



<div>Submission</div> <div>✓ Ran successfully</div> <div>Submitted by Leonardo Ferreira a month ago</div>	<div>Public Score</div> <div>0.9180</div>
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# Feature Engineering

~Almost~ all features of IEEE fraud detection dataset

## Purpose of the kernel:

In the last week I worked in all features trying to improve my model. I've worked in almost all features and I decided to share with the kaggle fellows.

NOTE: Maybe not all features could be useful, but I think that this work could help other kagglers in Data manipulation or to create another interesting feature

Please if this kernel were useful for you, please **UPVOTE** the kernel

## Importing Libraries

```
In [1]: import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O
(e.g. pd.read_csv)
import scipy as sp
from scipy import stats
import matplotlib.pyplot as plt
import seaborn as sns

# Standard plotly imports
#import plotly.plotly as py
import plotly.graph_objs as go
import plotly.tools as tls
from plotly.offline import iplot, init_notebook_mode
#import cufflinks
```

```

#import cufflinks as cf
import plotly.figure_factory as ff

# Using plotly + cufflinks in offline mode
init_notebook_mode(connected=True)
#cufflinks.go_offline(connected=True)

# Preprocessing, modelling and evaluating
from sklearn import preprocessing
from sklearn.metrics import confusion_matrix, roc_auc_score
from sklearn.model_selection import StratifiedKFold, cross_val_score, KFold
from xgboost import XGBClassifier
import xgboost as xgb

from sklearn.preprocessing import minmax_scale
from sklearn.decomposition import PCA
from sklearn.cluster import KMeans
from scipy.spatial.distance import cdist, pdist

## Hyperopt modules
from hyperopt import fmin, hp, tpe, Trials, space_eval, STATUS_OK, STATUS_RUNNING
from functools import partial

import os
import gc
print(os.listdir("../input"))

```

```

['train_identity.csv', 'train_transaction.csv', 'test_transaction.csv', 'test_identity.csv', 'sample_submission.csv']

```

## Some functions

```

In [2]:
## Function to reduce the DF size
def reduce_mem_usage(df, verbose=True):
    numerics = ['int16', 'int32', 'int64', 'float16', 'float32', 'float64']
    start_mem = df.memory_usage().sum() / 1024**2
    for col in df.columns:
        col_type = df[col].dtypes
        if col_type in numerics:
            c_min = df[col].min()
            c_max = df[col].max()
            if str(col_type)[:3] == 'int':
                if c_min > np.iinfo(np.int8).min and c_max < np.iinfo(np.int8).max:
                    df[col] = df[col].astype(np.int8)
                elif c_min > np.iinfo(np.int16).min and c_max < np.iinfo(np.int16).max:
                    df[col] = df[col].astype(np.int16)
            elif col_type == 'float':
                if c_min > np.finfo(np.float16).min and c_max < np.finfo(np.float16).max:
                    df[col] = df[col].astype(np.float16)
            else:
                pass
    end_mem = df.memory_usage().sum() / 1024**2
    if verbose:
        print('Mem usage reduced to %d%%' % (start_mem - end_mem) / start_mem * 100)

```

```

nd c_max < np.iinfo(np.int16).max:
    df[col] = df[col].astype(np.int16
)
    elif c_min > np.iinfo(np.int32).min a
nd c_max < np.iinfo(np.int32).max:
    df[col] = df[col].astype(np.int32
)
    elif c_min > np.iinfo(np.int64).min a
nd c_max < np.iinfo(np.int64).max:
    df[col] = df[col].astype(np.int64
)
    else:
        if c_min > np.finfo(np.float16).min a
nd c_max < np.finfo(np.float16).max:
    df[col] = df[col].astype(np.float
16)
    elif c_min > np.finfo(np.float32).min
and c_max < np.finfo(np.float32).max:
    df[col] = df[col].astype(np.float
32)
    else:
        df[col] = df[col].astype(np.float
64)
    end_mem = df.memory_usage().sum() / 1024**2
    if verbose: print('Mem. usage decreased to {:.5.2
f} Mb ({:.1f}% reduction)'.format(end_mem, 100 * (sta
rt_mem - end_mem) / start_mem))
    return df

def PCA_change(df, cols, n_components, prefix='PCA_',
rand_seed=4):
    pca = PCA(n_components=n_components, random_state
=rand_seed)

    principalComponents = pca.fit_transform(df[cols])

    principalDf = pd.DataFrame(principalComponents)

    df.drop(cols, axis=1, inplace=True)

    principalDf.rename(columns=lambda x: str(prefix)+
str(x), inplace=True)

    df = pd.concat([df, principalDf], axis=1)

    return df

```

In [3]:

```

df_trans = pd.read_csv('../input/train_transaction.cs
v', index_col='TransactionID')
df_test_trans = pd.read_csv('../input/test_transactio
n.csv', index_col='TransactionID')

```

In [4]:

```

df_trans = reduce_mem_usage(df_trans)
df_test_trans = reduce_mem_usage(df_test_trans)

```

Mem. usage decreased to 544.60 Mb (69.3% reduction)  
Mem. usage decreased to 474.52 Mb (68.8% reduction)

## Concatenating train and test

```
In [5]: labels = {np.nan: -999, 'nan': -999, 't': 1, 'f': 2,
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```



## ~Almost~ complete Feature Engineering IEEE data

Python notebook using data from [IEEE-CIS Fraud Detection](#) · 5,551 views · 1mo ago · starter code, beginner, tutorial, +2 more



170

Copy and Edit

86



Ver  
8

```
'sm-j810y': 3563, 'z899v1': 3564, 'sm-s367v1': 3565,
'sm-p905v': 3566, 'infinity': 3567, 'sm-g935r4': 3568
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hoo': 3605, 'de': 3606, 'jp': 3607, 'uk': 3608, 'fr':
3609, 'com': 3610, 'es': 3611, 'apple': 3612}
```

In [ ]:

In [6]:

```
df_test_trans['isFraud'] = 'test'
df = pd.concat([df_trans, df_test_trans], axis=0, sor
t=False )
df = df.reset_index()
```

In [7]:

```
df = reduce_mem_usage(df)
```

Mem. usage decreased to 1031.75 Mb (0.4% reduction)

In [8]:

```
for c1, c2 in df_trans.dtypes.reset_index().values:
    if c2=='0':
        df[c1] = df[c1].map(lambda x: labels[str(x).l
ower()])
# df.fillna(-999, inplace=True)
```

In [9]:

```
print('Shape before PCA')
df.shape
```

Shape before PCA

Out[9]:

(1097231, 394)

Notebook

Data

Output

Comments

```
In [10]: mas_v = df.columns[55:]

for col in mas_v:
    df[col].fillna((df[col].min() - 2), inplace=True)
    df[col] = (minmax_scale(df[col], feature_range=(0
,1)))

df = PCA_change(df, mas_v, prefix='PCA_V_', n_compone
nts=35)

columns = ['PCA_V_0', 'PCA_V_1', 'PCA_V_2', 'PCA_V_3'
, 'PCA_V_4', 'PCA_V_5',
          'PCA_V_6', 'PCA_V_7', 'PCA_V_8', 'PCA_V_9'
, 'PCA_V_10', 'PCA_V_11',
          'PCA_V_12', 'PCA_V_13', 'PCA_V_14', 'PCA_V
_15', 'PCA_V_16',
          'PCA_V_17', 'PCA_V_18', 'PCA_V_19', 'PCA_V
_20', 'PCA_V_21',
          'PCA_V_22', 'PCA_V_23', 'PCA_V_24', 'PCA_V
_25', 'PCA_V_26',
          'PCA_V_27', 'PCA_V_28', 'PCA_V_29', 'PCA_V
_30', 'PCA_V_31',
          'PCA_V_32', 'PCA_V_33', 'PCA_V_34']

km = KMeans(n_clusters=6)
km = km.fit(df[columns])
df['clusters_V'] = km.predict(df[columns])
gc.collect()
```

Out[10]:  
35

This kernel has been released under the [Apache 2.0](#) open source license.

Did you find this Kernel useful?  
Show your appreciation with an upvote

170



Data

Data Sources



IEEE-CIS Fraud Detection

IEEE-CIS Fraud Detection

sample\_submission.csv507k x 2

test\_identity.csv142k x 41

test\_transaction.csv507k x 393

train\_identity.csv144k x 41

train\_transaction.csv591k x 394

Can you detect fraud from customer transactions?

Last Updated: 2 months ago

About this Competition

In this competition you are predicting the probability that an online transaction is fraudulent, as denoted by the binary target `isFraud`.

The data is broken into two files `identity` and `transaction`, which are joined by `TransactionID`. Not all transactions have corresponding identity information.

Categorical Features - Transaction

ProductCD

card1 - card6

addr1, addr2

P\_emaildomain

R\_emaildomain

M1 - M9

Categorical Features - Identity

DeviceType

DeviceInfo

id\_12 - id\_38

The `TransactionDT` feature is a `timedelta` from a given reference `datetime` (not an actual timestamp).

You can read more about the data from [this post by the competition host](#).

Output Files

New Dataset

New Notebook

Download All

Output Files

xgb\_full\_feat\_eng.csv

About this file

This file was created from a Kernel, it does not have a description.

xgb\_full\_feat\_eng.csv

1	TransactionID	isFraud
2	3663549	3.2027652e-05
3	3663550	0.00018375987
4	3663551	0.00034164792
5	3663552	0.00062543136

6	3663553	8.65192e-05
7	3663554	3.9654995e-05
8	3663555	0.0011386632
9	3663556	0.0024418181
10	3663557	3.558498e-05
11	3663558	0.00010949105
12	3663559	0.0004151082
13	3663560	0.0002716025
14	3663561	0.0034285155
15	3663562	3.0838262e-05
16	3663563	4.3902648e-05
17	3663564	0.00029371819
18	3663565	0.0003524685
19	3663566	0.00045081295
20	3663567	0.00123404

Comments (29)

Sort by

All Comments

Hotness



Click here to comment...



**Benny** • Posted on Latest Version • a month ago • Options • Reply

1

dose the over sampling is unnecessay? the label have sever unbalance



**Leonardo Ferreira** **Kernel Author** • Posted on Latest Version • 19 days ago • Options • Reply

0

Good question bro... We need to test it!  
It's what the "No free lunch" means



**sicutglacies** • Posted on Latest Version • a month ago • Options • Reply

1

Thanks for your work! I have only one question, how did you determine that start point is 01/12/2017? Or that just a guess?



**Leonardo Ferreira** **Kernel Author** • Posted on Latest Version • 19 days ago • Options • Reply

0

It's just a guess of any data... I think that doesn't matter bro.  
Thank you for your feedback;



**LongYin** • Posted on Version 7 • a month ago • Options • Reply

^ 1

Thanks for sharing. Wish you be kernel GM.



**Leonardo Ferreira** Kernel Author • Posted on Latest Version • 19 days ago • Options • Reply

^ 0

Thank you very much, Long!!!



**Möbius** • Posted on Version 6 • 2 months ago • Options • Reply

^ 1

Brilliant ! I think you got some infs:

```
np.where(df_train.values >= np.finfo(np.float64).max)
(array([ 116, 285, 3587, ..., 588413, 589253, 589985]),
 array([136, 136, 136, ..., 136, 136, 136]))
```



**Leonardo Ferreira** Kernel Author • Posted on Version 6 • 2 months ago • Options • Reply

^ 1

Hi Möbius, thank you for your feedback. Would you clarify to me what you said?! I think I don't understand your comment



**Möbius** • Posted on Version 6 • 2 months ago • Options • Reply

^ 0

Some features got inf value, during your features engineering and can have a negative effect on the algorithm performance you can drop that column(s).



**Nicholas Weimer** • Posted on Latest Version • a month ago • Options • Reply

^ 0

inf=infinity value in python. i just had to look that up 😊



**Nicholas Weimer** • Posted on Latest Version • a month ago • Options • Reply

^ 0

thanks for the helpful kernel by the way. I upvoted it



**ratan rohith** • Posted on Version 5 • 2 months ago • Options • Reply

^ 1

Great one!! @kabure thanks for sharing!



**Leonardo Ferreira** Kernel Author • Posted on Version 5 • 2 months ago • Options • Reply

^ 1

Thank you very much, Ratan!!!



**Lucas Tourinho** • Posted on Version 5 • 2 months ago • Options • Reply

^ 1

WoWww!!! Nice work Leooo, Thanks for share



**Leonardo Ferreira** Kernel Author • Posted on Version 5 • 2 months ago • Options • Reply

^ 0

Valeuu Luuucas



**Aaron Davis** • Posted on Version 5 • 2 months ago • Options • Reply

^ 1

I've been struggling with memory management, but you seem to do a pretty good job of managing memory usage. Keep it up!



**Leonardo Ferreira** Kernel Author • Posted on Version 5 • 2 months ago • Options • Reply

^ 0

Hey Aaron, thank you very much for your feedback bro. I am happy that it is useful for you.



**Ants** • Posted on Version 5 • 2 months ago • Options • Reply

^ 1

Nice! A full solution.

After creating all those feature, isn't the most pressing question which features came top in feature importances? That would be nice to see.



**Leonardo Ferreira** Kernel Author • Posted on Version 5 • 2 months ago • Options • Reply

^ 0

Hi Ants, It's a good idea... I will try to implement your idea.



**Shahil Shaik** • Posted on Version 6 • 2 months ago • Options • Reply

^ 2

Nice work.



**Leonardo Ferreira** Kernel Author • Posted on Version 6 • 2 months ago • Options • Reply

^ 0

Hi, thank you very much Shahil



**Ayush Goel** • Posted on Latest Version • 19 days ago • Options • Reply

^ 0



Hi, great kernel. I just had one question. In the fifth code block( part of the code: 'labels = {np.nan: -999, 'nan': -999, 't': 1, 'f': 2, 'm2': 3, '}', I am assuming you did something similar to manual label encoding. Why did you set the values for strings across different columns to be in ascending order? Also, why didn't you use sklearn's label encoder. Also, this question is only if I understood the code correctly. Please correct my understanding if I am wrong.



**RAGHAV BANG** • Posted on Latest Version • a month ago • Options • Reply

^ 0

nice work



**gyeongah Na** • Posted on Latest Version • a month ago • Options • Reply

^ 0

Wow, great!



**Ethan** • Posted on Version 7 • a month ago • Options • Reply

^ 0

excellent!



**HamzaMassaoudi** • Posted on Version 6 • a month ago • Options • Reply

^ 0

Thanks for sharing these insights. did you compare the performance of your model with/without applying the PCA ?



**Denis** • Posted on Version 6 • 2 months ago • Options • Reply

^ 0

Great solution



**Raj Shinde** • Posted on Version 6 • 2 months ago • Options • Reply

^ 0

Great Work !!  
Thanks [@kabure](#)



11 days ago

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