5.ML_models - Hyperparameter

March 24, 2019

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import re
import time
import warnings
import sqlite3
from sqlalchemy import create_engine # database connection
import csv
import os
warnings.filterwarnings("ignore")
import datetime as dt
import numpy as np
from nltk.corpus import stopwords
from sklearn.decomposition import TruncatedSVD
from sklearn.preprocessing import normalize
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.manifold import TSNE
import seaborn as sns
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import confusion_matrix
from sklearn.metrics.classification import accuracy_score, log_loss
from sklearn.feature_extraction.text import TfidfVectorizer
from collections import Counter
from scipy.sparse import hstack
from sklearn.multiclass import OneVsRestClassifier
from sklearn.svm import SVC
from sklearn.model_selection import StratifiedKFold
from collections import Counter, defaultdict
from sklearn.calibration import CalibratedClassifierCV
from sklearn.naive_bayes import MultinomialNB
from sklearn.naive_bayes import GaussianNB
from sklearn.model_selection import train_test_split
from sklearn.model_selection import GridSearchCV
import math
from sklearn.metrics import normalized_mutual_info_score
from sklearn.ensemble import RandomForestClassifier
```

```
from sklearn.model_selection import cross_val_score
from sklearn.linear_model import SGDClassifier
from mlxtend.classifier import StackingClassifier

from sklearn import model_selection
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import precision_recall_curve, auc, roc_curve
```

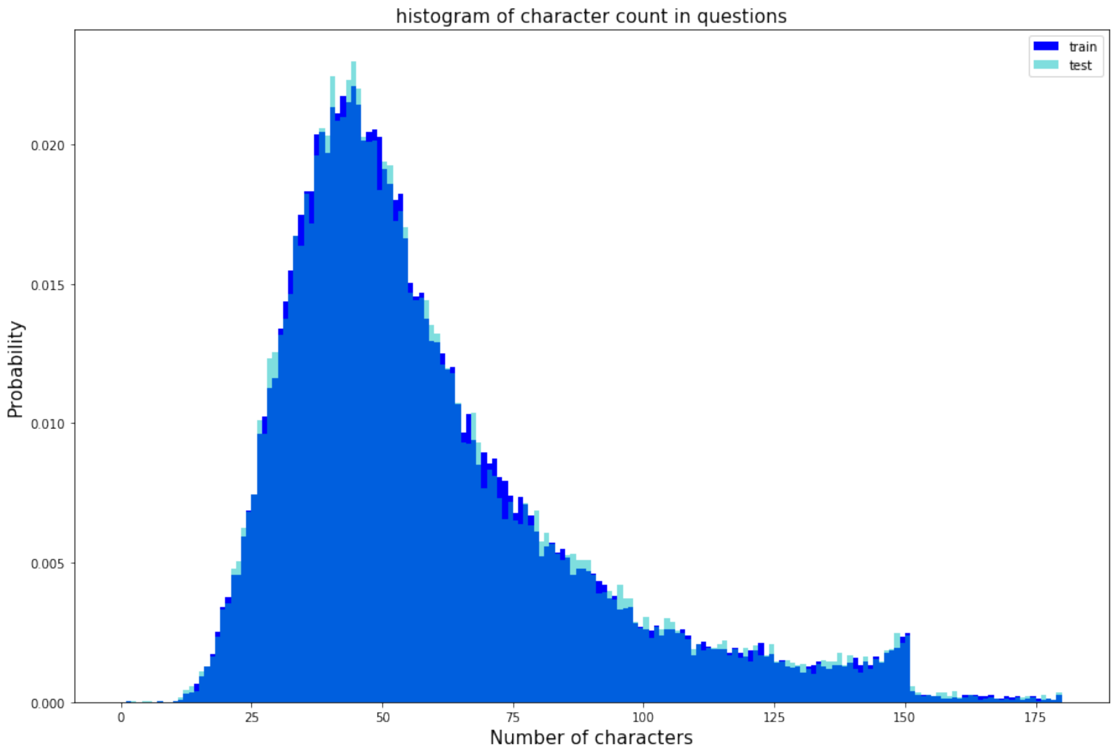
5. Assignments

1. Try out models (Logistic regression, Linear-SVM) with simple TF-IDF vectors instead of TD_IDF weighted word2Vec.
2. Hyperparameter tune XgBoost using RandomSearch to reduce the log-loss.

```
In [12]: if os.path.isfile('df_fe_without_preprocessing_train.csv'):
             dfppro = pd.read_csv("df_fe_without_preprocessing_train.csv",encoding='latin-1')
```

```
In [43]: train = pd.Series(df_vec['q1len'][0:40000].tolist() + df_vec['q2len'][0:40000].tolist
         test = pd.Series(df_vec['q1len'][40001:60000].tolist() + df_vec['q2len'][40001:60000]

         plt.figure(figsize=(15, 10))
         plt.hist(train, bins=180, range=[0, 180], color='b', normed=True, label='train')
         plt.hist(test, bins=180, range=[0, 180], color='c', normed=True, alpha=0.5, label='tes
         plt.legend()
         plt.title('histogram of character count in questions', fontsize=15)
         plt.xlabel('Number of characters', fontsize=15)
         plt.ylabel('Probability', fontsize=15)
         plt.show()


         print ('The mean of length of questions in train is: {} and test is {}\n'.format(np.me
```

```
c:\users\dell\appdata\local\programs\python\python36\lib\site-packages\matplotlib\axes\_axes.py
The 'normed' kwarg was deprecated in Matplotlib 2.1 and will be removed in 3.1. Use 'density' 
  alternative="'density'", removal="3.1")
c:\users\dell\appdata\local\programs\python\python36\lib\site-packages\matplotlib\axes\_axes.py
The 'normed' kwarg was deprecated in Matplotlib 2.1 and will be removed in 3.1. Use 'density' 
  alternative="'density'", removal="3.1")
```




```
The mean of length of questions in train is: 59.6954 and test is 59.826266313315664
```

We can see that both train and test follow the same distribution and mean is around 60

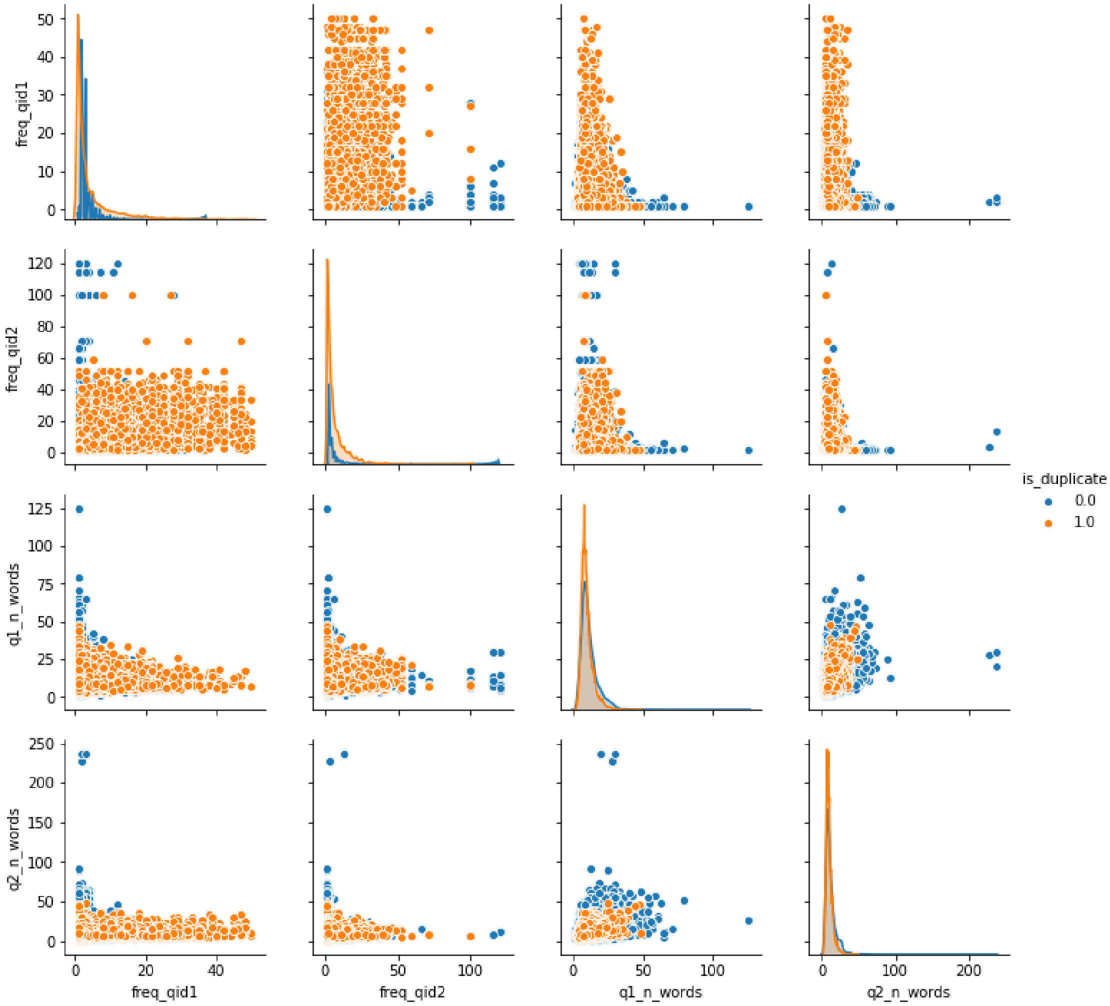
0.1 Pair plots of basic features

```
In [55]: #n = df.shape[0]
         sns.pairplot((dfppro[['word_Common','word_Total','word_share','freq_q1+q2','freq_q1-q
```

```
Out[55]: <seaborn.axisgrid.PairGrid at 0x29dc38ce860>
```

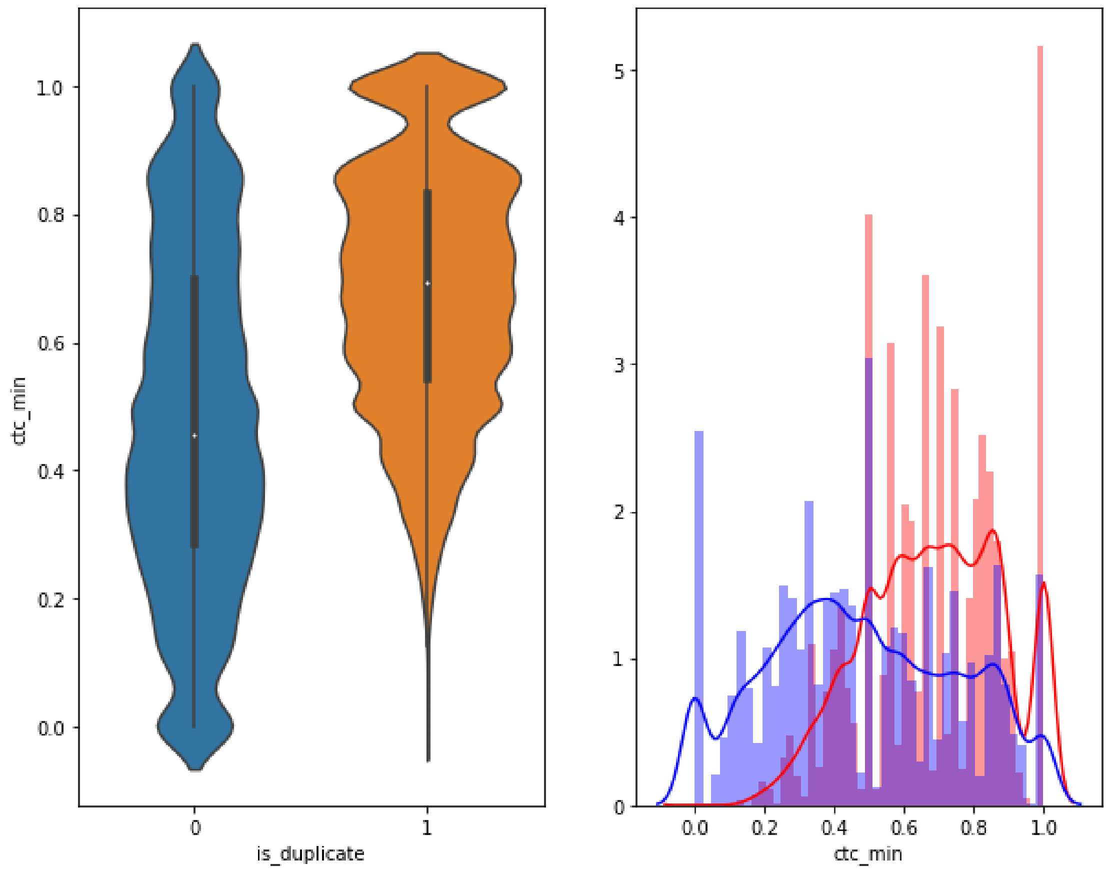

```
In [57]: sns.pairplot((dfppro[['freq_qid1','freq_qid2','q1_n_words','q2_n_words']]).join(dfnlp
```

```
Out[57]: <seaborn.axisgrid.PairGrid at 0x29df42d7ba8>
```

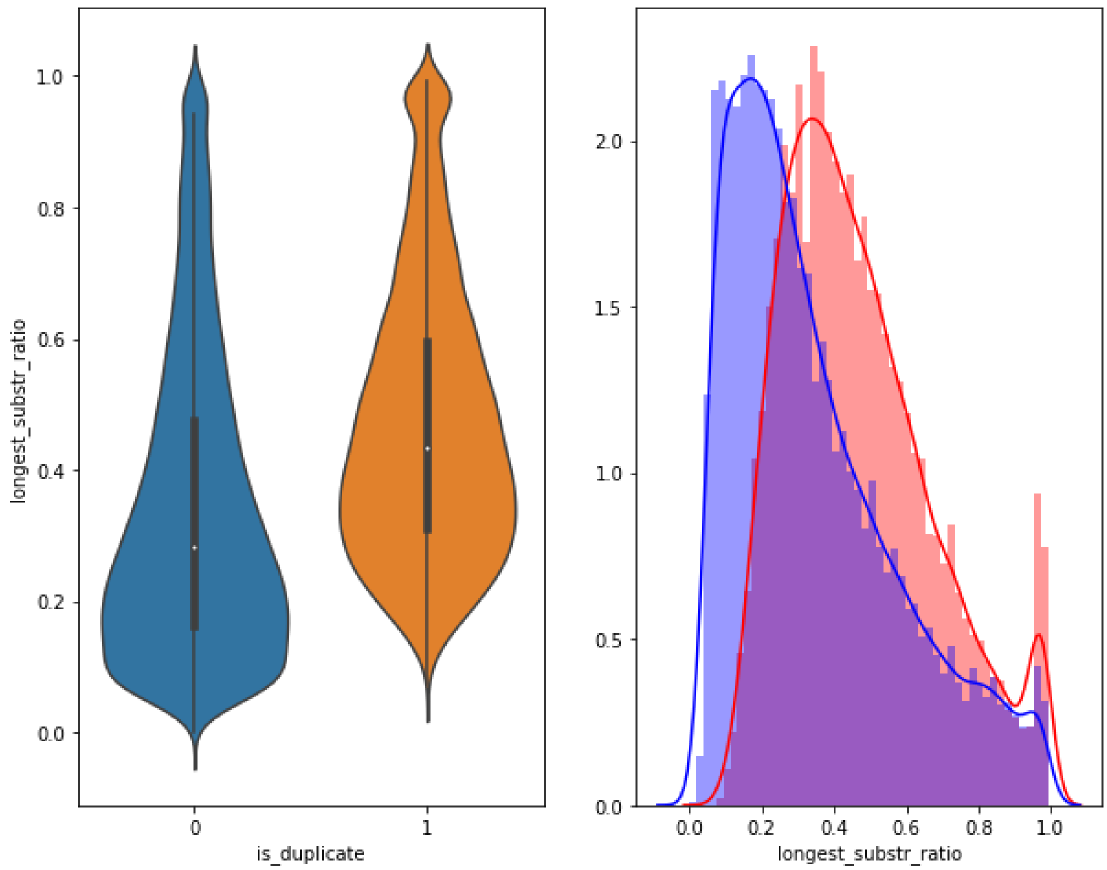


The features are important in classifying the points.

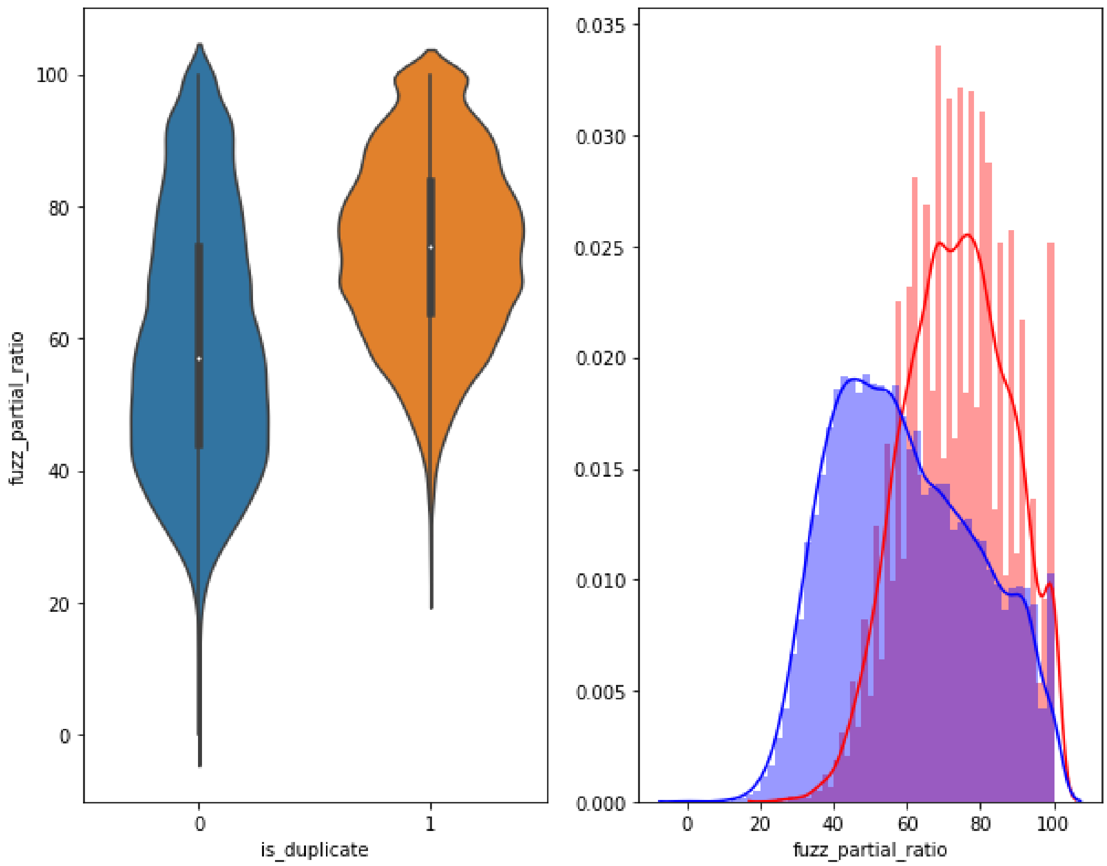
```
In [60]: dfc=dfppro[['word_Common','word_Total','word_share','freq_q1+q2','freq_q1-q2']].join(d

In [65]: # Distribution of the ctc_min
         plt.figure(figsize=(10, 8))

         plt.subplot(1,2,1)
         sns.violinplot(x = 'is_duplicate', y ='ctc_min', data = dfnlp[['is_duplicate','ctc_mi

         plt.subplot(1,2,2)
         sns.distplot(dfnlp[dfnlp['is_duplicate'] == 1.0]['ctc_min'][0:] , label = "1", color =
         sns.distplot(dfnlp[dfnlp['is_duplicate'] == 0.0]['ctc_min'][0:] , label = "0" , color
         plt.show()
```



In [69]:
```
# Distribution of the longest_substr_ratio
plt.figure(figsize=(10, 8))

plt.subplot(1,2,1)
sns.violinplot(x = 'is_duplicate', y ='longest_substr_ratio', data = dfnlp[['is_duplic

plt.subplot(1,2,2)
sns.distplot(dfnlp[dfnlp['is_duplicate'] == 1.0]['longest_substr_ratio'][0:] , label =
sns.distplot(dfnlp[dfnlp['is_duplicate'] == 0.0]['longest_substr_ratio'][0:] , label =
plt.show()
```




```
In [70]: # Distribution of the fuzz_partial_ratio
         plt.figure(figsize=(10, 8))

         plt.subplot(1,2,1)
         sns.violinplot(x = 'is_duplicate', y ='fuzz_partial_ratio', data = dfnlp[['is_duplica

         plt.subplot(1,2,2)
         sns.distplot(dfnlp[dfnlp['is_duplicate'] == 1.0]['fuzz_partial_ratio'][0:] , label = '
         sns.distplot(dfnlp[dfnlp['is_duplicate'] == 0.0]['fuzz_partial_ratio'][0:] , label = '
         plt.show()
```



0.2 Wordcloud of highest tfidf feature corresponding to y=0/1

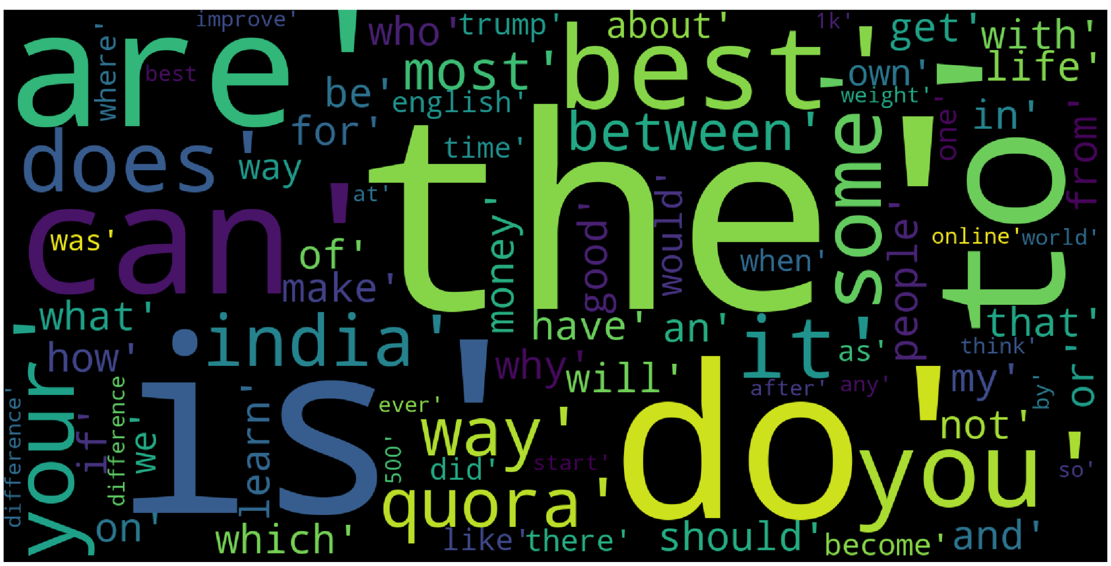
```
In [83]: idx=dfnlp.index[dfnlp['is_duplicate'] == 1]
         positive=dfnlp.loc[idx, ['question1', 'question2']]
         idz=dfnlp.index[dfnlp['is_duplicate'] == 0]
         negative=dfnlp.loc[idz, ['question1', 'question2']]
```

```
In [95]: #vectorizing the questions corresponding to y=1
         tf_idf_vect = TfidfVectorizer(ngram_range=(1,2), min_df=10)
         vec_pos=tf_idf_vect.fit_transform(positive['question1']+positive['question2'])
```

```
In [97]: #getting the features with top tfidf values
         features=pd.DataFrame(tf_idf_vect.get_feature_names())
         mean_tf=np.mean(vec_pos,axis=0)
         x=np.array(mean_tf)[0].tolist()
         # taking top 20 features
         important_feat=[]
         important_feat=np.argsort((x))[::-1]
         important_feat=important_feat[:100]
         important_feat
```

```
imp_feat=[]
for index in important_feat:
    imp_feat.append(features.iloc[index])

x=np.array(imp_feat)
feature=[]
for i in x:
    for j in i:
        feature.append(j)
```

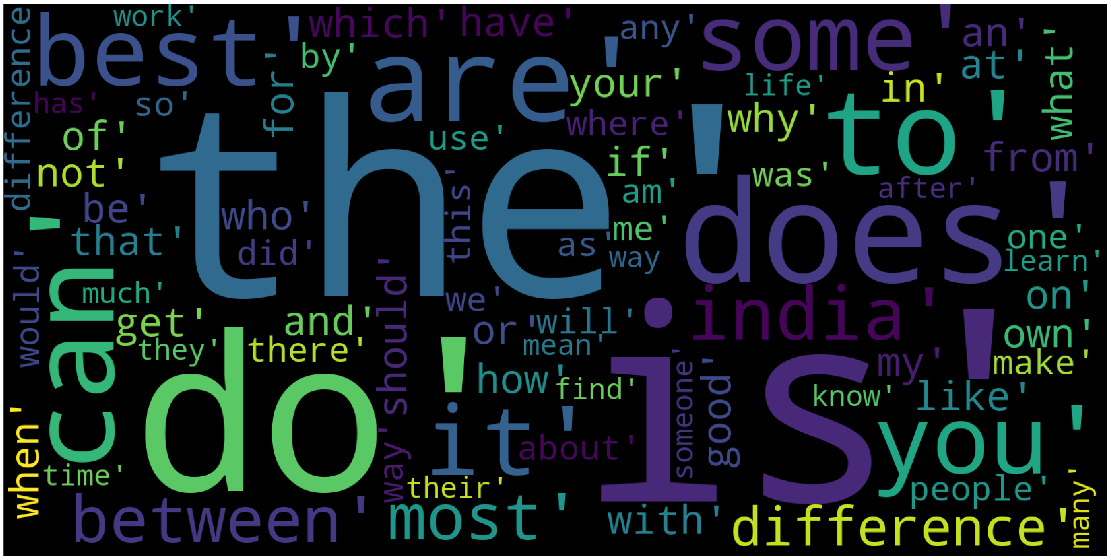
In [102]:
```
from wordcloud import WordCloud
# Ploting word cloud
# Lets first convert the 'result' dictionary to 'list of tuples'
#tup = dict(result.items())
#Initializing WordCloud using frequencies of tags.
wordcloud = WordCloud(    background_color='black',
                          width=1600,
                          height=800,
                    ).generate(str(feature))

fig = plt.figure(figsize=(30,20))
plt.imshow(wordcloud)
plt.axis('off')
plt.tight_layout(pad=0)
fig.savefig("tag.png")
plt.show()
```



In [103]:
```
#vectorizing the questions corresponding to y=0
tf_idf_vect = TfidfVectorizer(ngram_range=(1,2), min_df=10)
vec_pos=tf_idf_vect.fit_transform(negative['question1']+negative['question2'])
```

```
In [105]: #getting the features with top tfidf values
          features=pd.DataFrame(tf_idf_vect.get_feature_names())
          mean_tf=np.mean(vec_pos,axis=0)
          x=np.array(mean_tf)[0].tolist()
          # taking top 20 features
          important_feat=[]
          important_feat=np.argsort((x))[::-1]
          important_feat=important_feat[:100]
          important_feat
          imp_feat=[]
          for index in important_feat:
              imp_feat.append(features.iloc[index])

          x=np.array(imp_feat)
          feature=[]
          for i in x:
              for j in i:
                  feature.append(j)
```

```
In [106]: from wordcloud import WordCloud
          # Ploting word cloud
          # Lets first convert the 'result' dictionary to 'list of tuples'
          #tup = dict(result.items())
          #Initializing WordCloud using frequencies of tags.
          wordcloud = WordCloud(    background_color='black',
                                    width=1600,
                                    height=800,
                              ).generate(str(feature))

          fig = plt.figure(figsize=(30,20))
          plt.imshow(wordcloud)
          plt.axis('off')
          plt.tight_layout(pad=0)
          fig.savefig("tag.png")
          plt.show()
```



The wordcloud for questions coresponding to both y=0/1 contains similar words.

0.3 TFIDF vectorization

```
In [4]: if os.path.isfile('nlp_features_train.csv'):
            dfnlp = pd.read_csv("nlp_features_train.csv",encoding='latin-1')
```

```
In [6]: #filling the null vlues
        dfnlp=dfnlp.fillna(' ')
```

```
In [7]: dfnlp.isnull().any()
```

```
Out[7]: id                        False
        qid1                      False
        qid2                      False
        question1                 False
        question2                 False
        is_duplicate              False
        cwc_min                   False
        cwc_max                   False
        csc_min                   False
        csc_max                   False
        ctc_min                   False
        ctc_max                   False
        last_word_eq              False
        first_word_eq             False
        abs_len_diff              False
        mean_len                  False
        token_set_ratio           False
        token_sort_ratio          False
```

```
fuzz_ratio              False
fuzz_partial_ratio      False
longest_substr_ratio    False
dtype: bool
```

```
In [8]: #splitting manually into train and test
        dfnlp=dfnlp[0:60000]
        dfnlp.shape
        dfnlp_train=dfnlp[0:40000]
        dfnlp_test=dfnlp[40001:60000]
```

```
In [16]: print(dfnlp_train.shape)
         dfnlp_test.shape
```

```
(40000, 21)
```

```
Out[16]: (19999, 21)
```

```
In [17]: # tfidf vectorization with n_gram=2
         tf_idf_vect = TfidfVectorizer(ngram_range=(1,2), min_df=10)
         train_vec_1=tf_idf_vect.fit_transform(dfnlp_train['question1'])
         test_vec_1=tf_idf_vect.transform(dfnlp_test['question1'])
         train_vec_2=tf_idf_vect.fit_transform(dfnlp_train['question2'])
         test_vec_2=tf_idf_vect.transform(dfnlp_test['question2'])
```

```
In [18]: if os.path.isfile('df_fe_without_preprocessing_train.csv'):
             dfppro = pd.read_csv("df_fe_without_preprocessing_train.csv",encoding='latin-1')
```

```
In [19]: #stacking the train vectors of question 1 and two
         from scipy import sparse
         train_q=sparse.hstack([train_vec_1,train_vec_2])
         #stacking the test vectors of question 1 and two
         test_q=sparse.hstack([test_vec_1,test_vec_2])
         train_q.shape
```

```
Out[19]: (40000, 14983)
```

```
In [20]: #getting rest of advanced features
         df_vec=dfnlp[['cwc_min','cwc_max','csc_min','csc_max','ctc_min','ctc_max','last_word_
```

```
In [21]: #y labels
         train_y=dfnlp['is_duplicate'][0:40000]
         test_y=dfnlp['is_duplicate'][40001:60000]
```

```
In [22]: #stacking advanced features and tfidf vectors
         train_vecs=sparse.hstack([train_q,df_vec[0:40000]])
         test_vecs=sparse.hstack([test_q,df_vec[40001:60000]])
```

