

Social network Graph Link Prediction - Facebook Challenge

In [1]:

```
#Importing Libraries
# please do go through this python notebook:
import warnings
warnings.filterwarnings("ignore")

import csv
import pandas as pd#pandas to create small dataframes
import datetime #Convert to unix time
import time #Convert to unix time
# if numpy is not installed already : pip3 install numpy
import numpy as np#Do arithmetic operations on arrays
# matplotlib: used to plot graphs
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns#Plots
from matplotlib import rcParams#Size of plots
from sklearn.cluster import MiniBatchKMeans, KMeans#Clustering
import math
import pickle
import os
# to install xgboost: pip3 install xgboost
import xgboost as xgb

import warnings
import networkx as nx
import pdb
import pickle
from pandas import HDFStore,DataFrame
from pandas import read_hdf
from scipy.sparse.linalg import svds, eigs
import gc
from tqdm import tqdm
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import f1_score
```

In [3]:

```
#reading
from pandas import read_hdf
df_final_train = read_hdf('storage_sample_stage4.h5', 'train_df',mode='r')
df_final_test = read_hdf('storage_sample_stage4.h5', 'test_df',mode='r')
```

In [4]:

```
df_final_train.columns
```

Out[4]:

```
Index(['source_node', 'destination_node', 'indicator_link',
      'jaccard_followers', 'jaccard_followees', 'cosine_followers',
      'cosine_followees', 'num_followers_s', 'num_followees_s',
      'num_followees_d', 'inter_followers', 'inter_followees', 'adar_inde
x',
      'follows_back', 'same_comp', 'shortest_path', 'weight_in', 'weight_
out',
      'weight_f1', 'weight_f2', 'weight_f3', 'weight_f4', 'page_rank_s',
      'page_rank_d', 'katz_s', 'katz_d', 'hubs_s', 'hubs_d', 'authorities
_s',
      'authorities_d', 'svd_u_s_1', 'svd_u_s_2', 'svd_u_s_3', 'svd_u_s_
4',
      'svd_u_s_5', 'svd_u_s_6', 'svd_u_d_1', 'svd_u_d_2', 'svd_u_d_3',
      'svd_u_d_4', 'svd_u_d_5', 'svd_u_d_6', 'svd_v_s_1', 'svd_v_s_2',
      'svd_v_s_3', 'svd_v_s_4', 'svd_v_s_5', 'svd_v_s_6', 'svd_v_d_1',
      'svd_v_d_2', 'svd_v_d_3', 'svd_v_d_4', 'svd_v_d_5', 'svd_v_d_6',
      'preferential_attachment_follower', 'preferential_attachment_follow
ee',
      'svd_dot'],
      dtype='object')
```

In [5]:

```
y_train = df_final_train.indicator_link
y_test = df_final_test.indicator_link
```

In [6]:

```
df_final_train.drop(['source_node', 'destination_node', 'indicator_link'],axis=1,inplace
=True)
df_final_test.drop(['source_node', 'destination_node', 'indicator_link'],axis=1,inplace=
True)
```

In [0]:

```

estimators = [10,50,100,250,450]
train_scores = []
test_scores = []
for i in estimators:
    clf = RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                                max_depth=5, max_features='auto', max_leaf_nodes=None,
                                min_impurity_decrease=0.0, min_impurity_split=None,
                                min_samples_leaf=52, min_samples_split=120,
                                min_weight_fraction_leaf=0.0, n_estimators=i, n_jobs=-1, random_state=25, ver
bose=0, warm_start=False)
    clf.fit(df_final_train,y_train)
    train_sc = f1_score(y_train,clf.predict(df_final_train))
    test_sc = f1_score(y_test,clf.predict(df_final_test))
    test_scores.append(test_sc)
    train_scores.append(train_sc)
    print('Estimators = ',i,'Train Score',train_sc,'test Score',test_sc)
plt.plot(estimators,train_scores,label='Train Score')
plt.plot(estimators,test_scores,label='Test Score')
plt.xlabel('Estimators')
plt.ylabel('Score')
plt.title('Estimators vs score at depth of 5')

```

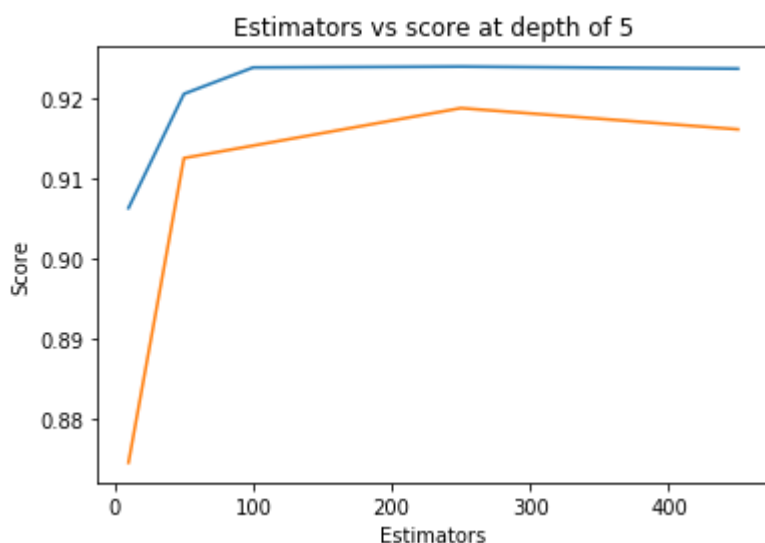
```

Estimators = 10 Train Score 0.9063252121775113 test Score 0.8745605278006
858
Estimators = 50 Train Score 0.9205725512208812 test Score 0.9125653355634
538
Estimators = 100 Train Score 0.9238690848446947 test Score 0.914119971415
3599
Estimators = 250 Train Score 0.9239789348046863 test Score 0.918800723266
4732
Estimators = 450 Train Score 0.9237190618658074 test Score 0.916150768582
8595

```

Out[0]:

Text(0.5,1,'Estimators vs score at depth of 5')



In [0]:

```

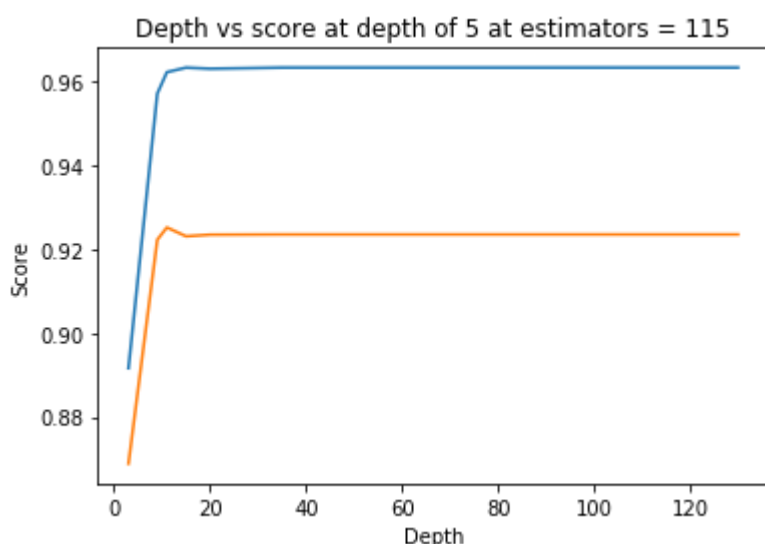
depths = [3,9,11,15,20,35,50,70,130]
train_scores = []
test_scores = []
for i in depths:
    clf = RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                                max_depth=i, max_features='auto', max_leaf_nodes=None,
                                min_impurity_decrease=0.0, min_impurity_split=None,
                                min_samples_leaf=52, min_samples_split=120,
                                min_weight_fraction_leaf=0.0, n_estimators=115, n_jobs=-1, random_state=25, verbose=0, warm_start=False)
    clf.fit(df_final_train, y_train)
    train_sc = f1_score(y_train, clf.predict(df_final_train))
    test_sc = f1_score(y_test, clf.predict(df_final_test))
    test_scores.append(test_sc)
    train_scores.append(train_sc)
    print('depth = ', i, 'Train Score', train_sc, 'test Score', test_sc)
plt.plot(depths, train_scores, label='Train Score')
plt.plot(depths, test_scores, label='Test Score')
plt.xlabel('Depth')
plt.ylabel('Score')
plt.title('Depth vs score at depth of 5 at estimators = 115')
plt.show()

```

```

depth = 3 Train Score 0.8916120853581238 test Score 0.8687934859875491
depth = 9 Train Score 0.9572226298198419 test Score 0.9222953031452904
depth = 11 Train Score 0.9623451340902863 test Score 0.9252318758281279
depth = 15 Train Score 0.9634267621927706 test Score 0.9231288356496615
depth = 20 Train Score 0.9631629153051491 test Score 0.9235051024711141
depth = 35 Train Score 0.9634333127085721 test Score 0.9235601652753184
depth = 50 Train Score 0.9634333127085721 test Score 0.9235601652753184
depth = 70 Train Score 0.9634333127085721 test Score 0.9235601652753184
depth = 130 Train Score 0.9634333127085721 test Score 0.9235601652753184

