06XgbCV

November 4, 2018

1 XGB + CV

In [2]:
```
import matplotlib.pyplot as plt
from planar_utils import plot_decision_boundary, sigmoid, load_planar_dataset, load_ext
import numpy as np
import pandas as pd
import os
from collections import Counter

from sklearn.neighbors import KNeighborsClassifier  ## KNN
from sklearn.linear_model import LogisticRegressionCV  ## logistic regression
from sklearn.tree import DecisionTreeClassifier  ## decision tree
from sklearn.svm import SVC  ## SVM

from sklearn.tree import DecisionTreeClassifier  ## decision tree
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier
from xgboost import XGBClassifier

import math
import string
import re

import xgboost

from preprocess import preprocess
```

2 鐵達尼號資料集

In [3]:
```
df = pd.read_csv('train.csv')
df = preprocess(df)
df.head()
```

Out[3]:

	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Ticket	Cabin	\
0	1	0	3	1	22.0	1	0	2	0	
1	2	1	1	0	38.0	1	0	5	3	
2	3	1	3	0	26.0	0	0	7	0	

```
3            4         1       1    0  35.0      1      0       1      3
4            5         0       3    1  35.0      0      0       1      0

   Embarked  Has_Cabin  Age_Cat  Fare_log2  Fare_Cat  Name_Length  \
0         0          0        1   2.857981         0           23
1         2          1        2   6.155492         5           51
2         0          0        1   2.986411         0           22
3         0          1        2   5.730640         4           44
4         0          0        2   3.008989         0           24

   Name_With_Special_Char  Family_Size  Title
0                       0            1      1
1                       1            1      3
2                       0            0      2
3                       1            1      3
4                       0            0      1
```

```
In [4]: X = df[['PassengerId', 'Pclass', 'Sex', 'Age', 'SibSp', 'Parch',
                'Ticket', 'Cabin', 'Embarked', 'Has_Cabin', 'Age_Cat', 'Fare_log2',
                'Fare_Cat', 'Name_Length', 'Name_With_Special_Char', 'Family_Size',
                'Title']].values
        Y = df['Survived'].values

In [5]: from sklearn.model_selection  import train_test_split

        X_train, X_valid, Y_train, Y_valid = train_test_split(X, Y, test_size =0.3, random_sta
        print(X_train.shape)  ## (445, 17)
        print(X_valid.shape)  ## (446, 17)
        print(Y_train.shape)  ## (445,)
        print(Y_valid.shape)  ## (446,)
```

```
(623, 17)
(268, 17)
(623,)
(268,)
```

```
In [6]: def get_accuracy(clf):
            #=============your works starts===============#
            clf = clf()
            clf = clf.fit(X_train, Y_train)
            y_pred = clf.predict(X_valid)
            accuracy = (str(sum(Y_valid == y_pred)/Y_valid.shape[0]))
            #==============your works ends================#
            return accuracy

        print('SVM: ', get_accuracy(SVC))
        print('DecisionTree: ', get_accuracy(DecisionTreeClassifier))
        print('RandomForest: ', get_accuracy(RandomForestClassifier))
```

```
        print('AdaBoost: ', get_accuracy(AdaBoostClassifier))  ## Boosting 的演算法
        print('XGB: ', get_accuracy(XGBClassifier))

        # SVM:  0.609865470852
        # DecisionTree:  0.764573991031
        # RandomForest:  0.795964125561
        # AdaBoost:  0.784753363229
        # XGB:  0.80269058296
```

```
SVM:  0.6455223880597015
DecisionTree:  0.7611940298507462
RandomForest:  0.8544776119402985
```

```
  "avoid this warning.", FutureWarning)
  "10 in version 0.20 to 100 in 0.22.", FutureWarning)
```

```
AdaBoost:  0.7910447761194029
XGB:  0.8432835820895522
```

```
In [7]: # Set our parameters for xgboost
        params = {}
        # 請填入以下參數:
        # 目標函數: 二元分類
        # 評價函數: logloss
        # 學習速度: 0.04
        # 最大深度: 5
        #=============your works starts===============#
        params['objective'] = 'binary:logistic'
        params['eval_metric'] = 'logloss'
        params['eta'] = 0.04
        params['max_depth'] = 3
        #==============your works ends================#

        d_train = xgboost.DMatrix(X_train, label=Y_train)
        d_valid = xgboost.DMatrix(X_valid, label=Y_valid)

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

        bst = xgboost.train(params, d_train, 100, watchlist, early_stopping_rounds=100, verbos
        y_pred = bst.predict(xgboost.DMatrix(X_valid))
        print("Accuracy: ", str(sum(Y_valid == (y_pred > 0.5))/Y_valid.shape[0]))
```

```
Accuracy:  0.835820895522388
```

3 房價資料集

In [8]:
```
import urllib.request
if 'df_realestate_processed.csv' not in os.listdir():
    url = 'https://s3.amazonaws.com/datasets-jeremy/df_realestate_processed.csv'
    urllib.request.urlretrieve(url, 'df_realestate_processed.csv')

# processed
path = "df_realestate_processed.csv"
df_realestate_processed = pd.read_csv(path)
X = df_realestate_processed.drop(["price_per_meter", "total_price"], axis=1)
Y = df_realestate_processed['total_price']
```

In [9]:
```
X_train = X.iloc[:-1000]
Y_train = Y.iloc[:-1000]
Y_train = np.log(Y_train)

X_valid = X.iloc[-1000:]
Y_valid = Y.iloc[-1000:]
Y_valid = np.log(Y_valid)
```

In [10]:
```
# Set our parameters for xgboost
params = {}

# 請填入以下參數:
# 目標函數: 線性回歸
# 評價函數: rmse
# 學習速度: 0.01
# 最大深度: 5
# bst = xgboost.train(params, d_train, 3000, watchlist, early_stopping_rounds=50, ver
#=============your works starts===============#
params['objective'] = 'reg:linear'
params['eval_metric'] = 'rmse'
params['eta'] = 0.03
params['max_depth'] = 3
d_train = xgboost.DMatrix(X_train, label=Y_train)
d_valid = xgboost.DMatrix(X_valid, label=Y_valid)
watchlist = [(d_train, 'train'), (d_valid, 'valid')]
bst = xgboost.train(params, d_train, 3000, watchlist, early_stopping_rounds=10, verbos
Y_pred = bst.predict(xgboost.DMatrix(X_valid))
#==============your works ends================#
```

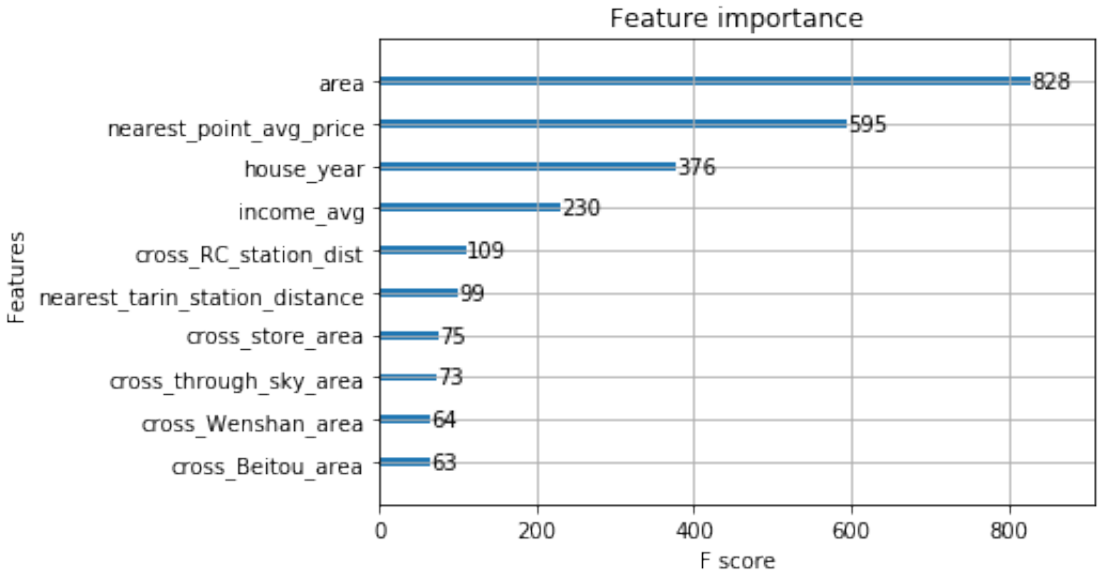
```
[0]        train-rmse:15.8112        valid-rmse:15.6215
Multiple eval metrics have been passed: 'valid-rmse' will be used for early stopping.

Will train until valid-rmse hasn't improved in 10 rounds.
[10]        train-rmse:11.6632        valid-rmse:11.5317
[20]        train-rmse:8.60487        valid-rmse:8.51713
```

```
[30]        train-rmse:6.35023        valid-rmse:6.30023
[40]        train-rmse:4.68857        valid-rmse:4.66973
[50]        train-rmse:3.46457        valid-rmse:3.46551
[60]        train-rmse:2.56373        valid-rmse:2.58316
[70]        train-rmse:1.90185        valid-rmse:1.93611
[80]        train-rmse:1.41686        valid-rmse:1.46651
[90]        train-rmse:1.06302        valid-rmse:1.12422
[100]        train-rmse:0.806951        valid-rmse:0.876425
[110]        train-rmse:0.624079        valid-rmse:0.700146
[120]        train-rmse:0.496058        valid-rmse:0.577805
[130]        train-rmse:0.408926        valid-rmse:0.49603
[140]        train-rmse:0.351423        valid-rmse:0.442858
[150]        train-rmse:0.314738        valid-rmse:0.409589
[160]        train-rmse:0.291941        valid-rmse:0.387703
[170]        train-rmse:0.277808        valid-rmse:0.373504
[180]        train-rmse:0.26903        valid-rmse:0.364483
[190]        train-rmse:0.263451        valid-rmse:0.358139
[200]        train-rmse:0.259615        valid-rmse:0.352701
[210]        train-rmse:0.256954        valid-rmse:0.349393
[220]        train-rmse:0.254944        valid-rmse:0.347053
[230]        train-rmse:0.253445        valid-rmse:0.345315
[240]        train-rmse:0.252139        valid-rmse:0.343419
[250]        train-rmse:0.251006        valid-rmse:0.342147
[260]        train-rmse:0.250072        valid-rmse:0.341061
[270]        train-rmse:0.249214        valid-rmse:0.340131
[280]        train-rmse:0.248427        valid-rmse:0.339297
[290]        train-rmse:0.247735        valid-rmse:0.338445
[300]        train-rmse:0.247081        valid-rmse:0.33738
[310]        train-rmse:0.24648        valid-rmse:0.337037
[320]        train-rmse:0.245882        valid-rmse:0.336335
[330]        train-rmse:0.245386        valid-rmse:0.335948
[340]        train-rmse:0.244862        valid-rmse:0.335533
[350]        train-rmse:0.244334        valid-rmse:0.33528
[360]        train-rmse:0.243893        valid-rmse:0.334766
[370]        train-rmse:0.243417        valid-rmse:0.334686
[380]        train-rmse:0.242968        valid-rmse:0.334314
[390]        train-rmse:0.242505        valid-rmse:0.333969
[400]        train-rmse:0.242057        valid-rmse:0.333667
[410]        train-rmse:0.241676        valid-rmse:0.333362
[420]        train-rmse:0.241232        valid-rmse:0.332969
[430]        train-rmse:0.240818        valid-rmse:0.332734
[440]        train-rmse:0.24045        valid-rmse:0.332447
[450]        train-rmse:0.240066        valid-rmse:0.332321
[460]        train-rmse:0.239724        valid-rmse:0.331935
[470]        train-rmse:0.239354        valid-rmse:0.331688
[480]        train-rmse:0.238993        valid-rmse:0.331617
[490]        train-rmse:0.23864        valid-rmse:0.331323
[500]        train-rmse:0.238285        valid-rmse:0.331034
```

```
[510]        train-rmse:0.23793        valid-rmse:0.331124
Stopping. Best iteration:
[502]        train-rmse:0.238198        valid-rmse:0.33097
```

In [ ]:
```
#   模型 save 與 load 的方式自己看
# bst.save_model("bst_subtotal_log_with_cross.pickle.dat")
# bst = xgboost.Booster({'nthread':1}) #init model
# bst.load_model("bst_subtotal_log_with_cross.pickle.dat") # load data
```

In [11]:
```
# 請使用 xgboost.plot_importance，並設定 max_num_features=10
#!=============your works starts==============!#
xgboost.plot_importance(bst, max_num_features=10)
#!=============your works ends===============!#

plt.show()
```



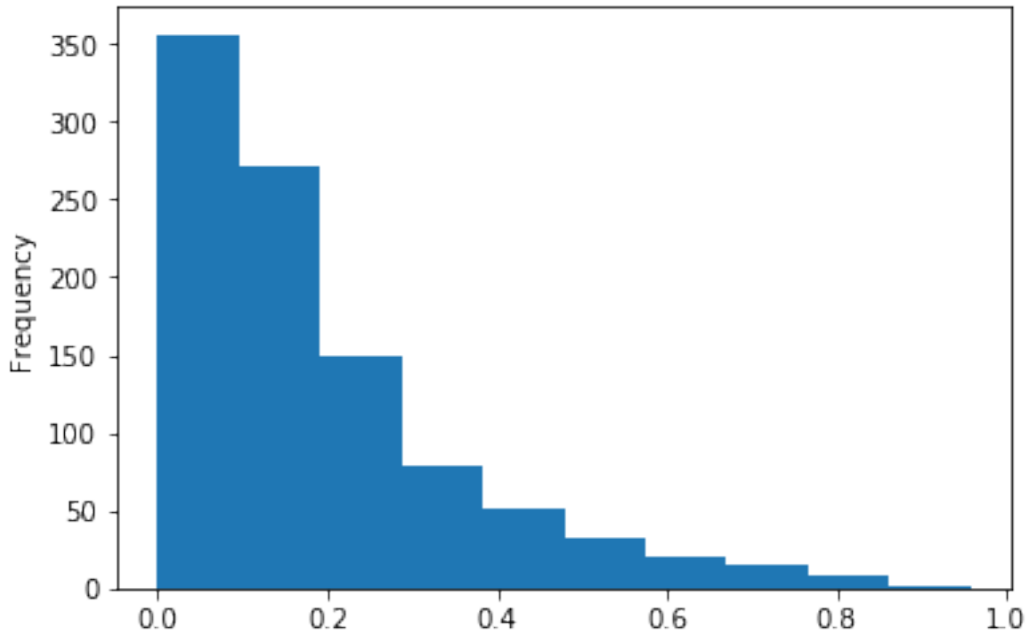
In [12]:
```
df_result = pd.DataFrame()

# 1. 使用 X_valid 去評價此模型
# 2. 使用 ['predict', 'truth', 'error'] 三個欄位的 DataFrame 去使決畫呈現預測結果
#    (1). 請注意與測結果 (Y_pred) 與真實值 (Y_valid) 都必須取 exp 方能反映實際情況
#    (2). error 請使用計算 (predict-truth)/truth 計算誤差百分比
#=============your works starts==============#
Y_pred = bst.predict(xgboost.DMatrix(X_valid))
df_result['predict'] = np.exp(Y_pred)
df_result['truth'] = np.exp((list(Y_valid)))
```

```
df_result['error'] = df_result.apply(lambda x:np.abs(x['predict'] - x['truth']) / x['t
df_result_sort = df_result.sort_values('truth')
#=============your works ends===============#

df_result.head()
```

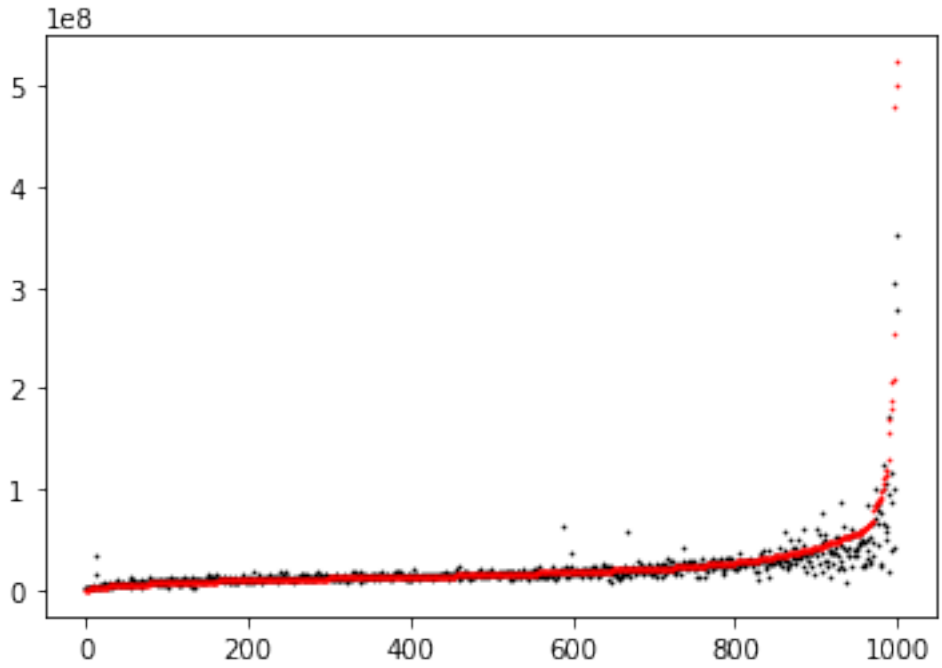
Out[12]:

	predict	truth	error
0	15413886.0	15880006.78	0.029353
1	12065383.0	10999982.00	0.096855
2	29951496.0	28199982.04	0.062110
3	23521218.0	21920043.69	0.073046
4	5400714.5	3220663.36	0.676895

In [13]:
```
# 請使用 df_result_sort 濾掉 error 大於 1 的部分畫出 error 的分布圖
#!=============your works starts==============!#
df_result_sort.loc[df_result_sort['error'] < 1, 'error'].plot('hist')
#!=============your works ends===============!#

plt.show()
```



In [14]:
```
# 請使用 plt.scatter，以 0~len(df_result) 作為 x，預測值 (黑色) 與實際值 (紅色) 作為 y。
#!=============your works starts==============!#
plt.scatter(range(len(df_result)), df_result_sort['predict'].values, color='black', s=
plt.scatter(range(len(df_result)), df_result_sort['truth'].values, color='red', s=0.5)
#!=============your works ends===============!#

plt.show()
```



In [ ]:

In [ ]: