Quora_Similarity_Case_Study

January 20, 2019

```
In [1]: import pandas as pd
        import matplotlib.pyplot as plt
        import re
        import time
        import warnings
        import numpy as np
        from nltk.corpus import stopwords
        from sklearn.preprocessing import normalize
        from sklearn.feature_extraction.text import CountVectorizer
        from sklearn.feature_extraction.text import TfidfVectorizer
        warnings.filterwarnings("ignore")
        import sys
        import os
        import pandas as pd
        import numpy as np
        from tqdm import tqdm
        from sklearn.calibration import CalibratedClassifierCV

        from sklearn.linear_model import SGDClassifier
        from sklearn.metrics import confusion_matrix
        from sklearn.metrics.classification import accuracy_score, log_loss
        import seaborn as sns
```

```
In [2]: # avoid decoding problems
        df = pd.read_csv("F:/Applied AI Course/quora similarity/train.csv")

        # encode questions to unicode
        # https://stackoverflow.com/a/6812069
        # ----------------- python 2 ---------------------
        # df['question1'] = df['question1'].apply(lambda x: unicode(str(x),"utf-8"))
        # df['question2'] = df['question2'].apply(lambda x: unicode(str(x),"utf-8"))
        # ----------------- python 3 ---------------------
        df['question1'] = df['question1'].apply(lambda x: str(x))
        df['question2'] = df['question2'].apply(lambda x: str(x))
```

```
In [3]: df.head()
```

```
Out[3]:    id  qid1  qid2                                          question1  \
        0   0     1     2  What is the step by step guide to invest in sh...
```

```
1  1    3    4  What is the story of Kohinoor (Koh-i-Noor) Dia...
2  2    5    6  How can I increase the speed of my internet co...
3  3    7    8  Why am I mentally very lonely? How can I solve...
4  4    9   10  Which one dissolve in water quikly sugar, salt...

                                         question2  is_duplicate
0  What is the step by step guide to invest in sh...             0
1  What would happen if the Indian government sto...             0
2  How can Internet speed be increased by hacking...             0
3  Find the remainder when [math]23^{24}[/math] i...             0
4            Which fish would survive in salt water?             0
```

```
In [3]: from sklearn.feature_extraction.text import TfidfVectorizer
        from sklearn.feature_extraction.text import CountVectorizer


        tfidf = TfidfVectorizer(max_features=500)
```

```
In [11]: # merge texts
         questions1 = (df['question1'].values)
         questions2 = (df['question2'].values)
         data_q1=(tfidf.fit_transform(questions1))
         data_q2=(tfidf.fit_transform(questions2))
```

```
In [5]: data_q1.get_shape()
```

```
Out[5]: (404290, 500)
```

```
In [12]: data_q1=data_q1.toarray()
```

```
In [13]: data_q2=data_q2.toarray()
```

```
In [14]: data_q1=pd.DataFrame(data_q1)
```

```
In [15]: data_q2=pd.DataFrame(data_q2)
```

```
In [16]: data_q1.head()
```

```
Out[16]:    0    1    2    3    4    5    6    7    8    9  ...  490  491  492  493  \
         0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 ...  0.0  0.0  0.0  0.0
         1  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 ...  0.0  0.0  0.0  0.0
         2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 ...  0.0  0.0  0.0  0.0
         3  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 ...  0.0  0.0  0.0  0.0
         4  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 ...  0.0  0.0  0.0  0.0

            494  495  496  497  498  499
         0  0.0  0.0  0.0  0.0  0.0  0.0
         1  0.0  0.0  0.0  0.0  0.0  0.0
         2  0.0  0.0  0.0  0.0  0.0  0.0
```

```
3  0.0  0.0  0.0  0.0  0.0  0.0
4  0.0  0.0  0.0  0.0  0.0  0.0

[5 rows x 500 columns]
```

```
In [17]: #prepro_features_train.csv (Simple Preprocessing Feartures)
         #nlp_features_train.csv (NLP Features)
         if os.path.isfile('F:/Applied AI Course/quora similarity/nlp_features_train.csv'):
             dfnlp = pd.read_csv("F:/Applied AI Course/quora similarity/nlp_features_train.csv"
         else:
             print("download nlp_features_train.csv from drive or run previous notebook")

         if os.path.isfile('F:/Applied AI Course/quora similarity/df_fe_without_preprocessing_t
             dfppro = pd.read_csv("F:/Applied AI Course/quora similarity/df_fe_without_preproce
         else:
             print("download df_fe_without_preprocessing_train.csv from drive or run previous n
```

```
In [18]: df1 = dfnlp.drop(['qid1','qid2','question1','question2'],axis=1)
         df2 = dfppro.drop(['qid1','qid2','question1','question2','is_duplicate'],axis=1)
         df3 = df.drop(['qid1','qid2','question1','question2','is_duplicate'],axis=1)
```

```
In [12]: df1.head()
```

```
Out[12]:    id  is_duplicate   cwc_min   cwc_max   csc_min   csc_max   ctc_min  \
         0   0             0  0.999980  0.833319  0.999983  0.999983  0.916659
         1   1             0  0.799984  0.399996  0.749981  0.599988  0.699993
         2   2             0  0.399992  0.333328  0.399992  0.249997  0.399996
         3   3             0  0.000000  0.000000  0.000000  0.000000  0.000000
         4   4             0  0.399992  0.199998  0.999950  0.666644  0.571420

             ctc_max  last_word_eq  first_word_eq  abs_len_diff  mean_len  \
         0  0.785709           0.0            1.0           2.0      13.0
         1  0.466664           0.0            1.0           5.0      12.5
         2  0.285712           0.0            1.0           4.0      12.0
         3  0.000000           0.0            0.0           2.0      12.0
         4  0.307690           0.0            1.0           6.0      10.0

            token_set_ratio  token_sort_ratio  fuzz_ratio  fuzz_partial_ratio  \
         0              100                93          93                 100
         1               86                63          66                  75
         2               66                66          54                  54
         3               36                36          35                  40
         4               67                47          46                  56

            longest_substr_ratio
         0              0.982759
         1              0.596154
         2              0.166667
         3             0.039216
         4             0.175000
```

```
In [13]: df2.head()
```

```
Out[13]:    id  freq_qid1  freq_qid2  q1len  q2len  q1_n_words  q2_n_words  \
         0   0          1          1     66     57          14          12
         1   1          4          1     51     88           8          13
         2   2          1          1     73     59          14          10
         3   3          1          1     50     65          11           9
         4   4          3          1     76     39          13           7

            word_Common  word_Total  word_share  freq_q1+q2  freq_q1-q2
         0         10.0        23.0    0.434783           2           0
         1          4.0        20.0    0.200000           5           3
         2          4.0        24.0    0.166667           2           0
         3          0.0        19.0    0.000000           2           0
         4          2.0        20.0    0.100000           4           2
```

```
In [14]: print("Number of features in nlp dataframe :", df1.shape[1])
         print("Number of features in preprocessed dataframe :", df2.shape[1])
         print("Number of features in question1 tf-idf  dataframe :", data_q1.shape[1])
         print("Number of features in question2 tf-idf  dataframe :", data_q2.shape[1])
         print("Number of features in final dataframe  :", df1.shape[1]+df2.shape[1]+data_q1.s
```

```
Number of features in nlp dataframe : 17
Number of features in preprocessed dataframe : 12
Number of features in question1 tf-idf  dataframe : 500
Number of features in question2 tf-idf  dataframe : 500
Number of features in final dataframe  : 1029
```

```
In [21]: # storing the final features to csv file
         from sklearn.utils import resample
         df1=resample(df1, n_samples=100000, random_state=30)
         df2=resample(df2, n_samples=100000, random_state=30)
         data_q1=resample(data_q1, n_samples=100000, random_state=30)
         data_q2=resample(data_q2, n_samples=100000, random_state=30)
```

```
In [22]: print("Number of datapoints in final dataframe  :", df1.shape[0]+df2.shape[0]+data_q1
```

```
Number of datapoints in final dataframe  : 400000
```

```
In [27]: data_q1['id']=df1['id']
         data_q2['id']=df1['id']
```

```
In [24]: df1  = df1.merge(df2, on='id',how='left')
         df2  = data_q1.merge(data_q2, on='id',how='left')
         result  = df1.merge(df2, on='id',how='left')
```

```
In [25]: result.shape

Out[25]: (307762, 1039)

In [26]: result=resample(result, n_samples=100000, random_state=30)

In [28]: result.to_csv('final_features.csv')

In [4]: result=pd.read_csv('final_features.csv')

In [5]: result.shape

Out[5]: (100000, 1040)

In [7]: y_true = result['is_duplicate']

In [9]: result.drop([ 'id','is_duplicate'], axis=1, inplace=True)
```

Random train test split(70:30)

```
In [10]: from sklearn.model_selection import train_test_split
         X_train,X_test, y_train, y_test = train_test_split(result, y_true, stratify=y_true, t

In [11]: print("Number of data points in train data :",X_train.shape)
         print("Number of data points in test data :",X_test.shape)

Number of data points in train data : (70000, 1038)
Number of data points in test data : (30000, 1038)


In [12]: # This function plots the confusion matrices given y_i, y_i_hat.
         def plot_confusion_matrix(test_y, predict_y):
             C = confusion_matrix(test_y, predict_y)
             # C = 9,9 matrix, each cell (i,j) represents number of points of class i are pred

             A =(((C.T)/(C.sum(axis=1))).T)
             #divid each element of the confusion matrix with the sum of elements in that colu

             # C = [[1, 2],
             #     [3, 4]]
             # C.T = [[1, 3],
             #        [2, 4]]
             # C.sum(axis = 1)  axis=0 corresonds to columns and axis=1 corresponds to rows in
             # C.sum(axix =1) = [[3, 7]]
             # ((C.T)/(C.sum(axis=1))) = [[1/3, 3/7]
             #                            [2/3, 4/7]]

             # ((C.T)/(C.sum(axis=1))).T = [[1/3, 2/3]
             #                            [3/7, 4/7]]
             # sum of row elements = 1
```

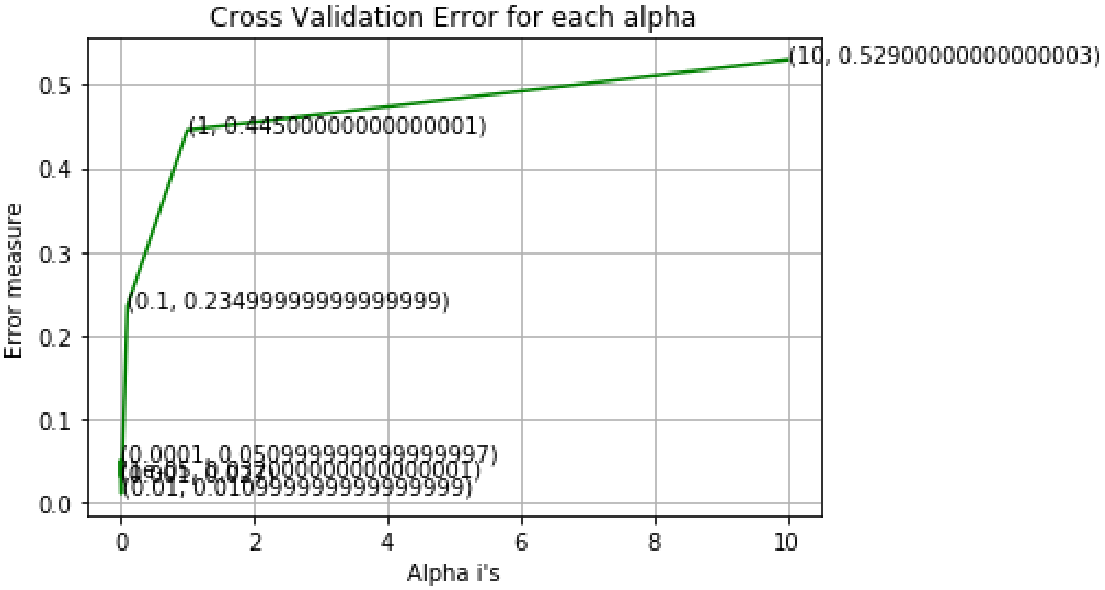
```
    B =(C/C.sum(axis=0))
    #divid each element of the confusion matrix with the sum of elements in that row
    # C = [[1, 2],
    #     [3, 4]]
    # C.sum(axis = 0)  axis=0 corresonds to columns and axis=1 corresponds to rows in
    # C.sum(axix =0) = [[4, 6]]
    # (C/C.sum(axis=0)) = [[1/4, 2/6],
    #                      [3/4, 4/6]]
    plt.figure(figsize=(20,4))

    labels = [1,2]
    # 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=
    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=
    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=
    plt.xlabel('Predicted Class')
    plt.ylabel('Original Class')
    plt.title("Recall matrix")

    plt.show()
```

Logistic Regression with hyperparameter tuning

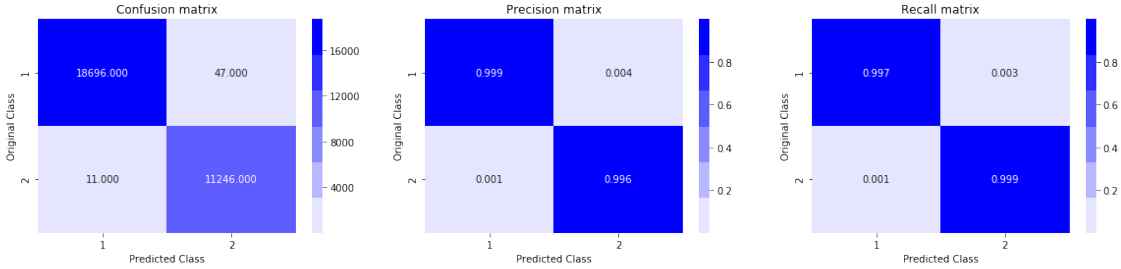
```
In [48]: alpha = [10 ** x for x in range(-5, 2)] # hyperparam for SGD classifier.

         # read more about SGDClassifier() at http://scikit-learn.org/stable/modules/generated
         # ------------------------------
         # default parameters
         # SGDClassifier(loss=hinge, penalty=l2, alpha=0.0001, l1_ratio=0.15, fit_intercept=Tr
         # shuffle=True, verbose=0, epsilon=0.1, n_jobs=1, random_state=None, learning_rate=op
         # class_weight=None, warm_start=False, average=False, n_iter=None)

         # some of methods
         # fit(X, y[, coef_init, intercept_init, ])        Fit linear model with Stochastic Gr
         # predict(X)        Predict class labels for samples in X.

         #-------------------------------
         # video link:
         #------------------------------


         log_error_array=[]
         for i in alpha:
             clf = SGDClassifier(alpha=i, penalty='l2', loss='log', random_state=42)
             clf.fit(X_train, y_train)
             sig_clf = CalibratedClassifierCV(clf, method="sigmoid")
             sig_clf.fit(X_train, y_train)
             predict_y = sig_clf.predict_proba(X_test)
             log_error_array.append(log_loss(y_test, predict_y, labels=clf.classes_, eps=1e-15
             print('For values of alpha = ', i, "The log loss is:",log_loss(y_test, predict_y,

         fig, ax = plt.subplots()
         ax.plot(alpha, log_error_array,c='g')
         for i, txt in enumerate(np.round(log_error_array,3)):
             ax.annotate((alpha[i],np.round(txt,3)), (alpha[i],log_error_array[i]))
         plt.grid()
         plt.title("Cross Validation Error for each alpha")
         plt.xlabel("Alpha i's")
         plt.ylabel("Error measure")
         plt.show()


         best_alpha = np.argmin(log_error_array)
         clf = SGDClassifier(alpha=alpha[best_alpha], penalty='l2', loss='log', random_state=4
         clf.fit(X_train, y_train)
         sig_clf = CalibratedClassifierCV(clf, method="sigmoid")
         sig_clf.fit(X_train, y_train)

         predict_y = sig_clf.predict_proba(X_train)
         print('For values of best alpha = ', alpha[best_alpha], "The train log loss is:",log_l
         predict_y = sig_clf.predict_proba(X_test)
         print('For values of best alpha = ', alpha[best_alpha], "The test log loss is:",log_lo
         predicted_y =np.argmax(predict_y,axis=1)
         print("Total number of data points :", len(predicted_y))
         plot_confusion_matrix(y_test, predicted_y)
```

```
For values of alpha =  1e-05 The log loss is: 0.0324060901258
For values of alpha =  0.0001 The log loss is: 0.051059843091
For values of alpha =  0.001 The log loss is: 0.0265776544546
For values of alpha =  0.01 The log loss is: 0.011433874772
For values of alpha =  0.1 The log loss is: 0.235486697939
For values of alpha =  1 The log loss is: 0.445421194718
For values of alpha =  10 The log loss is: 0.52910987166
```

```
<Figure size 1440x288 with 0 Axes>
```



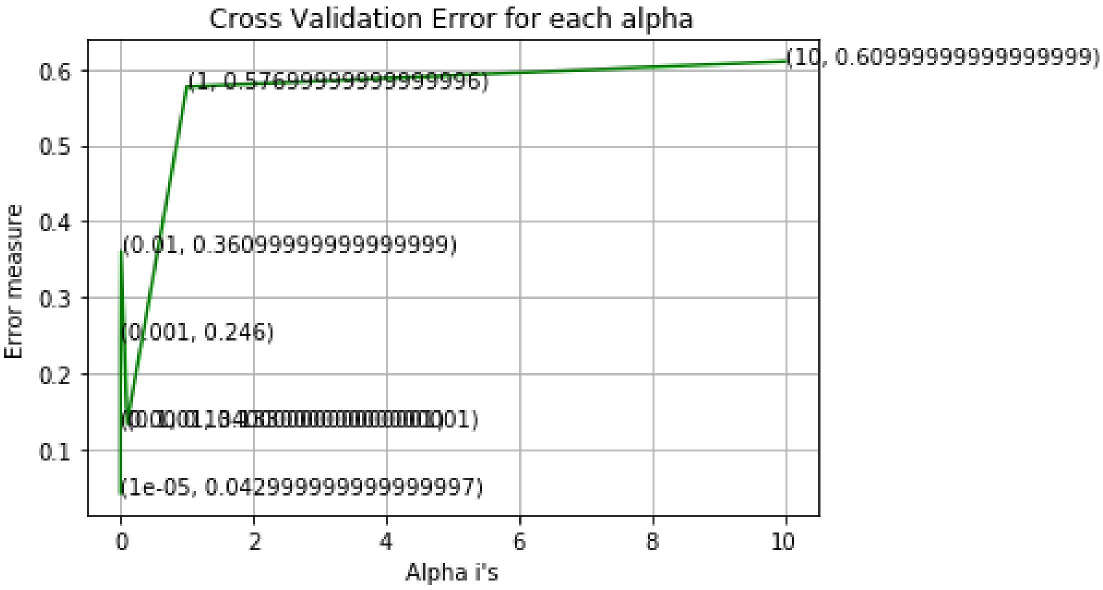
```
For values of best alpha =  0.01 The train log loss is: 0.0108237418247
For values of best alpha =  0.01 The test log loss is: 0.011433874772
Total number of data points : 30000
```



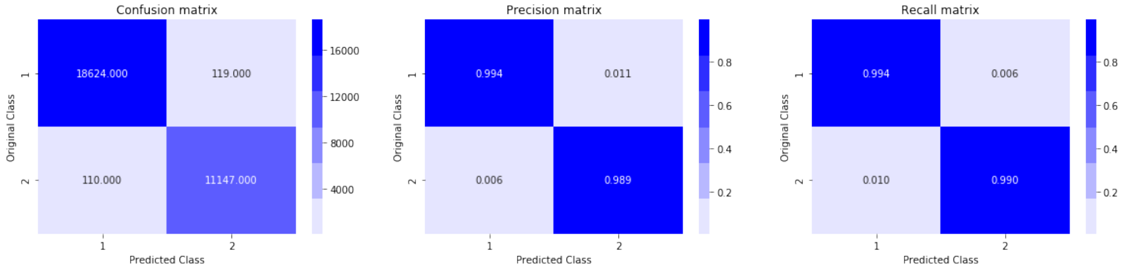
Linear SVM with hyperparameter tuning

```
In [49]: alpha = [10 ** x for x in range(-5, 2)] # hyperparam for SGD classifier.

         # read more about SGDClassifier() at http://scikit-learn.org/stable/modules/generated
         # ------------------------------
         # default parameters
         # SGDClassifier(loss=hinge, penalty=l2, alpha=0.0001, l1_ratio=0.15, fit_intercept=Tr
         # shuffle=True, verbose=0, epsilon=0.1, n_jobs=1, random_state=None, learning_rate=op
         # class_weight=None, warm_start=False, average=False, n_iter=None)

         # some of methods
         # fit(X, y[, coef_init, intercept_init, ])        Fit linear model with Stochastic Gr
         # predict(X)        Predict class labels for samples in X.

         #-------------------------------
         # video link:
         #------------------------------


         log_error_array=[]
         for i in alpha:
             clf = SGDClassifier(alpha=i, penalty='l1', loss='hinge', random_state=42)
             clf.fit(X_train, y_train)
             sig_clf = CalibratedClassifierCV(clf, method="sigmoid")
             sig_clf.fit(X_train, y_train)
             predict_y = sig_clf.predict_proba(X_test)
             log_error_array.append(log_loss(y_test, predict_y, labels=clf.classes_, eps=1e-15)
             print('For values of alpha = ', i, "The log loss is:",log_loss(y_test, predict_y,

         fig, ax = plt.subplots()
         ax.plot(alpha, log_error_array,c='g')
         for i, txt in enumerate(np.round(log_error_array,3)):
             ax.annotate((alpha[i],np.round(txt,3)), (alpha[i],log_error_array[i]))
         plt.grid()
         plt.title("Cross Validation Error for each alpha")
         plt.xlabel("Alpha i's")
         plt.ylabel("Error measure")
         plt.show()


         best_alpha = np.argmin(log_error_array)
         clf = SGDClassifier(alpha=alpha[best_alpha], penalty='l1', loss='hinge', random_state=
         clf.fit(X_train, y_train)
         sig_clf = CalibratedClassifierCV(clf, method="sigmoid")
         sig_clf.fit(X_train, y_train)

         predict_y = sig_clf.predict_proba(X_train)
         print('For values of best alpha = ', alpha[best_alpha], "The train log loss is:",log_l
         predict_y = sig_clf.predict_proba(X_test)
         print('For values of best alpha = ', alpha[best_alpha], "The test log loss is:",log_lo
         predicted_y =np.argmax(predict_y,axis=1)
         print("Total number of data points :", len(predicted_y))
         plot_confusion_matrix(y_test, predicted_y)
```

```
For values of alpha =  1e-05 The log loss is: 0.0427410657654
For values of alpha =  0.0001 The log loss is: 0.133065455907
For values of alpha =  0.001 The log loss is: 0.246352507555
For values of alpha =  0.01 The log loss is: 0.36060485994
For values of alpha =  0.1 The log loss is: 0.133812754686
For values of alpha =  1 The log loss is: 0.576707543599
For values of alpha =  10 The log loss is: 0.609841792942
```



```
For values of best alpha =  1e-05 The train log loss is: 0.0408144563488
For values of best alpha =  1e-05 The test log loss is: 0.0427410657654
Total number of data points : 30000
```



XGBoost

```
In [13]: from sklearn.model_selection import RandomizedSearchCV
         from scipy import stats
         from xgboost import XGBClassifier
         import xgboost as xgb
```

```
In [14]: param_dist = {'n_estimators': [25,50,75,100],
                       'learning_rate': stats.uniform(0.01, 0.07),
                       'max_depth': [5,7,9,11]
                       }
         model=RandomizedSearchCV(XGBClassifier(n_jobs=-1), param_distributions=param_dist, sco
         model.fit(X_train, y_train)
         print(model.best_estimator_)
         print(model.score(X_test, y_test))
```

```
XGBClassifier(base_score=0.5, booster='gbtree', colsample_bylevel=1,
       colsample_bytree=1, gamma=0, learning_rate=0.068660486889955685,
       max_delta_step=0, max_depth=9, min_child_weight=1, missing=None,
       n_estimators=100, n_jobs=-1, nthread=None,
       objective='binary:logistic', random_state=0, reg_alpha=0,
       reg_lambda=1, scale_pos_weight=1, seed=None, silent=True,
       subsample=1)
-0.227220311349
```

```
In [15]: params={}
         params['n_estimators'] = 100
         params['learning_rate'] = 0.068
         params['max_depth'] = 9
```

```
In [16]: d_train = xgb.DMatrix(X_train, label=y_train)
         d_test = xgb.DMatrix(X_test, label=y_test)

         watchlist = [(d_train, 'train'), (d_test, 'valid')]

         bst = xgb.train(params, d_train, 400, watchlist, early_stopping_rounds=20, verbose_eva

         xgdmat = xgb.DMatrix(X_train,y_train)
         predict_y = bst.predict(d_train)
         print("The train log loss is:",log_loss(y_train, predict_y, labels=clf.classes_, eps=1
         predict_y = bst.predict(d_test)
         print("The test log loss is:",log_loss(y_test, predict_y, labels=clf.classes_, eps=1e-
```

```
[18:50:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 492 extra nodes, 0 pruned n
[0]     train-rmse:0.479837     valid-rmse:0.480244
Multiple eval metrics have been passed: 'valid-rmse' will be used for early stopping.

Will train until valid-rmse hasn't improved in 20 rounds.
[18:50:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 452 extra nodes, 0 pruned n
[18:50:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 518 extra nodes, 0 pruned n
[18:50:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 504 extra nodes, 0 pruned n
[18:50:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 484 extra nodes, 0 pruned n
```

```
[18:50:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 498 extra nodes, 0 pruned
[18:50:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 498 extra nodes, 0 pruned
[18:50:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 468 extra nodes, 0 pruned
[18:50:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 470 extra nodes, 0 pruned
[18:50:56] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 488 extra nodes, 0 pruned
[18:50:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 472 extra nodes, 0 pruned
[10]        train-rmse:0.351311        valid-rmse:0.357074
[18:51:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 480 extra nodes, 0 pruned
[18:51:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 492 extra nodes, 0 pruned
[18:51:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 472 extra nodes, 0 pruned
[18:51:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 452 extra nodes, 0 pruned
[18:51:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 466 extra nodes, 0 pruned
[18:51:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 472 extra nodes, 0 pruned
[18:51:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 454 extra nodes, 0 pruned
[18:51:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 476 extra nodes, 0 pruned
[18:51:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 474 extra nodes, 0 pruned
[18:51:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 414 extra nodes, 0 pruned
[20]        train-rmse:0.294933        valid-rmse:0.306027
[18:51:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 464 extra nodes, 0 pruned
[18:51:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 480 extra nodes, 0 pruned
[18:51:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 424 extra nodes, 0 pruned
[18:51:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 340 extra nodes, 0 pruned
[18:51:32] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 478 extra nodes, 0 pruned
[18:51:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 498 extra nodes, 0 pruned
[18:51:36] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 306 extra nodes, 0 pruned
[18:51:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 402 extra nodes, 0 pruned
[18:51:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 466 extra nodes, 0 pruned
[18:51:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 336 extra nodes, 0 pruned
[30]        train-rmse:0.26946        valid-rmse:0.283903
[18:51:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 392 extra nodes, 0 pruned
[18:51:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 426 extra nodes, 0 pruned
[18:51:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 436 extra nodes, 0 pruned
[18:51:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 382 extra nodes, 0 pruned
[18:51:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 340 extra nodes, 0 pruned
[18:51:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 310 extra nodes, 0 pruned
[18:52:00] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 310 extra nodes, 0 pruned
[18:52:02] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 344 extra nodes, 0 pruned
[18:52:04] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 380 extra nodes, 0 pruned
[18:52:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 280 extra nodes, 0 pruned
[40]        train-rmse:0.254037        valid-rmse:0.270792
[18:52:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 258 extra nodes, 0 pruned
[18:52:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 322 extra nodes, 0 pruned
[18:52:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 268 extra nodes, 0 pruned
[18:52:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 282 extra nodes, 0 pruned
[18:52:17] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 300 extra nodes, 0 pruned
[18:52:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 296 extra nodes, 0 pruned
[18:52:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 322 extra nodes, 0 pruned
[18:52:23] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 268 extra nodes, 0 pruned
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[18:52:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 340 extra nodes, 0 pruned n
[18:52:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 362 extra nodes, 0 pruned n
[50]        train-rmse:0.244683        valid-rmse:0.263502
[18:52:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 338 extra nodes, 0 pruned n
[18:52:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 208 extra nodes, 0 pruned n
[18:52:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 246 extra nodes, 0 pruned n
[18:52:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 210 extra nodes, 0 pruned n
[18:52:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 258 extra nodes, 0 pruned n
[18:52:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 222 extra nodes, 0 pruned n
[18:52:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 170 extra nodes, 0 pruned n
[18:52:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 214 extra nodes, 0 pruned n
[18:52:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 216 extra nodes, 0 pruned n
[18:52:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 248 extra nodes, 0 pruned n
[60]        train-rmse:0.239415        valid-rmse:0.259318
[18:52:51] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 180 extra nodes, 0 pruned n
[18:52:53] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 218 extra nodes, 0 pruned n
[18:52:55] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 184 extra nodes, 0 pruned n
[18:52:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 190 extra nodes, 0 pruned n
[18:52:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 248 extra nodes, 0 pruned n
[18:53:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[18:53:04] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 254 extra nodes, 0 pruned n
[18:53:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 162 extra nodes, 0 pruned n
[18:53:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 266 extra nodes, 0 pruned n
[18:53:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[70]        train-rmse:0.23539        valid-rmse:0.256351
[18:53:12] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 168 extra nodes, 0 pruned n
[18:53:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 196 extra nodes, 0 pruned n
[18:53:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[18:53:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[18:53:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[18:53:23] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 202 extra nodes, 0 pruned n
[18:53:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 188 extra nodes, 0 pruned n
[18:53:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 224 extra nodes, 0 pruned n
[18:53:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[18:53:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 198 extra nodes, 0 pruned n
[80]        train-rmse:0.232745        valid-rmse:0.254318
[18:53:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[18:53:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 144 extra nodes, 0 pruned n
[18:53:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 232 extra nodes, 0 pruned n
[18:53:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:53:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 176 extra nodes, 0 pruned n
[18:53:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[18:53:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[18:53:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 218 extra nodes, 0 pruned n
[18:53:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 196 extra nodes, 0 pruned n
[18:53:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 150 extra nodes, 0 pruned n
[90]        train-rmse:0.230712        valid-rmse:0.252827
[18:53:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 184 extra nodes, 0 pruned n
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[18:53:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 34 extra nodes, 0 pruned no
[18:54:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[18:54:04] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[18:54:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:54:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[18:54:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[18:54:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 156 extra nodes, 0 pruned n
[18:54:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[18:54:17] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 240 extra nodes, 0 pruned n
[100]        train-rmse:0.228617        valid-rmse:0.251257
[18:54:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:54:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 176 extra nodes, 0 pruned n
[18:54:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 56 extra nodes, 0 pruned no
[18:54:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[18:54:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[18:54:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 182 extra nodes, 0 pruned n
[18:54:32] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 84 extra nodes, 0 pruned no
[18:54:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 174 extra nodes, 0 pruned n
[18:54:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:54:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 174 extra nodes, 0 pruned n
[110]        train-rmse:0.226531        valid-rmse:0.24967
[18:54:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 206 extra nodes, 0 pruned n
[18:54:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 174 extra nodes, 0 pruned n
[18:54:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[18:54:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[18:54:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 192 extra nodes, 0 pruned n
[18:54:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 158 extra nodes, 0 pruned n
[18:54:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 236 extra nodes, 0 pruned n
[18:54:56] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[18:54:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:55:02] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 152 extra nodes, 0 pruned n
[120]        train-rmse:0.224493        valid-rmse:0.248177
[18:55:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 134 extra nodes, 0 pruned n
[18:55:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[18:55:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[18:55:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[18:55:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 56 extra nodes, 0 pruned no
[18:55:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 158 extra nodes, 0 pruned n
[18:55:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 206 extra nodes, 0 pruned n
[18:55:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 170 extra nodes, 0 pruned n
[18:55:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[18:55:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[130]        train-rmse:0.222796        valid-rmse:0.246849
[18:55:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 178 extra nodes, 0 pruned n
[18:55:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[18:55:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[18:55:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 78 extra nodes, 0 pruned no
[18:55:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 156 extra nodes, 0 pruned n
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[18:55:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 170 extra nodes, 0 pruned n
[18:55:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 204 extra nodes, 0 pruned n
[18:55:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[18:55:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:55:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[140]       train-rmse:0.220956       valid-rmse:0.245497
[18:55:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[18:55:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 168 extra nodes, 0 pruned n
[18:55:53] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[18:55:55] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 56 extra nodes, 0 pruned no
[18:55:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 88 extra nodes, 0 pruned no
[18:55:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 184 extra nodes, 0 pruned n
[18:56:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 212 extra nodes, 0 pruned n
[18:56:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 64 extra nodes, 0 pruned no
[18:56:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 126 extra nodes, 0 pruned n
[18:56:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[150]       train-rmse:0.219455       valid-rmse:0.244518
[18:56:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[18:56:12] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:56:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 246 extra nodes, 0 pruned n
[18:56:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[18:56:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 78 extra nodes, 0 pruned no
[18:56:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[18:56:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[18:56:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 72 extra nodes, 0 pruned no
[18:56:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 176 extra nodes, 0 pruned n
[18:56:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 206 extra nodes, 0 pruned n
[160]       train-rmse:0.217537       valid-rmse:0.243167
[18:56:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[18:56:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 144 extra nodes, 0 pruned n
[18:56:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[18:56:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[18:56:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 156 extra nodes, 0 pruned n
[18:56:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 182 extra nodes, 0 pruned n
[18:56:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[18:56:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[18:56:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[18:56:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[170]       train-rmse:0.216228       valid-rmse:0.242316
[18:56:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[18:56:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 148 extra nodes, 0 pruned n
[18:56:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 156 extra nodes, 0 pruned n
[18:56:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 192 extra nodes, 0 pruned n
[18:57:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 188 extra nodes, 0 pruned n
[18:57:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:57:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[18:57:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[18:57:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
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[18:57:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 204 extra nodes, 0 pruned n
[180]        train-rmse:0.214609        valid-rmse:0.241129
[18:57:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 132 extra nodes, 0 pruned n
[18:57:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:57:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:57:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 136 extra nodes, 0 pruned n
[18:57:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 154 extra nodes, 0 pruned n
[18:57:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:57:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 68 extra nodes, 0 pruned no
[18:57:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[18:57:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:57:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[190]        train-rmse:0.213161        valid-rmse:0.240077
[18:57:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[18:57:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 88 extra nodes, 0 pruned no
[18:57:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[18:57:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:57:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:57:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 92 extra nodes, 0 pruned no
[18:57:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:57:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 200 extra nodes, 0 pruned n
[18:57:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[18:57:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[200]        train-rmse:0.211541        valid-rmse:0.238908
[18:57:56] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 200 extra nodes, 0 pruned n
[18:57:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[18:58:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 102 extra nodes, 0 pruned n
[18:58:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 180 extra nodes, 0 pruned n
[18:58:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[18:58:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 150 extra nodes, 0 pruned n
[18:58:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 102 extra nodes, 0 pruned n
[18:58:12] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[18:58:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:58:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[210]        train-rmse:0.209911        valid-rmse:0.237776
[18:58:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[18:58:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[18:58:23] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:58:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[18:58:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[18:58:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 200 extra nodes, 0 pruned n
[18:58:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 216 extra nodes, 0 pruned n
[18:58:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 182 extra nodes, 0 pruned n
[18:58:36] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:58:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 70 extra nodes, 0 pruned no
[220]        train-rmse:0.208317        valid-rmse:0.236606
[18:58:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 178 extra nodes, 0 pruned n
[18:58:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
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[18:58:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[18:58:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 176 extra nodes, 0 pruned n
[18:58:51] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 54 extra nodes, 0 pruned no
[18:58:53] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[18:58:55] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 86 extra nodes, 0 pruned no
[18:58:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 82 extra nodes, 0 pruned no
[18:59:00] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 188 extra nodes, 0 pruned n
[18:59:02] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[230]        train-rmse:0.206925        valid-rmse:0.235699
[18:59:04] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[18:59:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[18:59:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 86 extra nodes, 0 pruned no
[18:59:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[18:59:12] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:59:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 92 extra nodes, 0 pruned no
[18:59:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 82 extra nodes, 0 pruned no
[18:59:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 66 extra nodes, 0 pruned no
[18:59:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 134 extra nodes, 0 pruned n
[18:59:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[240]        train-rmse:0.205761        valid-rmse:0.234964
[18:59:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:59:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[18:59:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 158 extra nodes, 0 pruned n
[18:59:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 94 extra nodes, 0 pruned no
[18:59:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 148 extra nodes, 0 pruned n
[18:59:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:59:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 184 extra nodes, 0 pruned n
[18:59:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[18:59:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 126 extra nodes, 0 pruned n
[18:59:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[250]        train-rmse:0.204385        valid-rmse:0.23401
[18:59:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 100 extra nodes, 0 pruned n
[18:59:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[18:59:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 106 extra nodes, 0 pruned n
[18:59:51] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 100 extra nodes, 0 pruned n
[18:59:53] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[18:59:55] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[18:59:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 54 extra nodes, 0 pruned no
[18:59:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[19:00:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 108 extra nodes, 0 pruned n
[19:00:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[260]        train-rmse:0.203199        valid-rmse:0.233161
[19:00:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[19:00:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[19:00:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 190 extra nodes, 0 pruned n
[19:00:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 56 extra nodes, 0 pruned no
[19:00:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[19:00:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 168 extra nodes, 0 pruned n
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[19:00:17] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 138 extra nodes, 0 pruned n
[19:00:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 126 extra nodes, 0 pruned n
[19:00:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[19:00:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[270]          train-rmse:0.201971          valid-rmse:0.232365
[19:00:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 132 extra nodes, 0 pruned n
[19:00:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 74 extra nodes, 0 pruned no
[19:00:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 184 extra nodes, 0 pruned n
[19:00:32] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 174 extra nodes, 0 pruned n
[19:00:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 48 extra nodes, 0 pruned no
[19:00:36] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 50 extra nodes, 0 pruned no
[19:00:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[19:00:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 196 extra nodes, 0 pruned n
[19:00:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 162 extra nodes, 0 pruned n
[19:00:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 152 extra nodes, 0 pruned n
[280]          train-rmse:0.200744          valid-rmse:0.231567
[19:00:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 138 extra nodes, 0 pruned n
[19:00:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[19:00:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:00:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[19:00:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[19:00:56] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 232 extra nodes, 0 pruned n
[19:00:58] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 86 extra nodes, 0 pruned no
[19:01:00] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 168 extra nodes, 0 pruned n
[19:01:02] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[19:01:04] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[290]          train-rmse:0.19942         valid-rmse:0.230612
[19:01:06] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 102 extra nodes, 0 pruned n
[19:01:08] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[19:01:10] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 180 extra nodes, 0 pruned n
[19:01:12] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 94 extra nodes, 0 pruned no
[19:01:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 80 extra nodes, 0 pruned no
[19:01:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 88 extra nodes, 0 pruned no
[19:01:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 102 extra nodes, 0 pruned n
[19:01:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[19:01:23] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:01:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 228 extra nodes, 0 pruned n
[300]          train-rmse:0.198039          valid-rmse:0.229695
[19:01:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 162 extra nodes, 0 pruned n
[19:01:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 134 extra nodes, 0 pruned n
[19:01:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[19:01:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[19:01:36] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 194 extra nodes, 0 pruned n
[19:01:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[19:01:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 136 extra nodes, 0 pruned n
[19:01:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:01:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 138 extra nodes, 0 pruned n
[19:01:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 60 extra nodes, 0 pruned no
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[310]        train-rmse:0.196851        valid-rmse:0.228969
[19:01:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 206 extra nodes, 0 pruned n
[19:01:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 72 extra nodes, 0 pruned no
[19:01:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 66 extra nodes, 0 pruned no
[19:01:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 162 extra nodes, 0 pruned n
[19:01:56] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 164 extra nodes, 0 pruned n
[19:01:58] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 122 extra nodes, 0 pruned n
[19:02:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 160 extra nodes, 0 pruned n
[19:02:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[19:02:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 76 extra nodes, 0 pruned no
[19:02:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[320]        train-rmse:0.195708        valid-rmse:0.228067
[19:02:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[19:02:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 92 extra nodes, 0 pruned no
[19:02:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:02:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[19:02:17] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[19:02:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[19:02:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 32 extra nodes, 0 pruned no
[19:02:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[19:02:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 190 extra nodes, 0 pruned n
[19:02:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[330]        train-rmse:0.194551        valid-rmse:0.227301
[19:02:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[19:02:32] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[19:02:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 144 extra nodes, 0 pruned n
[19:02:36] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[19:02:38] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[19:02:40] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 166 extra nodes, 0 pruned n
[19:02:42] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 84 extra nodes, 0 pruned no
[19:02:44] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 80 extra nodes, 0 pruned no
[19:02:46] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[19:02:48] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 66 extra nodes, 0 pruned no
[340]        train-rmse:0.193554        valid-rmse:0.226623
[19:02:50] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 138 extra nodes, 0 pruned n
[19:02:52] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 142 extra nodes, 0 pruned n
[19:02:54] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 212 extra nodes, 0 pruned n
[19:02:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[19:02:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:03:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[19:03:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 118 extra nodes, 0 pruned n
[19:03:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 158 extra nodes, 0 pruned n
[19:03:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 58 extra nodes, 0 pruned no
[19:03:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 158 extra nodes, 0 pruned n
[350]        train-rmse:0.192229        valid-rmse:0.225766
[19:03:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 140 extra nodes, 0 pruned n
[19:03:13] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[19:03:15] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 150 extra nodes, 0 pruned n
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[19:03:17] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 64 extra nodes, 0 pruned no
[19:03:19] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 112 extra nodes, 0 pruned n
[19:03:21] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 190 extra nodes, 0 pruned n
[19:03:23] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 66 extra nodes, 0 pruned no
[19:03:25] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 90 extra nodes, 0 pruned no
[19:03:27] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[19:03:29] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 86 extra nodes, 0 pruned no
[360]        train-rmse:0.191225        valid-rmse:0.225082
[19:03:31] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[19:03:33] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 92 extra nodes, 0 pruned no
[19:03:35] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 116 extra nodes, 0 pruned n
[19:03:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 104 extra nodes, 0 pruned n
[19:03:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[19:03:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 124 extra nodes, 0 pruned n
[19:03:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 84 extra nodes, 0 pruned no
[19:03:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 138 extra nodes, 0 pruned n
[19:03:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 118 extra nodes, 0 pruned n
[19:03:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[370]        train-rmse:0.190323        valid-rmse:0.224466
[19:03:51] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 66 extra nodes, 0 pruned no
[19:03:53] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 62 extra nodes, 0 pruned no
[19:03:55] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[19:03:57] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[19:03:59] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 134 extra nodes, 0 pruned n
[19:04:01] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 56 extra nodes, 0 pruned no
[19:04:03] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 186 extra nodes, 0 pruned n
[19:04:05] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[19:04:07] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 96 extra nodes, 0 pruned no
[19:04:09] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 172 extra nodes, 0 pruned n
[380]        train-rmse:0.189498        valid-rmse:0.223883
[19:04:11] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 86 extra nodes, 0 pruned no
[19:04:14] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 154 extra nodes, 0 pruned n
[19:04:16] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 98 extra nodes, 0 pruned no
[19:04:18] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 204 extra nodes, 0 pruned n
[19:04:20] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 110 extra nodes, 0 pruned n
[19:04:22] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 136 extra nodes, 0 pruned n
[19:04:24] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 148 extra nodes, 0 pruned n
[19:04:26] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 114 extra nodes, 0 pruned n
[19:04:28] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[19:04:30] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 154 extra nodes, 0 pruned n
[390]        train-rmse:0.188443        valid-rmse:0.223193
[19:04:32] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 130 extra nodes, 0 pruned n
[19:04:34] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 146 extra nodes, 0 pruned n
[19:04:37] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 102 extra nodes, 0 pruned n
[19:04:39] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 120 extra nodes, 0 pruned n
[19:04:41] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 128 extra nodes, 0 pruned n
[19:04:43] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 64 extra nodes, 0 pruned no
[19:04:45] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 40 extra nodes, 0 pruned no
```

```
[19:04:47] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 152 extra nodes, 0 pruned n
[19:04:49] src/tree/updater_prune.cc:74: tree pruning end, 1 roots, 52 extra nodes, 0 pruned no
[399]       train-rmse:0.187477        valid-rmse:0.22261
```

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

        NameError                                 Traceback (most recent call last)

        <ipython-input-16-d4a006c3671e> in <module>()
          8 xgdmat = xgb.DMatrix(X_train,y_train)
          9 predict_y = bst.predict(d_train)
    ---> 10 print("The train log loss is:",log_loss(y_train, predict_y, labels=clf.classes_, ep
         11 predict_y = bst.predict(d_test)
         12 print("The test log loss is:",log_loss(y_test, predict_y, labels=clf.classes_, eps=


        NameError: name 'log_loss' is not defined
```

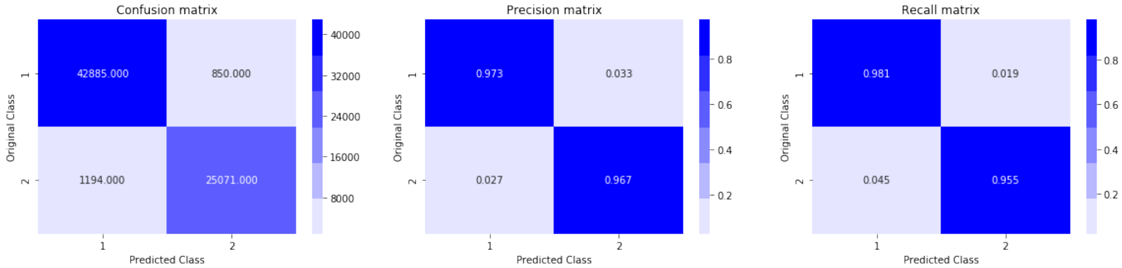
```
In [17]: print("The train log loss is:",0.187)

         print("The test log loss is:",0.222)
```

```
The train log loss is: 0.187
The test log loss is: 0.222
```

```
In [22]: predicted_y =np.array(predict_y>0.5,dtype=int)
         print("Total number of data points :", len(predicted_y))
         plot_confusion_matrix(y_train, predicted_y)
```

```
Total number of data points : 70000
```

```
<Figure size 1440x288 with 0 Axes>
```



Conclusion

In [23]:
```python
from prettytable import PrettyTable
x = PrettyTable()

x.field_names = ["Model ", "Train Loss", "Test Loss"]

x.add_row(['Logistic Regression',0.010,0.011])
x.add_row(['Linear SVM',0.040,0.042])
x.add_row(['XGBoost',0.187,0.222])

print(x)
```

```
+---------------------+------------+-----------+
|        Model        | Train Loss | Test Loss |
+---------------------+------------+-----------+
| Logistic Regression |    0.01    |   0.011   |
|      Linear SVM     |    0.04    |   0.042   |
|       XGBoost       |   0.187    |   0.222   |
+---------------------+------------+-----------+
```