```



In [0]:

```

from sklearn.metrics import f1_score
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import f1_score
from sklearn.model_selection import RandomizedSearchCV
from scipy.stats import randint as sp_randint
from scipy.stats import uniform

param_dist = {"n_estimators":sp_randint(105,125),
              "max_depth": sp_randint(10,15),
              "min_samples_split": sp_randint(110,190),
              "min_samples_leaf": sp_randint(25,65)}

clf = RandomForestClassifier(random_state=25,n_jobs=-1)

rf_random = RandomizedSearchCV(clf, param_distributions=param_dist,
                              n_iter=5,cv=10,scoring='f1',random_state=25)

rf_random.fit(df_final_train,y_train)
print('mean test scores',rf_random.cv_results_['mean_test_score'])
print('mean train scores',rf_random.cv_results_['mean_train_score'])

```

```

mean test scores [0.96225043 0.96215493 0.96057081 0.96194015 0.96330005]
mean train scores [0.96294922 0.96266735 0.96115674 0.96263457 0.96430539]

```

In [0]:

```
print(rf_random.best_estimator_)
```

```

RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                        i',
                        max_depth=14, max_features='auto', max_leaf_nodes=None,
                        min_impurity_decrease=0.0, min_impurity_split=None,
                        min_samples_leaf=28, min_samples_split=111,
                        min_weight_fraction_leaf=0.0, n_estimators=121, n_jobs=-1,
                        oob_score=False, random_state=25, verbose=0, warm_start=False)

```

In [0]:

```

clf = RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                             max_depth=14, max_features='auto', max_leaf_nodes=None,
                             min_impurity_decrease=0.0, min_impurity_split=None,
                             min_samples_leaf=28, min_samples_split=111,
                             min_weight_fraction_leaf=0.0, n_estimators=121, n_jobs=-1,
                             oob_score=False, random_state=25, verbose=0, warm_start=False)

```

In [0]:

```

clf.fit(df_final_train,y_train)
y_train_pred = clf.predict(df_final_train)
y_test_pred = clf.predict(df_final_test)

```

In [0]:

```
from sklearn.metrics import f1_score
print('Train f1 score',f1_score(y_train,y_train_pred))
print('Test f1 score',f1_score(y_test,y_test_pred))
```

Train f1 score 0.9652533106548414

Test f1 score 0.9241678239279553

In [0]:

```
from sklearn.metrics import confusion_matrix
def plot_confusion_matrix(test_y, predict_y):
    C = confusion_matrix(test_y, predict_y)

    A = (((C.T)/(C.sum(axis=1))).T)

    B =(C/C.sum(axis=0))
    plt.figure(figsize=(20,4))

    labels = [0,1]
    # representing A in heatmap format
    cmap=sns.light_palette("blue")
    plt.subplot(1, 3, 1)
    sns.heatmap(C, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=labels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Confusion matrix")

    plt.subplot(1, 3, 2)
    sns.heatmap(B, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=labels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Precision matrix")

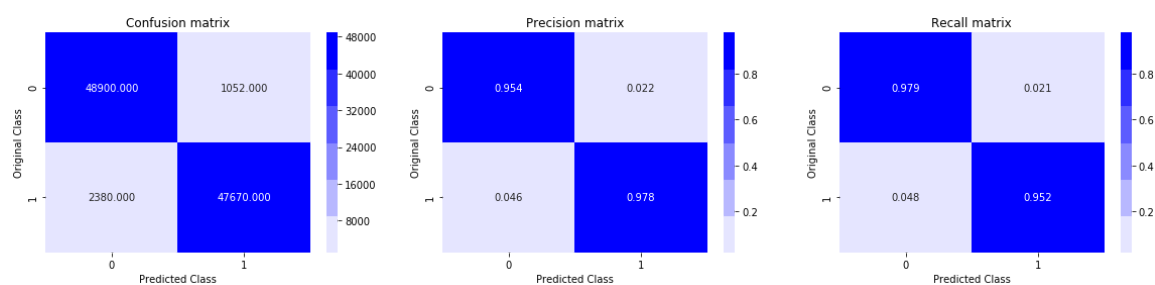
    plt.subplot(1, 3, 3)
    # representing B in heatmap format
    sns.heatmap(A, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=labels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Recall matrix")

    plt.show()
```

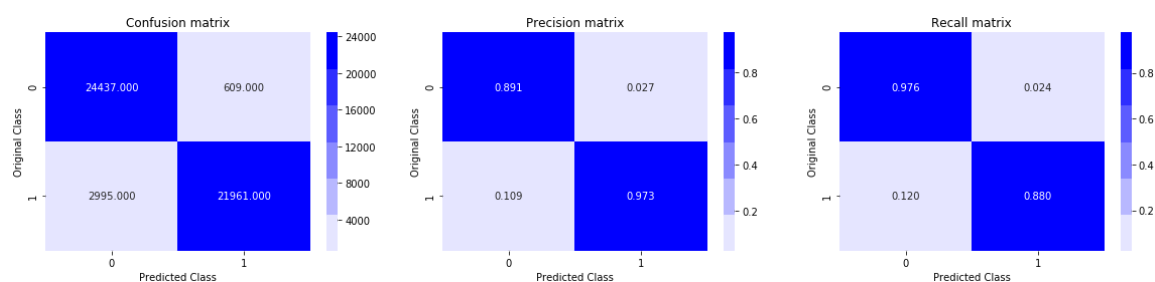
In [0]:

```
print('Train confusion_matrix')
plot_confusion_matrix(y_train,y_train_pred)
print('Test confusion_matrix')
plot_confusion_matrix(y_test,y_test_pred)
```

Train confusion_matrix

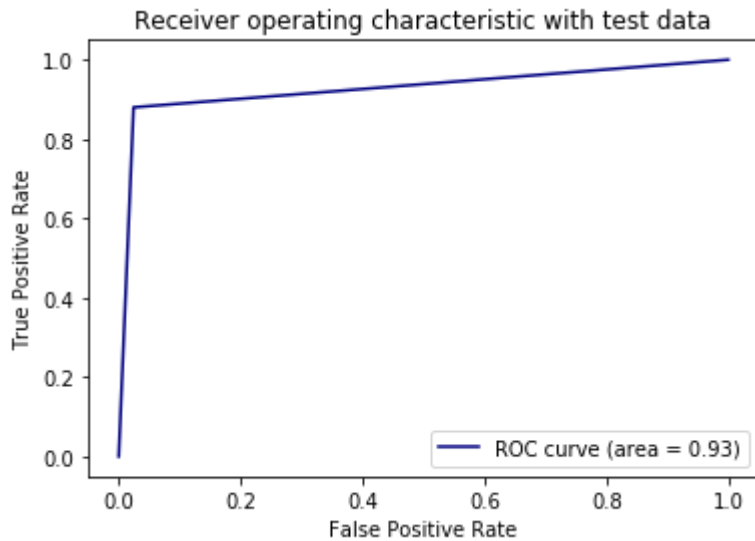


Test confusion_matrix



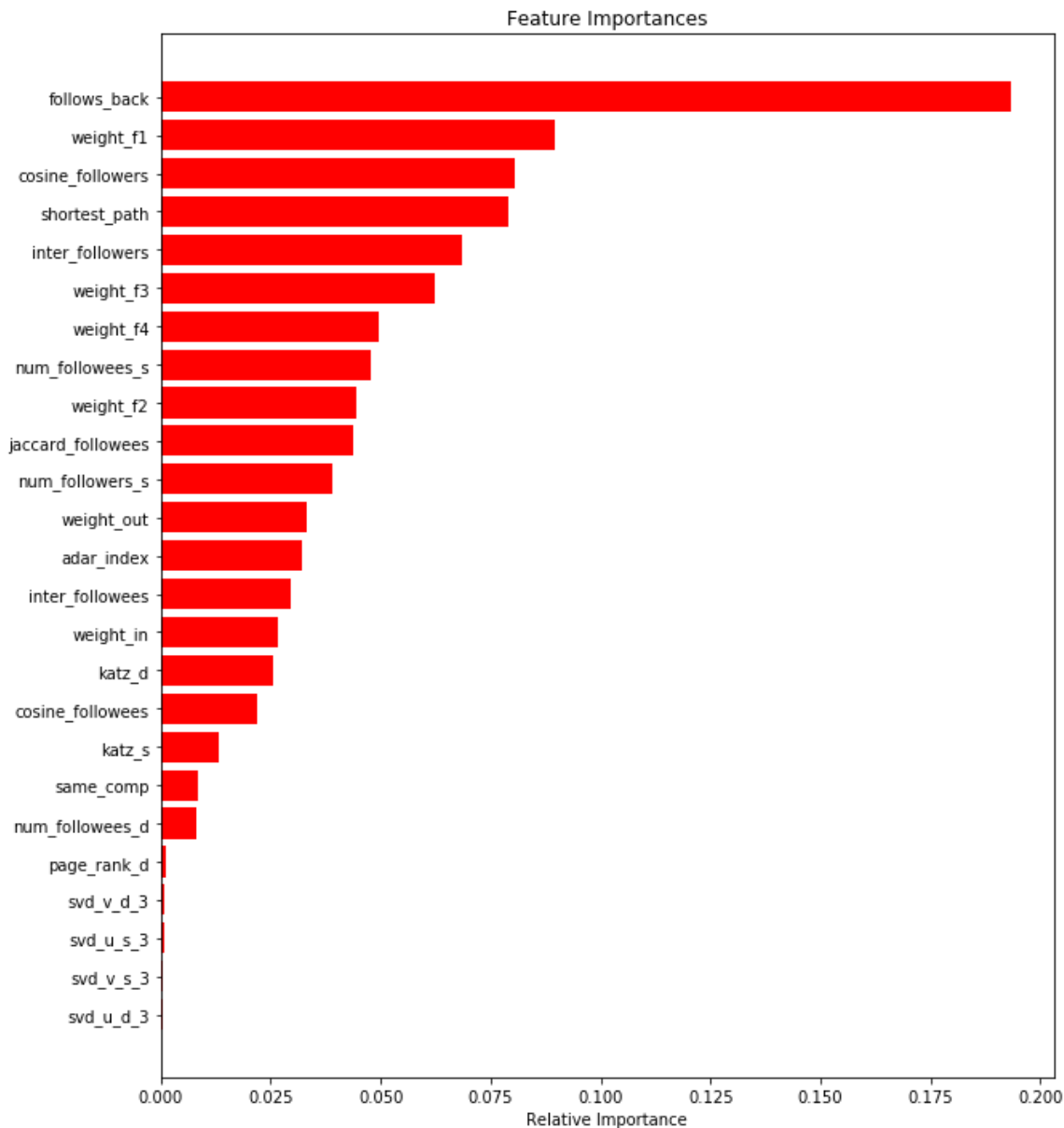
In [0]:

```
from sklearn.metrics import roc_curve, auc
fpr,tpr,ths = roc_curve(y_test,y_test_pred)
auc_sc = auc(fpr, tpr)
plt.plot(fpr, tpr, color='navy',label='ROC curve (area = %0.2f)' % auc_sc)
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver operating characteristic with test data')
plt.legend()
plt.show()
```



In [0]:

```
features = df_final_train.columns
importances = clf.feature_importances_
indices = (np.argsort(importances))[-25:]
plt.figure(figsize=(10,12))
plt.title('Feature Importances')
plt.barh(range(len(indices)), importances[indices], color='r', align='center')
plt.yticks(range(len(indices)), [features[i] for i in indices])
plt.xlabel('Relative Importance')
plt.show()
```



Tuning hyperparameters for XG boost

In [11]:

```
from xgboost import XGBClassifier
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import f1_score, make_scorer
parameters = {'n_estimators': [50, 100, 150, 200], 'max_depth': [3, 4, 5, 6], 'learning_rate': [0.1, 0.2, 0.3]}
xgb = XGBClassifier(class_weight = 'balanced')
clf = GridSearchCV(xgb, parameters, cv=3, scoring='roc_auc', return_train_score=True)
clf.fit(df_final_train, y_train)
```

[07:34:51] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:34:53] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:34:55] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:34:57] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:00] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:03] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:07] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:11] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:16] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:21] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:28] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:35] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:42] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:44] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:47] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:49] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:53] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:35:57] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:00] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:06] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:12] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:17] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:25] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:32] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:36:40] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language

e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:36:42] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:36:45] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:36:47] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:36:52] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:36:56] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:37:01] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:14] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:21] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:30] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:39] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:37:48] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

hrough this
verification. Please open an issue if you find above cases.

[07:37:51] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:37:53] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:37:56] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:38:01] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:38:07] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:38:12] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:38:20] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:38:28] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:38:35] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:38:47] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:38:57] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:39:08] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:39:09] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:11] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:13] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:16] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:19] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:22] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:27] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:31] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:35] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:41] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:47] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:53] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:55] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:57] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:39:59] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:03] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:07] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:11] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:17] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:23] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:28] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:36] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:43] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:51] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:53] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:56] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:40:58] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:03] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:13] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:20] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:27] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:33] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:42] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:41:51] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:42:00] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:42:03] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language

e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:05] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:13] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:19] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:24] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but
passed down to XGBoost core. Or some parameters are not used but slip t
hrough this
verification. Please open an issue if you find above cases.

[07:42:32] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in languag
e bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:42:40] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:42:48] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:42:58] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:43:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:43:19] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:43:21] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

hrough this
verification. Please open an issue if you find above cases.

[07:43:22] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:43:24] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:43:27] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:43:30] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:43:33] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this
verification. Please open an issue if you find above cases.

[07:43:37] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but
passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:43:42] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:43:46] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:43:52] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:43:58] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:04] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:06] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:10] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:14] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:18] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:22] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:27] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:44:33] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:38] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:46] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:44:53] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:45:00] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:45:03] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but

passed down to XGBoost core. Or some parameters are not used but slip through this

verification. Please open an issue if you find above cases.

[07:45:05] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:12] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:17] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:22] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:28] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:35] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:42] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:45:51] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:00] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:08] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:11] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:14] WARNING: /workspace/src/learner.cc:480:

Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:17] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:23] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:28] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:34] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:41] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:49] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:46:57] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:47:08] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:47:18] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

[07:47:28] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

Out[11]:

```
GridSearchCV(cv=3, error_score=nan,
             estimator=XGBClassifier(base_score=None, booster=None,
                                     class_weight='balanced',
                                     colsample_bylevel=None,
                                     colsample_bynode=None,
                                     colsample_bytree=None, gamma=None,
                                     gpu_id=None, importance_type='gain',
                                     interaction_constraints=None,
                                     learning_rate=None, max_delta_step=No
ne,
                                     max_depth=None, min_child_weight=Non
e,
                                     missing=nan, monotone_...
                                     random_state=None, reg_alpha=None,
                                     reg_lambda=None, scale_pos_weight=Non
e,
                                     subsample=None, tree_method=None,
                                     validate_parameters=None, verbosity=N
one),
             iid='deprecated', n_jobs=None,
             param_grid={'learning_rate': [0.1, 0.2, 0.3],
                         'max_depth': [3, 4, 5, 6],
                         'n_estimators': [50, 100, 150, 200]},
             pre_dispatch='2*n_jobs', refit=True, return_train_score=True,
             scoring='roc_auc', verbose=0)
```

Assignments:

1. Add another feature called Preferential Attachment with followers and followees data of vertex. you can check about Preferential Attachment in below link <http://be.amazd.com/link-prediction/> (<http://be.amazd.com/link-prediction/>)
2. Add feature called svd_dot. you can calculate svd_dot as Dot product between source node svd and destination node svd features. you can read about this in below pdf https://storage.googleapis.com/kaggle-forum-message-attachments/2594/supervised_link_prediction.pdf (https://storage.googleapis.com/kaggle-forum-message-attachments/2594/supervised_link_prediction.pdf)
3. Tune hyperparameters for XG boost with all these features and check the error metric.

In [14]:

```
clf.best_estimator_
```

Out[14]:

```
XGBClassifier(base_score=0.5, booster='gbtree', class_weight='balanced',
              colsample_bylevel=1, colsample_bynode=1, colsample_bytree=1,
              gamma=0, gpu_id=-1, importance_type='gain',
              interaction_constraints='', learning_rate=0.3, max_delta_ste
p=0,
              max_depth=5, min_child_weight=1, missing=nan,
              monotone_constraints='()', n_estimators=200, n_jobs=0,
              num_parallel_tree=1, objective='binary:logistic', random_sta
te=0,
              reg_alpha=0, reg_lambda=1, scale_pos_weight=1, subsample=1,
              tree_method='exact', validate_parameters=1, verbosity=None)
```

In [17]:

```
clf= XGBClassifier(base_score=0.5, booster='gbtree', class_weight='balanced',
                  colsample_bylevel=1, colsample_bynode=1, colsample_bytree=1,
                  gamma=0, gpu_id=-1, importance_type='gain',
                  interaction_constraints='', learning_rate=0.3, max_delta_step=0,
                  max_depth=5, min_child_weight=1,
                  monotone_constraints='()', n_estimators=200, n_jobs=0,
                  num_parallel_tree=1, objective='binary:logistic', random_state=0,
                  reg_alpha=0, reg_lambda=1, scale_pos_weight=1, subsample=1,
                  tree_method='exact', validate_parameters=1, verbosity=None)
```

In [18]:

```
clf.fit(df_final_train,y_train)
y_train_pred = clf.predict(df_final_train)
y_test_pred = clf.predict(df_final_test)
```

[08:36:10] WARNING: /workspace/src/learner.cc:480:
Parameters: { class_weight } might not be used.

This may not be accurate due to some parameters are only used in language bindings but passed down to XGBoost core. Or some parameters are not used but slip through this verification. Please open an issue if you find above cases.

In [19]:

```
from sklearn.metrics import f1_score
print('Train f1 score',f1_score(y_train,y_train_pred))
print('Test f1 score',f1_score(y_test,y_test_pred))
```

Train f1 score 0.9979697766754344
Test f1 score 0.8978336278552262

In [20]:

```
from sklearn.metrics import confusion_matrix
def plot_confusion_matrix(test_y, predict_y):
    C = confusion_matrix(test_y, predict_y)

    A = (((C.T)/(C.sum(axis=1))).T)

    B = (C/C.sum(axis=0))
    plt.figure(figsize=(20,4))

    labels = [0,1]
    # representing A in heatmap format
    cmap=sns.light_palette("blue")
    plt.subplot(1, 3, 1)
    sns.heatmap(C, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=la
bels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Confusion matrix")

    plt.subplot(1, 3, 2)
    sns.heatmap(B, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=la
bels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Precision matrix")

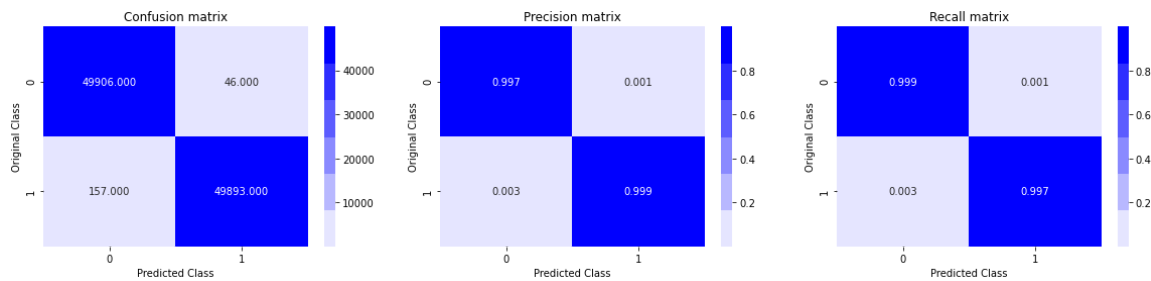
    plt.subplot(1, 3, 3)
    # representing B in heatmap format
    sns.heatmap(A, annot=True, cmap=cmap, fmt=".3f", xticklabels=labels, yticklabels=la
bels)
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Recall matrix")

    plt.show()
```

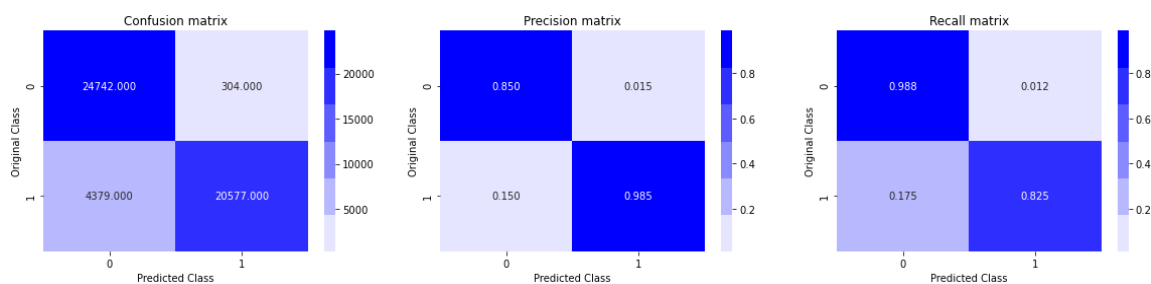
In [21]:

```
print('Train confusion_matrix')
plot_confusion_matrix(y_train,y_train_pred)
print('Test confusion_matrix')
plot_confusion_matrix(y_test,y_test_pred)
```

Train confusion_matrix

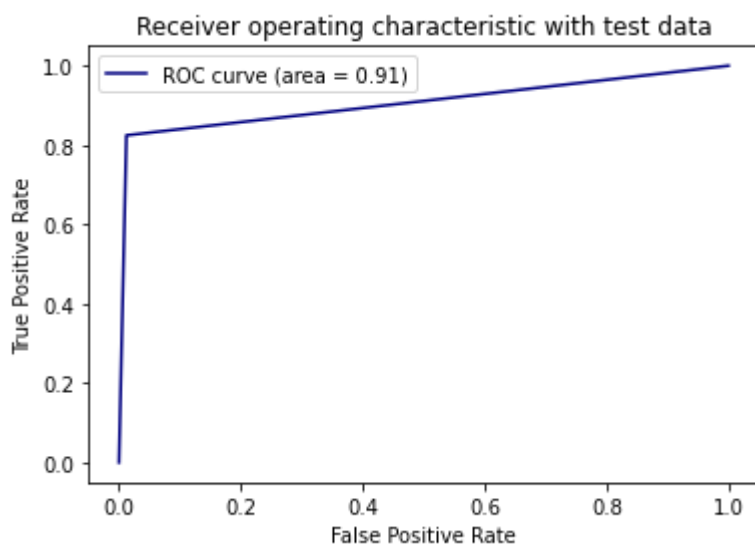


Test confusion_matrix



In [22]:

```
from sklearn.metrics import roc_curve, auc
fpr, tpr, ths = roc_curve(y_test,y_test_pred)
auc_sc = auc(fpr, tpr)
plt.plot(fpr, tpr, color='navy',label='ROC curve (area = %0.2f)' % auc_sc)
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver operating characteristic with test data')
plt.legend()
plt.show()
```

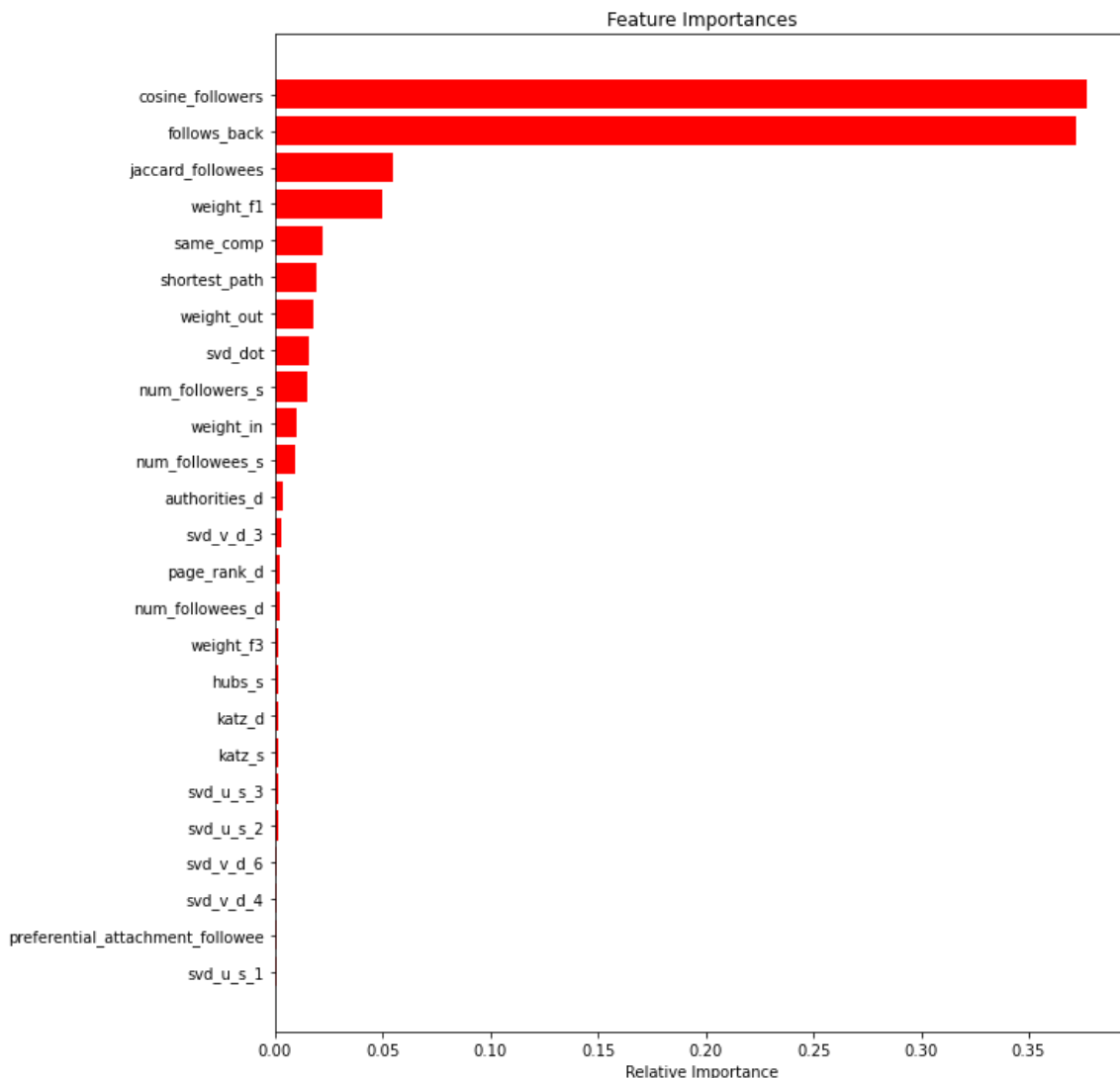


In [23]:

```

features = df_final_train.columns
importances = clf.feature_importances_
indices = (np.argsort(importances))[-25:]
plt.figure(figsize=(10,12))
plt.title('Feature Importances')
plt.barh(range(len(indices)), importances[indices], color='r', align='center')
plt.yticks(range(len(indices)), [features[i] for i in indices])
plt.xlabel('Relative Importance')
plt.show()

```



In [27]:

```

weather_data = [('RandomForest',0.965,0.924),
                 ('XGBOOST',0.997,0.89)]
df = pd.DataFrame(weather_data, columns=['Model', 'train_f1_score ', "test_f1_score"])
#Ref: https://pypi.org/project/tabulate/
from tabulate import tabulate
print(tabulate(df, headers='keys', tablefmt='github'))

```

	Model	train_f1_score	test_f1_score
0	RandomForest	0.965	0.924
1	XGBOOST	0.997	0.89

In []: