```
import pandas as pd
import numpy as np
```

```
df=pd.read_csv(r"/content/credit_card (1).csv")
df
```

	CUST_ID	BALANCE	BALANCE_FREQUENCY	PURCHASES	ONEOFF_PURCHASES	INSTALLMENTS
0	C10001	40.900749	0.818182	95.40	0.00	
1	C10002	3202.467416	0.909091	0.00	0.00	
2	C10003	2495.148862	1.000000	773.17	773.17	
3	C10004	1666.670542	0.636364	1499.00	1499.00	
4	C10005	817.714335	1.000000	16.00	16.00	
...	...	...	...	...	...	
8945	C19186	28.493517	1.000000	291.12	0.00	
8946	C19187	19.183215	1.000000	300.00	0.00	
8947	C19188	23.398673	0.833333	144.40	0.00	
8948	C19189	13.457564	0.833333	0.00	0.00	
8949	C19190	372.708075	0.666667	1093.25	1093.25	

8950 rows × 18 columns

Saved successfully!

```
df.size
```

```
161100
```

```
df.shape
```

```
(8950, 18)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8950 entries, 0 to 8949
Data columns (total 18 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   CUST_ID                           8950 non-null   object
 1   BALANCE                           8950 non-null   float64
 2   BALANCE_FREQUENCY                 8950 non-null   float64
```

```
 3   PURCHASES                         8950 non-null   float64
 4   ONEOFF_PURCHASES                  8950 non-null   float64
 5   INSTALLMENTS_PURCHASES            8950 non-null   float64
 6   CASH_ADVANCE                      8950 non-null   float64
 7   PURCHASES_FREQUENCY               8950 non-null   float64
 8   ONEOFF_PURCHASES_FREQUENCY        8950 non-null   float64
 9   PURCHASES_INSTALLMENTS_FREQUENCY  8950 non-null   float64
 10  CASH_ADVANCE_FREQUENCY            8950 non-null   float64
 11  CASH_ADVANCE_TRX                  8950 non-null   int64
 12  PURCHASES_TRX                     8950 non-null   int64
 13  CREDIT_LIMIT                      8949 non-null   float64
 14  PAYMENTS                          8950 non-null   float64
 15  MINIMUM_PAYMENTS                  8637 non-null   float64
 16  PRC_FULL_PAYMENT                  8950 non-null   float64
 17  TENURE                            8950 non-null   int64
dtypes: float64(14), int64(3), object(1)
memory usage: 1.2+ MB
```

```
df.describe()
```

	BALANCE	BALANCE_FREQUENCY	PURCHASES	ONEOFF_PURCHASES	INSTALLMEN
count	8950.000000	8950.000000	8950.000000	8950.000000	
mean	1564.474828	0.877271	1003.204834	592.437371	
std	2081.531879	0.236904	2136.634782	1659.887917	
min	0.000000	0.000000	0.000000	0.000000	
25%	128.281915	0.888889	39.635000	0.000000	
50%	[illegible]	1.000000	361.280000	38.000000	
		1.000000	1110.130000	577.405000	
max	19043.138560	1.000000	49039.570000	40761.250000	

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```
df.head(10)
```

	CUST_ID	BALANCE	BALANCE_FREQUENCY	PURCHASES	ONEOFF_PURCHASES	INSTALLME
0	C10001	40.900749	0.818182	95.40	0.00	
1	C10002	3202.467416	0.909091	0.00	0.00	
2	C10003	2495.148862	1.000000	773.17	773.17	

```
df.isnull().sum()
```

```
CUST_ID                             0
BALANCE                             0
BALANCE_FREQUENCY                   0
PURCHASES                           0
ONEOFF_PURCHASES                    0
INSTALLMENTS_PURCHASES              0
CASH_ADVANCE                        0
PURCHASES_FREQUENCY                 0
ONEOFF_PURCHASES_FREQUENCY          0
PURCHASES_INSTALLMENTS_FREQUENCY    0
CASH_ADVANCE_FREQUENCY              0
CASH_ADVANCE_TRX                    0
PURCHASES_TRX                       0
CREDIT_LIMIT                        1
PAYMENTS                            0
MINIMUM_PAYMENTS                  313
PRC_FULL_PAYMENT                    0
TENURE                              0
dtype: int64
```

```
Columnas nulas=df[['MINIMUM_PAYMENTS','CREDIT_LIMIT']]
```

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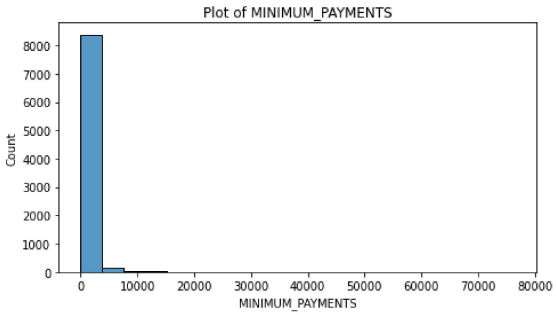
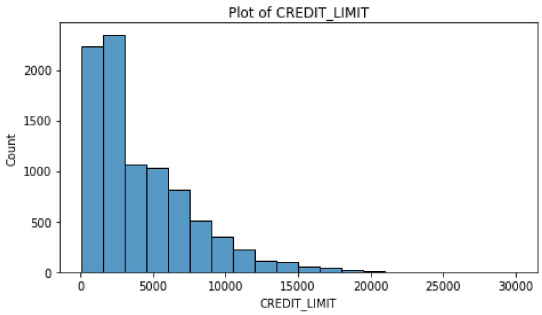
```
maxv=df[nombre].max()
minv=df[nombre].min()
print('Columna: {}\n ===> Promedio: {}\n ===> Valor Max: {}\n ===> Valor Min: {}\n'.forma
```

```
Columna: MINIMUM_PAYMENTS
 ===> Promedio: 864.2065423050828
 ===> Valor Max: 76406.20752
 ===> Valor Min: 0.019163

Columna: CREDIT_LIMIT
 ===> Promedio: 4494.449450364621
 ===> Valor Max: 30000.0
 ===> Valor Min: 50.0
```

```
from sklearn.preprocessing import StandardScaler
import seaborn as sns

#Graficos
```

```
import matplotlib.pyplot as plt

plt.figure(1 , figsize = (30, 4))
n = 0
for x in ['MINIMUM_PAYMENTS','CREDIT_LIMIT']:
    n += 1
    plt.subplot(1 , 3 , n)
    plt.subplots_adjust(hspace =0.5 , wspace = 0.5)
    sns.histplot(df[x] , bins = 20)
    plt.title('Plot of {}'.format(x))
plt.show()
```






```
df['MINIMUM_PAYMENTS'].fillna(df['MINIMUM_PAYMENTS'].median(),inplace=True)
df['CREDIT_LIMIT'].fillna(df['CREDIT_LIMIT'].median(),inplace=True)
```

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```
df.isnull().sum()
```

```
CUST_ID                             0
BALANCE                             0
BALANCE_FREQUENCY                   0
PURCHASES                           0
ONEOFF_PURCHASES                    0
INSTALLMENTS_PURCHASES              0
CASH_ADVANCE                        0
PURCHASES_FREQUENCY                 0
ONEOFF_PURCHASES_FREQUENCY          0
PURCHASES_INSTALLMENTS_FREQUENCY    0
CASH_ADVANCE_FREQUENCY              0
CASH_ADVANCE_TRX                    0
PURCHASES_TRX                       0
CREDIT_LIMIT                        0
PAYMENTS                            0
MINIMUM_PAYMENTS                    0
PRC_FULL_PAYMENT                    0
```

```
TENURE                            0
dtype: int64
```

```
df.head()
```

	CUST_ID	BALANCE	BALANCE_FREQUENCY	PURCHASES	ONEOFF_PURCHASES	INSTALLME
0	C10001	40.900749	0.818182	95.40	0.00	
1	C10002	3202.467416	0.909091	0.00	0.00	
2	C10003	2495.148862	1.000000	773.17	773.17	
3	C10004	1666.670542	0.636364	1499.00	1499.00	
4	C10005	817.714335	1.000000	16.00	16.00	

```
plt.figure(1 , figsize = (45, 50))
n = 0
for x in df.columns[1:18]:
    n += 1
    plt.subplot(5 , 4 , n)
    sns.histplot(df[x] , bins = 20)
    plt.title('Plot of {}'.format(x))
plt.show()
```

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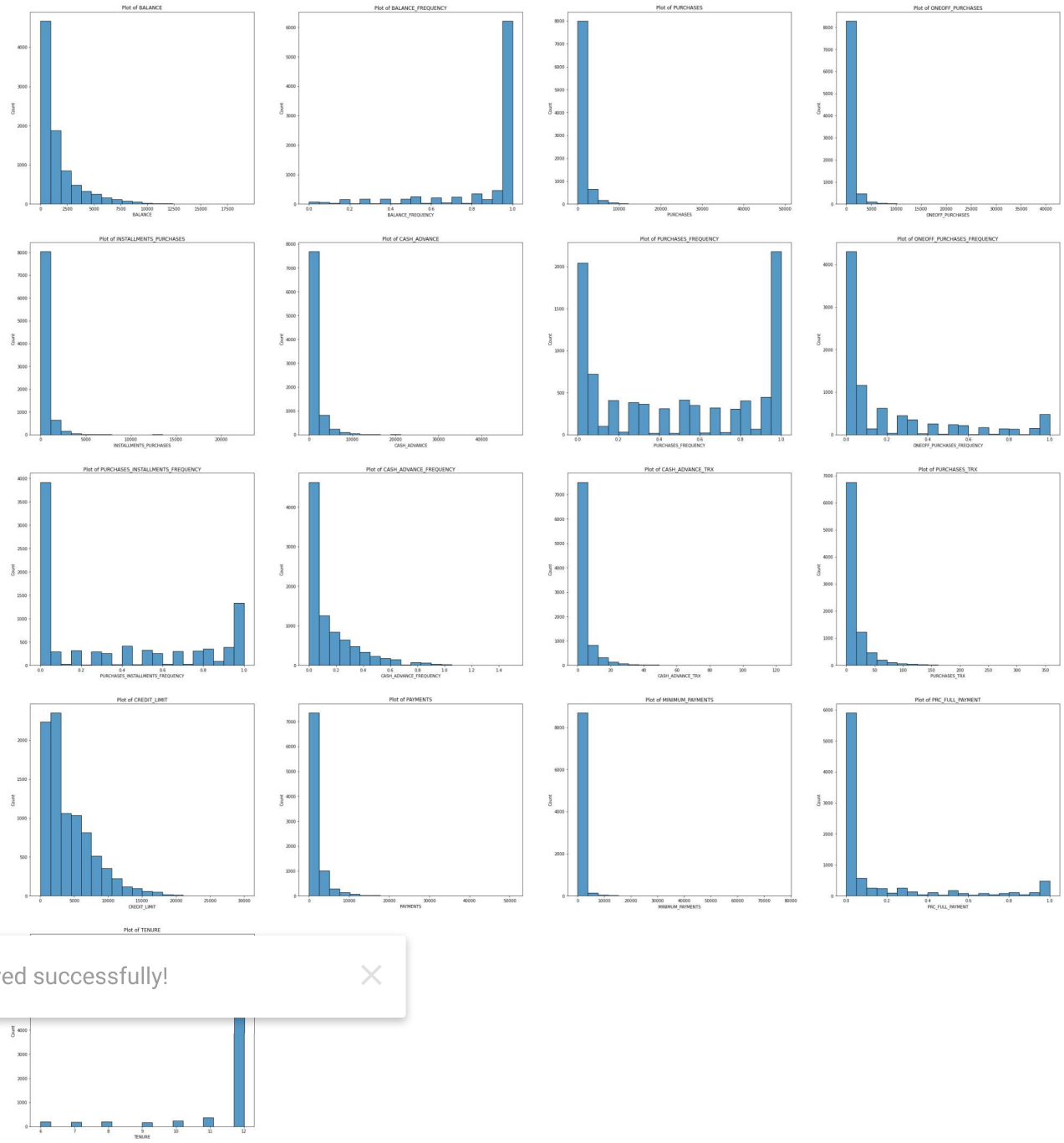

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```
columns=['BALANCE', 'PURCHASES', 'ONEOFF_PURCHASES', 'INSTALLMENTS_PURCHASES', 'CASH_ADVANCE'
        'PAYMENTS', 'MINIMUM_PAYMENTS']

for c in columns:

    Range=c+' RANGE'
```

```
    df[Range]=0
    df.loc[((df[c]>0)&(df[c]<=500)),Range]=1
    df.loc[((df[c]>500)&(df[c]<=1000)),Range]=2
    df.loc[((df[c]>1000)&(df[c]<=3000)),Range]=3
    df.loc[((df[c]>3000)&(df[c]<=5000)),Range]=4
    df.loc[((df[c]>5000)&(df[c]<=10000)),Range]=5
    df.loc[((df[c]>10000)),Range]=6



columns=['BALANCE_FREQUENCY', 'PURCHASES_FREQUENCY', 'ONEOFF_PURCHASES_FREQUENCY', 'PURCHASES
         'CASH_ADVANCE_FREQUENCY', 'PRC_FULL_PAYMENT']

for c in columns:

    Range=c+'_RANGE'
    df[Range]=0
    df.loc[((df[c]>0)&(df[c]<=0.1)),Range]=1
    df.loc[((df[c]>0.1)&(df[c]<=0.2)),Range]=2
    df.loc[((df[c]>0.2)&(df[c]<=0.3)),Range]=3
    df.loc[((df[c]>0.3)&(df[c]<=0.4)),Range]=4
    df.loc[((df[c]>0.4)&(df[c]<=0.5)),Range]=5
    df.loc[((df[c]>0.5)&(df[c]<=0.6)),Range]=6
    df.loc[((df[c]>0.6)&(df[c]<=0.7)),Range]=7
    df.loc[((df[c]>0.7)&(df[c]<=0.8)),Range]=8
    df.loc[((df[c]>0.8)&(df[c]<=0.9)),Range]=9
    df.loc[((df[c]>0.9)&(df[c]<=1.0)),Range]=10


columns=['PURCHASES_TRX', 'CASH_ADVANCE_TRX']
```

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```
    Range=c+'_RANGE'
    df[Range]=0
    df.loc[((df[c]>0)&(df[c]<=5)),Range]=1
    df.loc[((df[c]>5)&(df[c]<=10)),Range]=2
    df.loc[((df[c]>10)&(df[c]<=15)),Range]=3
    df.loc[((df[c]>15)&(df[c]<=20)),Range]=4
    df.loc[((df[c]>20)&(df[c]<=30)),Range]=5
    df.loc[((df[c]>30)&(df[c]<=50)),Range]=6
    df.loc[((df[c]>50)&(df[c]<=100)),Range]=7
    df.loc[((df[c]>100)),Range]=8


df.drop(['CUST_ID','BALANCE', 'BALANCE_FREQUENCY', 'PURCHASES',
       'ONEOFF_PURCHASES', 'INSTALLMENTS_PURCHASES', 'CASH_ADVANCE',
       'PURCHASES_FREQUENCY',  'ONEOFF_PURCHASES_FREQUENCY',
       'PURCHASES_INSTALLMENTS_FREQUENCY', 'CASH_ADVANCE_FREQUENCY',
       'CASH_ADVANCE_TRX', 'PURCHASES_TRX', 'CREDIT_LIMIT', 'PAYMENTS',
       'MINIMUM_PAYMENTS', 'PRC_FULL_PAYMENT' ], axis=1, inplace=True)
```

```
Features= np.asarray(df)
```

```
Features
```

```
array([[12,  1,  1, ...,  0,  1,  0],
       [12,  4,  0, ...,  3,  0,  1],
       [12,  3,  2, ...,  0,  3,  0],
       ...,
       [ 6,  1,  1, ...,  3,  1,  0],
       [ 6,  1,  0, ...,  3,  0,  1],
       [ 6,  1,  3, ...,  0,  5,  1]])
```

```
scale = StandardScaler()
Features = scale.fit_transform(Features)
Features.shape
```

```
(8950, 17)
```

```
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
from sklearn.metrics.pairwise import cosine_similarity
```

```
n_clusters=15
cost=[]
for i in range(1,n_clusters):
    kmean= KMeans(i)
    kmean.fit(Features)
    cost.append(kmean.inertia_)
```

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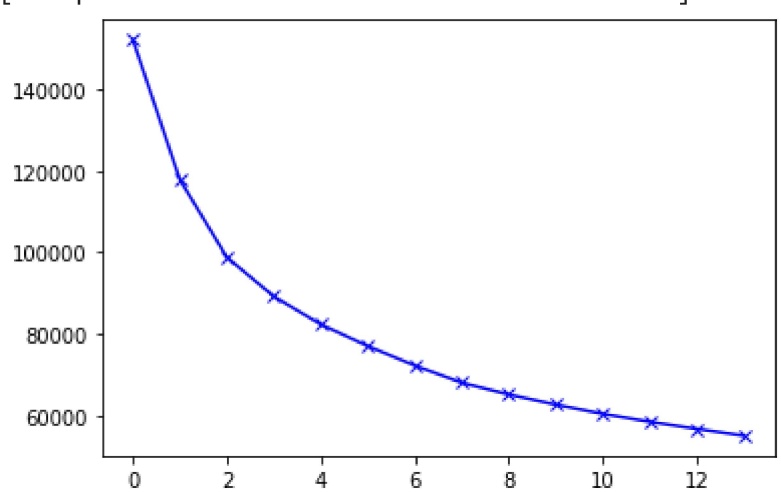
```
plt.plot(cost, 'bx-')
```

```
[<matplotlib.lines.Line2D at 0x7f29f1480150>]
```




```
kmean= KMeans(4)
kmean.fit(Features)
```

```
labels=kmean.labels_


clusters=pd.concat([df, pd.DataFrame({'cluster':labels})], axis=1)
clusters.head()
```

	TENURE	BALANCE_RANGE	PURCHASES_RANGE	ONEOFF_PURCHASES_RANGE	INSTALLMENTS_PU
0	12	1	1	0	
1	12	4	0	0	
2	12	3	2	2	
3	12	3	3	3	
4	12	2	1	1	

```
for c in clusters:
    grid= sns.FacetGrid(clusters, col='cluster')
    grid.map(plt.hist, c)
```

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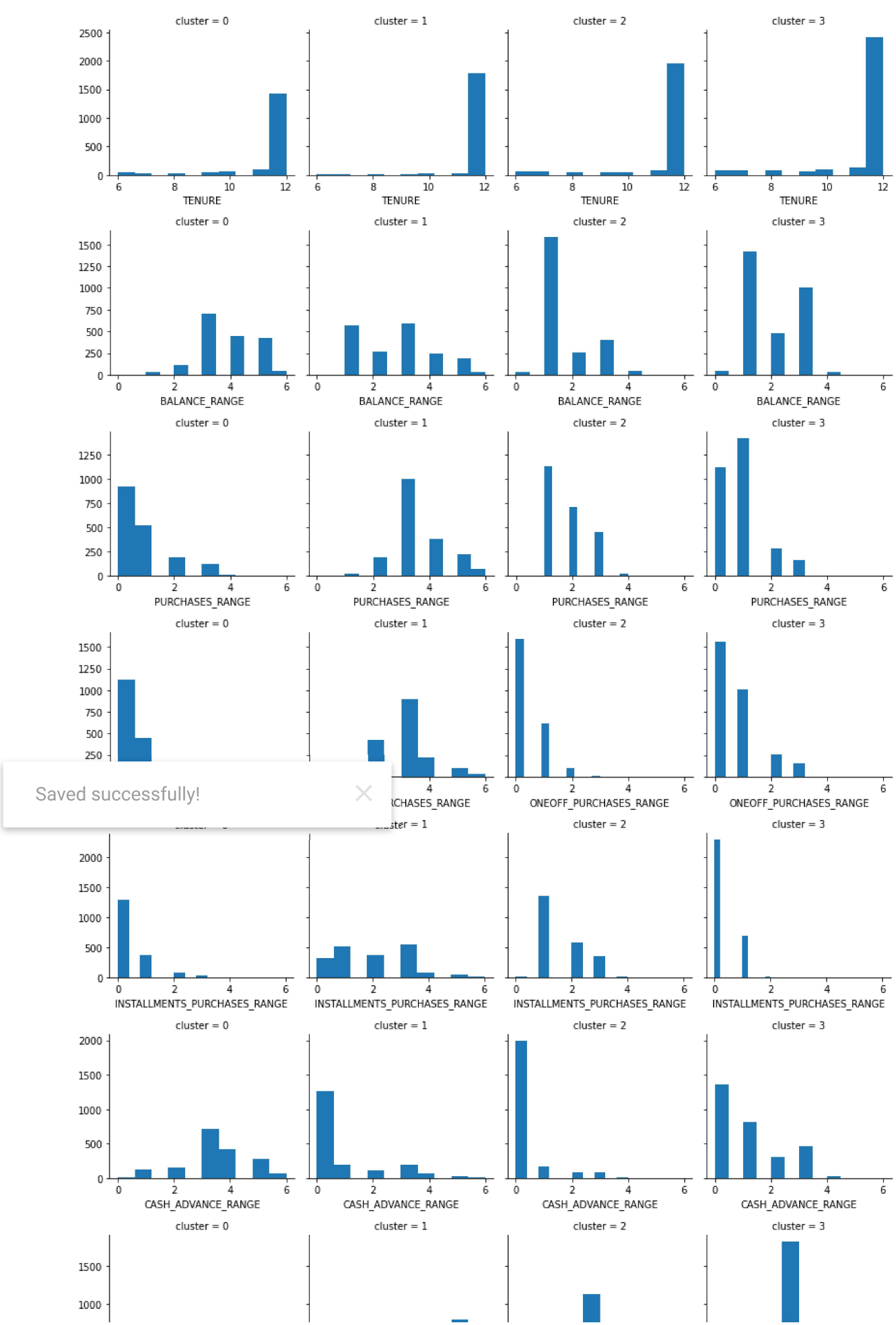

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