```
from google.colab import files


uploaded = files.upload()


import pandas as pd
import io

df = pd.read_csv('/content/products.csv')
print(df)


import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline


df.shape
```

```
(32951, 9)
```

```
df.columns
```

```
Index(['product_id', 'product_category_name', 'product_name_lenght',
       'product_description_lenght', 'product_photos_qty', 'product_weight_g',
       'product_length_cm', 'product_height_cm', 'product_width_cm',
       'product_vol_cm3', 'density_g/cm3', 'cluster'],
      dtype='object')
```

```
df.duplicated().sum()
```

```
0
```

```
df.describe()
```

	product_name_lenght	product_description_lenght	produ
count	32340.000000	32340.000000	
mean	48.476592	771.492393	
std	10.245699	635.124831	
min	5.000000	4.000000	
25%	42.000000	339.000000	
50%	51.000000	595.000000	

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32951 entries, 0 to 32950
Data columns (total 9 columns):
 #   Column                      Non-Null Count  Dtype  
---  ------                      --------------  -----  
 0   product_id                  32951 non-null  object 
 1   product_category_name       32341 non-null  object 
 2   product_name_lenght         32341 non-null  float64
 3   product_description_lenght  32341 non-null  float64
 4   product_photos_qty          32341 non-null  float64
 5   product_weight_g            32949 non-null  float64
 6   product_length_cm           32949 non-null  float64
 7   product_height_cm           32949 non-null  float64
 8   product_width_cm            32949 non-null  float64
dtypes: float64(7), object(2)
memory usage: 2.3+ MB
```

```
df.isna().sum()[:20]
```

```
product_id                      0
product_category_name         610
product_name_lenght           610
product_description_lenght    610
product_photos_qty            610
product_weight_g                2
product_length_cm               2
```

```
product_height_cm               2
product_width_cm                2
dtype: int64
```

```
df['product_vol_cm3'] = df.product_length_cm * \
  df.product_width_cm * df.product_height_cm
df['density_g/cm3'] = df.product_weight_g / \
  df.product_vol_cm3
display(df)
```

	product_id	product_cate
0	1e9e8ef04dbcff4541ed26657ea517e5	
1	3aa071139cb16b67ca9e5dea641aaa2f	
2	96bd76ec8810374ed1b65e291975717f	es
3	cef67bcfe19066a932b7673e239eb23d	
4	9dc1a7de274444849c219cff195d0b71	utilidades_
...	...	
32946	a0b7d5a992ccda646f2d34e418fff5a0	moveis
32947	bf4538d88321d0fd4412a93c974510e6	construcao_ferramentas_
32948	9a7c6041fa9592d9d9ef6cfe62a71f8c	cama_m
32949	83808703fc0706a22e264b9d75f04a2e	informatica_

```
df.dropna(subset= ['product_category_name', 'product_name_lenght', 'product_description_lenght', 'product_photos_qty'], inplace=True)
```

```
print(df.isna().sum())

df = df.dropna()

print(df.isna().sum())
```

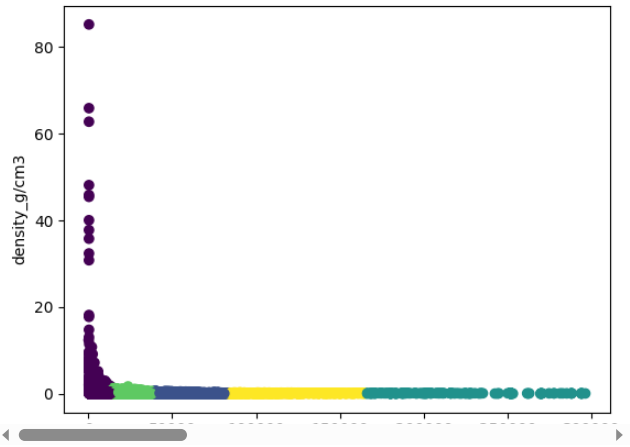
```
product_id                    0
product_category_name         0
product_name_lenght           0
product_description_lenght    0
product_photos_qty            0
product_weight_g              1
product_length_cm             1
product_height_cm             1
product_width_cm              1
product_vol_cm3               1
density_g/cm3                 1
dtype: int64
product_id                    0
product_category_name         0
product_name_lenght           0
product_description_lenght    0
product_photos_qty            0
product_weight_g              0
product_length_cm             0
product_height_cm             0
product_width_cm              0
product_vol_cm3               0
density_g/cm3                 0
dtype: int64
```

```
x = df[["product_vol_cm3", "density_g/cm3"]]

n_clusters = 5

kmeans = KMeans(n_clusters=n_clusters)

kmeans.fit(x)

df["cluster"] = kmeans.labels_

print(df.groupby("cluster").mean())
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fr
  warnings.warn(
         product_name_lenght  product_description_lenght  product_photos_qty  \
cluster
0                  49.464280                  733.075297            2.315383
1                  48.752415                  965.105072            2.283816
2                  48.138769                  774.390474            2.132804
3                  48.623188                  844.512077            2.531401
4                  48.821598                  775.028481            2.301028

         product_weight_g  product_length_cm  product_height_cm  \
cluster
0             2857.867150          40.198426          23.354421
1            15254.258454          56.748792          49.981884
2              813.003902          24.534177          11.488787
3            24759.106280          67.512077          62.908213
4             7607.809731          51.160206          34.227453

         product_width_cm  product_vol_cm3  density_g/cm3
cluster
0               31.283753     23572.892146       0.121314
1               45.425121    109744.096618       0.139890
2               17.952861      4978.678463       0.237615
3               55.260870    213799.922705       0.118159
4               38.958861     54282.453718       0.138924
<ipython-input-123-22f401148fe2>:11: FutureWarning: The default value of numeric_only in DataFrameGroupBy.mean is deprecated. In a
  print(df.groupby("cluster").mean())
```

```
x = df[["product_vol_cm3", "density_g/cm3"]]

kmeans = KMeans(n_clusters=5, random_state=42).fit(x)

df["cluster"] = kmeans.labels_

plt.scatter(x=df["product_vol_cm3"], y=df["density_g/cm3"], c=df["cluster"])
plt.xlabel("product_vol_cm3")
plt.ylabel("density_g/cm3")
plt.show()
```

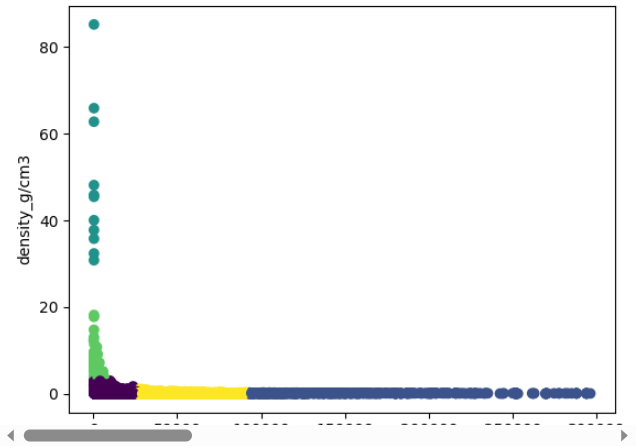
```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeai
  warnings.warn(
```




```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()

x = df[["product_vol_cm3", "density_g/cm3"]]

scaler.fit(x)

dados_escalados = scaler.transform(x)

kmeans = KMeans(n_clusters=5, random_state=0)
kmeans.fit(dados_escalados)


df["cluster"] = kmeans.labels_

plt.scatter(x=df["product_vol_cm3"], y=df["density_g/cm3"], c=df["cluster"])
```

```
plt.xlabel("product_vol_cm3")
plt.ylabel("density_g/cm3")
plt.show()
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeai
  warnings.warn(
```



✓ 0s conclusão: 20:02