```
In [23]: train_vecs.shape
```

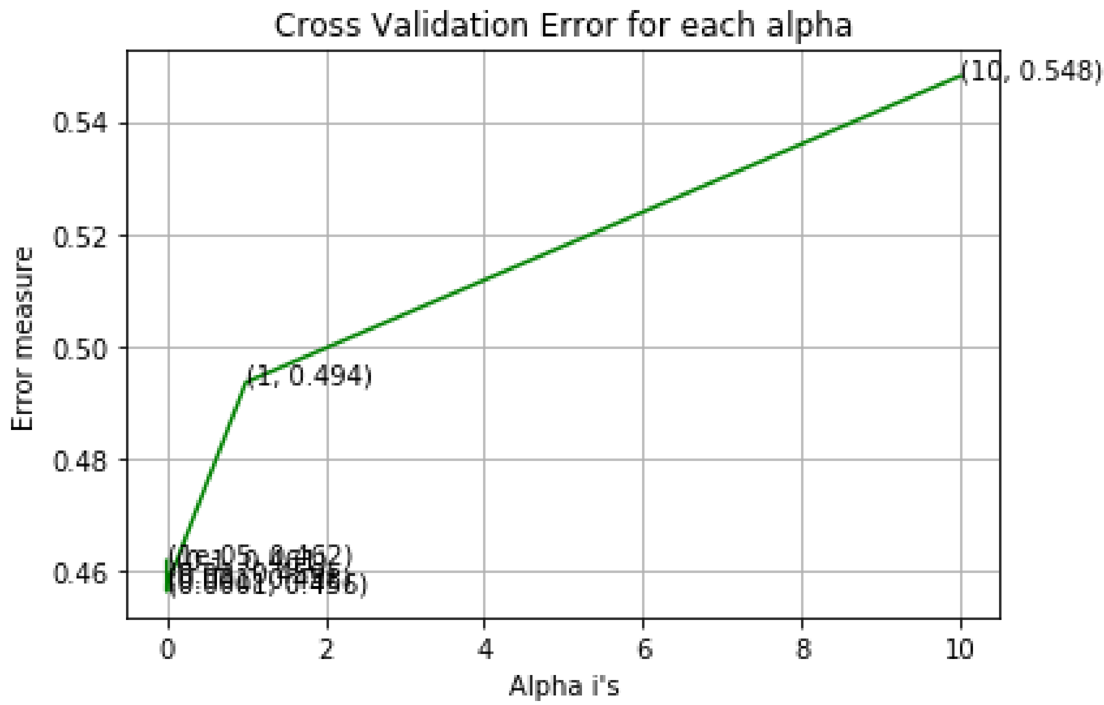
```
Out[23]: (40000, 15009)
```

0.4 Logistic Regression with hyperparameter tuning

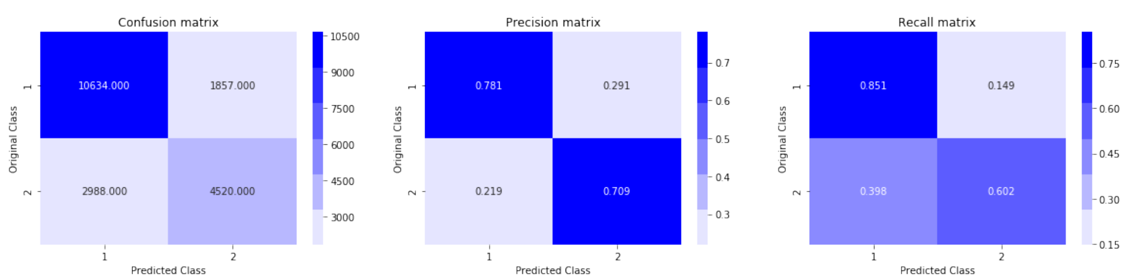
In [85]:
```
from tqdm.auto import tqdm
alpha = [10 ** x for x in range(-5, 2)] # hyperparam for SGD classifier.

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

predict_y = sig_clf.predict_proba(train_vecs)
print('For values of best alpha = ', alpha[best_alpha], "The train log loss is:",log_l
predict_y = sig_clf.predict_proba(test_vecs)
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(test_y, predicted_y)
```

```
HBox(children=(IntProgress(value=0, max=7), HTML(value='')))


For values of alpha =  1e-05 The log loss is: 0.46184114657478476
For values of alpha =  0.0001 The log loss is: 0.4564201176731175
For values of alpha =  0.001 The log loss is: 0.45756864449921325
For values of alpha =  0.01 The log loss is: 0.4585507362678816
For values of alpha =  0.1 The log loss is: 0.460880908451455
For values of alpha =  1 The log loss is: 0.4935858896035705
```

```
For values of alpha =  10 The log loss is: 0.5480599551149273
```




```
For values of best alpha =  0.0001 The train log loss is: 0.45278879999465105
For values of best alpha =  0.0001 The test log loss is: 0.4564201176731175
Total number of data points : 19999
```

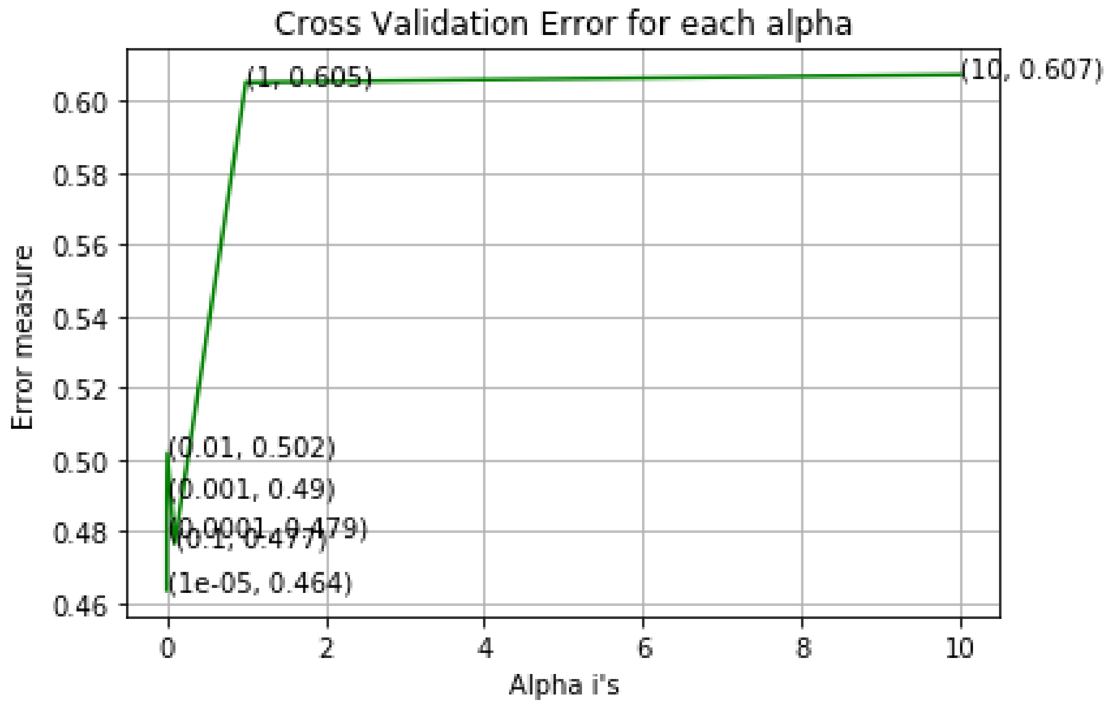


0.5 Linear SVM with hyperparameter tuning

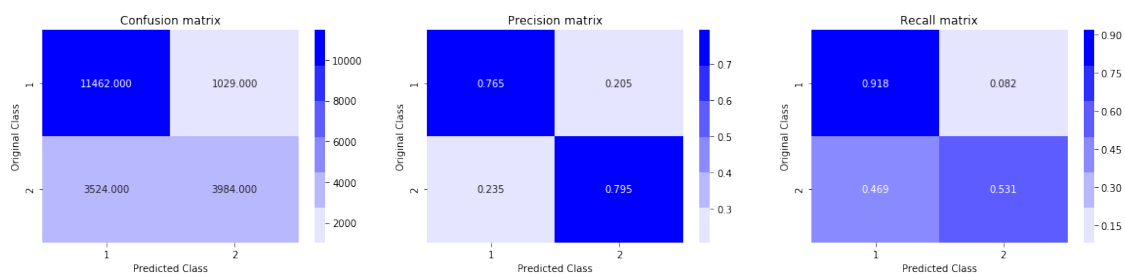
```
In [86]: alpha = [10 ** x for x in range(-5, 2)] # hyperparam for SGD classifier.
         --
```

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

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

```
HBox(children=(IntProgress(value=0, max=7), HTML(value='')))


For values of alpha =  1e-05 The log loss is: 0.4636498119106351
For values of alpha =  0.0001 The log loss is: 0.4789319096072303
For values of alpha =  0.001 The log loss is: 0.48969325832950694
For values of alpha =  0.01 The log loss is: 0.5018947372269298
For values of alpha =  0.1 The log loss is: 0.4765511555383432
For values of alpha =  1 The log loss is: 0.6052293455226234
For values of alpha =  10 The log loss is: 0.6074137784736146
```




```
For values of best alpha =  1e-05 The train log loss is: 0.45968365849046866
For values of best alpha =  1e-05 The test log loss is: 0.4636498119106351
Total number of data points : 19999
```



0.6 XGBOOST

```
In [151]: import xgboost as xgb
          # with glove vectorization
          from scipy.stats import randint as sp_randint
          from sklearn.model_selection import RandomizedSearchCV
          g=sp_randint(1, 50)
          # using randomsearch for hyperparameter tuning
```

```
xg=xgb.XGBClassifier(nthread=-1, early_stopping_rounds=20, verbose_eval=10)
params = {}
params['n_estimators']=[10,100]
params['max_depth'] = sp_randint(1, 50)

random_search = RandomizedSearchCV(xg,cv=5, param_distributions=params,\
                                    n_jobs=-1,verbose=10 ,scoring='neg_log_loss')
random_search.fit(X_train,y_train)
```

```
Fitting 5 folds for each of 10 candidates, totalling 50 fits
```

```
[Parallel(n_jobs=-1)]: Using backend LokyBackend with 8 concurrent workers.
[Parallel(n_jobs=-1)]: Done   2 tasks      | elapsed: 43.4min
[Parallel(n_jobs=-1)]: Done   9 tasks      | elapsed: 67.9min
[Parallel(n_jobs=-1)]: Done  16 tasks      | elapsed: 92.7min
[Parallel(n_jobs=-1)]: Done  25 tasks      | elapsed: 122.2min
[Parallel(n_jobs=-1)]: Done  34 tasks      | elapsed: 142.2min
[Parallel(n_jobs=-1)]: Done  41 out of  50 | elapsed: 148.2min remaining: 32.5min
[Parallel(n_jobs=-1)]: Done  47 out of  50 | elapsed: 164.2min remaining: 10.5min
[Parallel(n_jobs=-1)]: Done  50 out of  50 | elapsed: 166.7min finished
```

```
Out[151]: 'estimators=[]\n    depth=[]\n    key_scores={}\n\n    #storing the results\n    all_
```

```
In [174]: random_search.best_params_
```

```
Out[174]: {'max_depth': 7, 'n_estimators': 100}
```

```
In [153]: #building a model with depth=7 and n_estimators=100
          import xgboost as xgb
          params = {}
          params['objective'] = 'binary:logistic'
          params['eval_metric'] = 'logloss'
          params['eta'] = 0.02
          params['max_depth'] = 7
          params['n_estimators']=100

          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_ev

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

```
[12:23:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[0]	train-logloss:0.683169	valid-logloss:0.683406
Multiple eval metrics have been passed: 'valid-logloss' will be used for early stopping.

Will train until valid-logloss hasn't improved in 20 rounds.
[12:23:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:17] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:25] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[10]	train-logloss:0.600874	valid-logloss:0.603531
[12:23:29] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:31] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[20]	train-logloss:0.541371	valid-logloss:0.546414
[12:23:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:23:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:01] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:03] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[30]	train-logloss:0.497047	valid-logloss:0.504672
[12:24:05] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:21] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
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[40]	train-logloss:0.462761	valid-logloss:0.473101
[12:24:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:25] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:27] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:29] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:31] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:33] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:35] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[50]	train-logloss:0.435551	valid-logloss:0.448506
[12:24:42] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:44] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:46] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:53] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:55] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:57] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:24:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:01] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[60]	train-logloss:0.413591	valid-logloss:0.428939
[12:25:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[70]	train-logloss:0.395748	valid-logloss:0.413363
[12:25:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:38] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:40] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[80]	train-logloss:0.380662	valid-logloss:0.400891
[12:25:42] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:25:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
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[12:25:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:25:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[90]        train-logloss:0.367734        valid-logloss:0.390448
[12:26:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:03] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:05] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[100]       train-logloss:0.357484        valid-logloss:0.382438
[12:26:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[110]       train-logloss:0.348923        valid-logloss:0.376011
[12:26:38] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:40] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:42] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:44] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:46] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:48] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[120]       train-logloss:0.341572        valid-logloss:0.37071
[12:26:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:26:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:27:01] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:27:03] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:27:05] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:27:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:27:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
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[12:27:11] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[130]	train-logloss:0.33541	valid-logloss:0.366235
[12:27:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:29] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:31] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:33] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:35] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[140]	train-logloss:0.329708	valid-logloss:0.362328
[12:27:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:46] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:48] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:27:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[150]	train-logloss:0.324431	valid-logloss:0.35914
[12:27:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:01] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:03] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:05] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:11] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:13] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:15] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[160]	train-logloss:0.319374	valid-logloss:0.356443
[12:28:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:21] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:25] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:27] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:29] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:31] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:28:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[170]	train-logloss:0.31527	valid-logloss:0.354324
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[12:28:38] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:40] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:28:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[180]	train-logloss:0.311408	valid-logloss:0.352429
[12:29:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[190]	train-logloss:0.307966	valid-logloss:0.350713
[12:29:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[200]	train-logloss:0.304137	valid-logloss:0.349097
[12:29:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:29:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[210]	train-logloss:0.300298	valid-logloss:0.347713
[12:29:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:30:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:30:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
[12:30:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning e
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[12:30:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:11] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:13] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:15] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[220]        train-logloss:0.296561        valid-logloss:0.346376
[12:30:17] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:21] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[230]        train-logloss:0.293428        valid-logloss:0.345433
[12:30:35] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:48] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[240]        train-logloss:0.290118        valid-logloss:0.344356
[12:30:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:57] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:30:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:01] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:03] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:05] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[250]        train-logloss:0.286856        valid-logloss:0.343388
[12:31:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
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[12:31:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[260]       train-logloss:0.283932      valid-logloss:0.342688
[12:31:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[270]       train-logloss:0.280924      valid-logloss:0.34203
[12:31:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:53] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:55] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:57] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:31:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[280]       train-logloss:0.277796      valid-logloss:0.341367
[12:32:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:17] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:21] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:25] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:33] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[290]       train-logloss:0.274492      valid-logloss:0.340595
[12:32:35] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:32:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[300]       train-logloss:0.270773      valid-logloss:0.339879
[12:32:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
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[12:32:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[310]       train-logloss:0.267399        valid-logloss:0.3393
[12:33:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[320]       train-logloss:0.263963        valid-logloss:0.338796
[12:33:35] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:37] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:39] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:41] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:43] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:45] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:47] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:49] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:51] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:53] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[330]       train-logloss:0.260538        valid-logloss:0.338225
[12:33:57] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:33:59] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:08] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:10] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:12] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:14] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[340]       train-logloss:0.256831        valid-logloss:0.337606
[12:34:16] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:18] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:20] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:22] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:24] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
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[12:34:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:31] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[350]       train-logloss:0.253318       valid-logloss:0.337014
[12:34:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:38] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:40] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:42] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:44] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:46] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:48] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[360]       train-logloss:0.249653       valid-logloss:0.33644
[12:34:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:34:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:11] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:13] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[370]       train-logloss:0.24637       valid-logloss:0.336029
[12:35:15] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:17] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:19] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:21] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:23] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:26] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:28] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:30] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:32] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:34] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[380]       train-logloss:0.242865       valid-logloss:0.3356
[12:35:36] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:38] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:40] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:42] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:44] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:46] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:48] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:50] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
[12:35:52] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning en
```
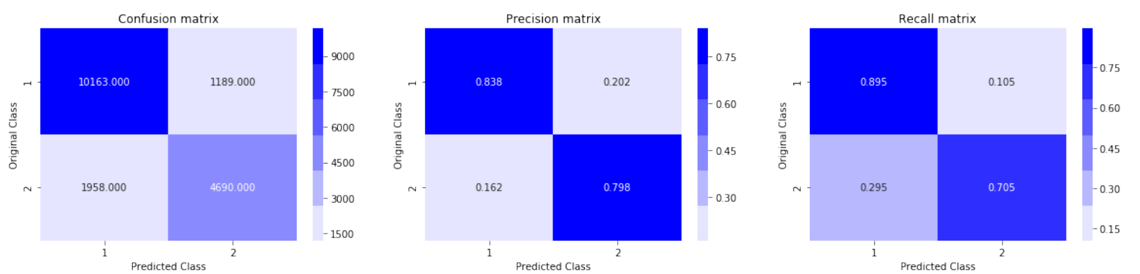

```
[12:35:54] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[390]       train-logloss:0.239867       valid-logloss:0.335152
[12:35:56] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:35:58] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:00] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:02] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:04] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:06] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:07] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:09] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[12:36:11] C:\Users\Administrator\Desktop\xgboost\src\tree\updater_prune.cc:74: tree pruning er
[399]       train-logloss:0.237149       valid-logloss:0.334897
The test log loss is: 0.33489747420122634
```

```
In [173]: predicted_y =np.array(predict_y>0.5,dtype=int)
          print("Total number of data points :", len(predicted_y))
          plot_confusion_matrix(y_test, predicted_y)
```

```
Total number of data points : 18000
```



0.7 Conclusion:

Objective: Identify which questions asked on Quora are duplicates of questions that have already been asked. This could be useful to instantly provide answers to questions that have already been answered. We are tasked with predicting whether a pair of questions are duplicates or not.

1. We are given a dataset with 4M rows and 5 columns: qid1,qid2,question1,question2,is_duplicate of which is_duplicate is a binary column containing whether the two questions are similar or not(1 or 0).
2. We perform EDA on the dataset to know about the distribution of the data and get more insights about the data.
3. Next we perform feature extraction to get some important features like length, common words which might be helpful to classify and then we go for advance feature extraction like fuzzy wuzzy.
4. We then preprocess the data to remove html tags etc and then visualize using wordclouds.

5. We then perform eda to know which of the features are actually important in classification using pairplots and histograms.
6. We convert the questions into vectors using tfidf glove vectorization and stack the features extracted to it (question1+question2+basic features+advance features).
7. We apply various model like logistic regression, linear svm and xgboost and compare them.
8. We use log loss and confusion matrix as the performance metric to compare various models.
9. we also try tfidf vectors on linear svm and logistic regression and hyperparameter tune xgboost model to furthur reduce the log loss.

In [1]:
```
from prettytable import PrettyTable

x=PrettyTable()

x.field_names=['Algorithm','Vectorizer','alpha','max_depth','train log-loss','test log-
x.add_row(["Logistic Regression","TFIDF-GLOVE",10,'-',0.513, 0.522 ])
x.add_row(["Linear SVM","TFIDF-GLOVE",0.0001,'-', 0.49,0.506])
x.add_row(["XGBOOST","TFIDF-GLOVE",'-',4, 0.337,0.3518])
x.add_row(["Logistic Regression","TFIDF",0.0001 ,'-', 0.452,0.456])
x.add_row(["Linear SVM","TFIDF",0.00001,'-', 0.459,0.463])
x.add_row(["XGBOOST","TFIDF-GLOVE",'-', 7,0.237,0.3348])


print(x)
```

```
+---------------------+-------------+--------+-----------+----------------+---------------+
|      Algorithm      |  Vectorizer | alpha  | max_depth | train log-loss | test log-loss |
+---------------------+-------------+--------+-----------+----------------+---------------+
| Logistic Regression | TFIDF-GLOVE |   10   |     -     |     0.513      |     0.522     |
|      Linear SVM     | TFIDF-GLOVE | 0.0001 |     -     |      0.49      |     0.506     |
|       XGBOOST       | TFIDF-GLOVE |   -    |     4     |     0.337      |     0.3518    |
| Logistic Regression |    TFIDF    | 0.0001 |     -     |     0.452      |     0.456     |
|      Linear SVM     |    TFIDF    | 1e-05  |     -     |     0.459      |     0.463     |
|       XGBOOST       | TFIDF-GLOVE |   -    |     7     |     0.237      |     0.3348    |
+---------------------+-------------+--------+-----------+----------------+---------------+
```

We can see that XgBoost with max depth of 7 and 100 estimators reduced the log loss to 0.334

In [ ]: