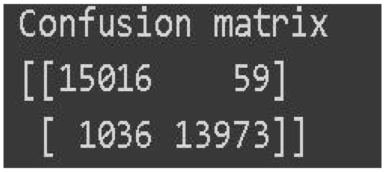
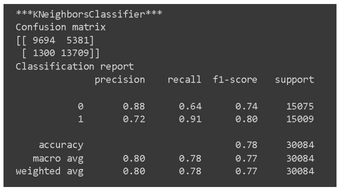
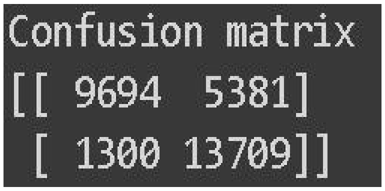
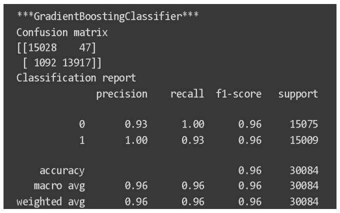
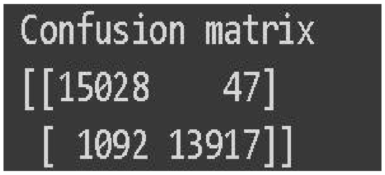
```python
# KNN
def KNN(x_train, x_test, y_train, y_test):
    knn = KNeighborsClassifier()
    knn.fit(x_train, y_train)
    yPred = knn.predict(x_test)
    print('***KNeighborsClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test, yPred))
    print('Classification report')
    print(classification_report(y_test, yPred))
```



```python
# Xg Boost Model
def xgboost(x_train, x_test, y_train, y_test):
    xg= GradientBoostingClassifier()
    xg.fit(x_train, y_train)
    yPred = xg.predict(x_test)
    print('***GradientBoostingClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test, yPred))
    print('Classification report')
    print(classification_report(y_test, yPred))
```

**Model validation and Evaluation Report:**

| Model | Classification Report | Accuracy | Confusion Matrix |
|---|---|---|---|
| Decision Tree | <br>***DecisionTreeClassifier***<br>Confusion matrix<br>[[14090   985]<br> [  798 14211]]<br>Classification report<br>              precision    recall  f1-score   support<br>           0       0.95      0.93      0.94     15075<br>           1       0.94      0.95      0.94     15009<br>    accuracy                           0.94     30084<br>   macro avg       0.94      0.94      0.94     30084<br>weighted avg       0.94      0.94      0.94     30084 | 94% | <br>Confusion matrix<br>[[14090   985]<br> [  798 14211]] |

| | | | |
|---|---|---|---|
| Random Forest | <br>***RandomForestClassifier***<br>Confusion matrix<br>[[15016    59]<br> [ 1036 13973]]<br>Classification report<br>              precision    recall  f1-score   support<br><br>           0       0.94      1.00      0.96     15075<br>           1       1.00      0.93      0.96     15009<br><br>    accuracy                           0.96     30084<br>   macro avg       0.97      0.96      0.96     30084<br>weighted avg       0.97      0.96      0.96     30084 | 96% | <br>Confusion matrix<br>[[15016    59]<br> [ 1036 13973]] |
| KNN | <br>***KNeighborsClassifier***<br>Confusion matrix<br>[[ 9694  5381]<br> [ 1300 13709]]<br>Classification report<br>              precision    recall  f1-score   support<br><br>           0       0.88      0.64      0.74     15075<br>           1       0.72      0.91      0.80     15009<br><br>    accuracy                           0.78     30084<br>   macro avg       0.80      0.78      0.77     30084<br>weighted avg       0.80      0.78      0.77     30084 | 91% | <br>Confusion matrix<br>[[ 9694  5381]<br> [ 1300 13709]] |
| Xgboost | <br>***GradientBoostingClassifier***<br>Confusion matrix<br>[[15028    47]<br> [ 1092 13917]]<br>Classification report<br>              precision    recall  f1-score   support<br><br>           0       0.93      1.00      0.96     15075<br>           1       1.00      0.93      0.96     15009<br><br>    accuracy                           0.96     30084<br>   macro avg       0.96      0.96      0.96     30084<br>weighted avg       0.96      0.96      0.96     30084 | 96% | <br>Confusion matrix<br>[[15028    47]<br> [ 1092 13917]] |