Mineração de Dados

Conjunto de dados: Diamonds Prices

https://www.kaggle.com/datasets/nancyalaswad90/diamonds-prices

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Contexto geral dos dados: Dados relativos a 53,940 diamantes de corte redondo negociados em 2022, onde são descritas 10 caracteristicas sobre eles, carat, cut, color, clarity, depth, table, price, x, y, e z, descrição detalhada a frente.

Carregando os dados:

```
from google.colab import drive
drive.mount('/content/drive')
import pandas as pd
import numpy as np
import math
import pylab as plt
import seaborn as sns
from scipy import stats

%matplotlib inline
```

```
Mounted at /content/drive
```

```
data = pd.read_csv('/content/drive/My Drive/TPDataMining/DiamondsPrices2022.csv')
```

```
data.shape
```

```
(53943, 11)
```

Removendo uma coluna com valores de indice

```
data.drop('Unnamed: 0', axis=1, inplace=True)
```

```
numData = data.select_dtypes('number')
catData = data.select_dtypes('O')
```

```
for c in catData.columns:
    print(catData[c].unique())
```

```
['Ideal' 'Premium' 'Good' 'Very Good' 'Fair']
['E' 'I' 'J' 'H' 'F' 'G' 'D']
['SI2' 'SI1' 'VS1' 'VS2' 'VVS2' 'VVS1' 'I1' 'IF']
```

```
instances, features = data.shape
```

Pequeno Exemplo:

```
data.head(20)
```

	carat	cut	color	clarity	depth	table	price	x	y	z
0	0.23	Ideal	E	SI2	61.5	55.0	326	3.95	3.98	2.43
1	0.21	Premium	E	SI1	59.8	61.0	326	3.89	3.84	2.31
2	0.23	Good	E	VS1	56.9	65.0	327	4.05	4.07	2.31
3	0.29	Premium	I	VS2	62.4	58.0	334	4.20	4.23	2.63
4	0.31	Good	J	SI2	63.3	58.0	335	4.34	4.35	2.75
5	0.24	Very Good	J	VVS2	62.8	57.0	336	3.94	3.96	2.48
6	0.24	Very Good	I	VVS1	62.3	57.0	336	3.95	3.98	2.47
7	0.26	Very Good	H	SI1	61.9	55.0	337	4.07	4.11	2.53
8	0.22	Fair	E	VS2	65.1	61.0	337	3.87	3.78	2.49
9	0.23	Very Good	H	VS1	59.4	61.0	338	4.00	4.05	2.39
10	0.30	Good	J	SI1	64.0	55.0	339	4.25	4.28	2.73
11	0.23	Ideal	J	VS1	62.8	56.0	340	3.93	3.90	2.46
12	0.22	Premium	F	SI1	60.4	61.0	342	3.88	3.84	2.33
13	0.31	Ideal	J	SI2	62.2	54.0	344	4.35	4.37	2.71
14	0.20	Premium	E	SI2	60.2	62.0	345	3.79	3.75	2.27
15	0.32	Premium	E	I1	60.9	58.0	345	4.38	4.42	2.68
16	0.30	Ideal	I	SI2	62.0	54.0	348	4.31	4.34	2.68
17	0.30	Good	J	SI1	63.4	54.0	351	4.23	4.29	2.70
18	0.30	Good	J	SI1	63.8	56.0	351	4.23	4.26	2.71
19	0.30	Very Good	J	SI1	62.7	59.0	351	4.21	4.27	2.66

Descrição dos Atributos:

1) index - indice numerico que indentifica a entidade, dado Discreto

2) carat - quilate, unidade de medida baseada no peso, dado Continuo

3) cut - classificação do corte da pedra preciosa, dado categorico

4) color - cor da pedra, dado categorico

5) clarity - clareza da pedra, dado categorico

6) depth - "altura" da pedra, continuo

7) table - "largura" do topo da pedra, continuo

8) price - preço da pedra em dolar, continuo

9) x - medida no eixo x da pedra em mm, continuo

10) y - medida no eixo y da pedra em mm, continuo

11) z - medida no eixo z da pedra em mm, continuo

Avaliando os valores contidos no banco de dados:

Quilate

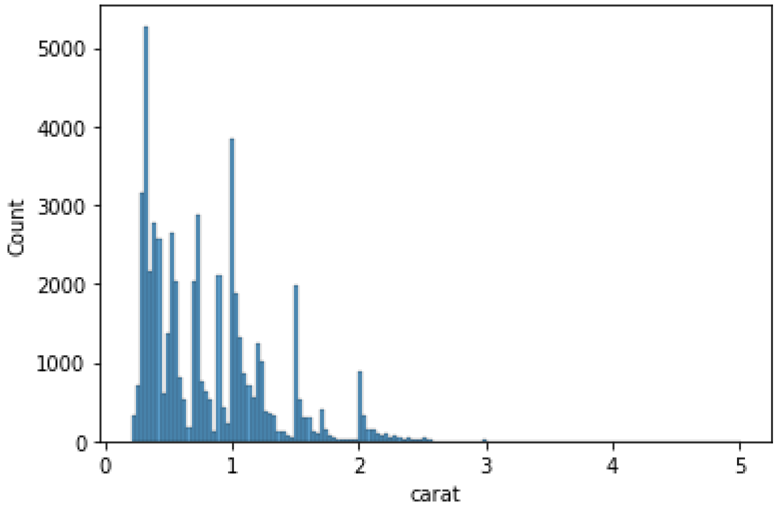
```
min = np.min(data['carat'])
max = np.max(data['carat'])
media = sum(data['carat'])/instances
desv= math.sqrt(np.sum((data['carat']-media)**2)/instances)
inter=max-min
out=[]

print("Carat:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)
```

```
Carat:
Minimo:  0.2
Maximo:  5.01
Media:  0.7979346717831621
Desvio Padrao:  0.4739941595630074
Intervalo:  4.81
```

```
sns.histplot(numData['carat'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c5008990>
```



"Altura"

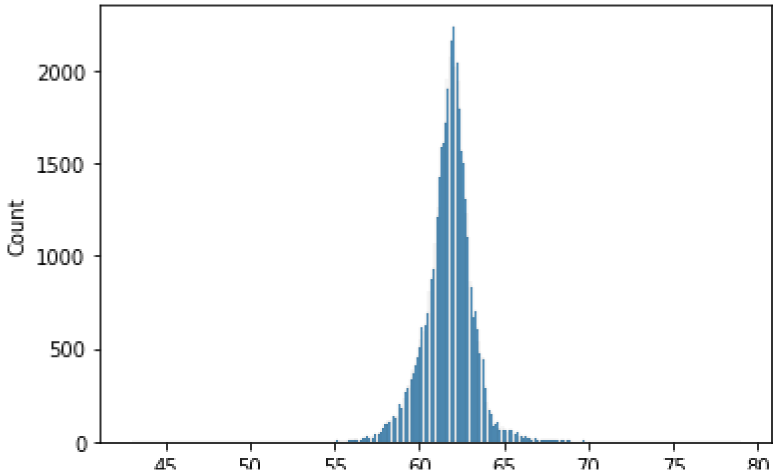
```
min = np.min(data['depth'])
max = np.max(data['depth'])
media = sum(data['depth'])/instances
desv= math.sqrt(np.sum((data['depth']-media)**2)/instances)
inter=max-min
out=[]

print("Depth:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)
```

```
Depth:
Minimo:  43.0
Maximo:  79.0
Media:  61.74932243293768
Desvio Padrao:  1.4326129869036368
Intervalo:  36.0
```

```
sns.histplot(numData['depth'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c4d3f310>
```



"Largura"

```
min = np.min(data['table'])
max = np.max(data['table'])
media = sum(data['table'])/instances
desv= math.sqrt(np.sum((data['table']-media)**2)/instances)
inter=max-min
out=[]

print("Table:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)
```

```
Table:
Minimo:  43.0
Maximo:  95.0
Media:  57.45725117253402
Desvio Padrao:  2.2345282410474523
Intervalo:  52.0
```

```
sns.histplot(numData['table'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c433d790>
```

"Preço"

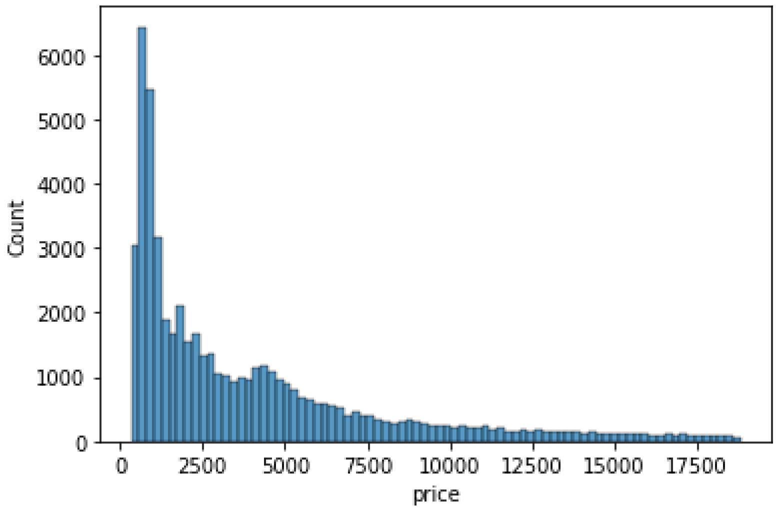
```
min = np.min(data['price'])
max = np.max(data['price'])
media = sum(data['price'])/instances
desv= math.sqrt(np.sum((data['price']-media)**2)/instances)
inter=max-min
out=[]

print("Price:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)
```

```
Price:
Minimo:  326
Maximo:  18823
Media:  3932.734293606214
Desvio Padrao:  3989.301469302266
Intervalo:  18497
```

```
sns.histplot(numData['price'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c3ec03d0>
```



Medidas x, y e z

```
min = np.min(data['x'])
max = np.max(data['x'])
media = sum(data['x'])/instances
desv= math.sqrt(np.sum((data['x']-media)**2)/instances)
inter=max-min
out=[]
```

```
print("\nEixo x:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)

min = np.min(data['y'])
max = np.max(data['y'])
media = sum(data['y'])/instances
desv= math.sqrt(np.sum((data['y']-media)**2)/instances)
inter=max-min
out=[]

print("\n--------------------\n")

print("Eixo y:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)

print("\n--------------------\n")


min = np.min(data['z'])
max = np.max(data['z'])
media = sum(data['z'])/instances
desv= math.sqrt(np.sum((data['z']-media)**2)/instances)
inter=max-min
out=[]

print("Eixo z:")
print("Minimo: ",min)
print("Maximo: ",max)
print("Media: ",media)
print("Desvio Padrao: ", desv)
print("Intervalo: ", inter)
```

```
Eixo x:
Minimo:  0.0
Maximo:  10.74
Media:  5.731158074263461
Desvio Padrao:  1.121719188381892
Intervalo:  10.74

--------------------

Eixo y:
Minimo:  0.0
Maximo:  58.9
Media:  5.734526444580299
```

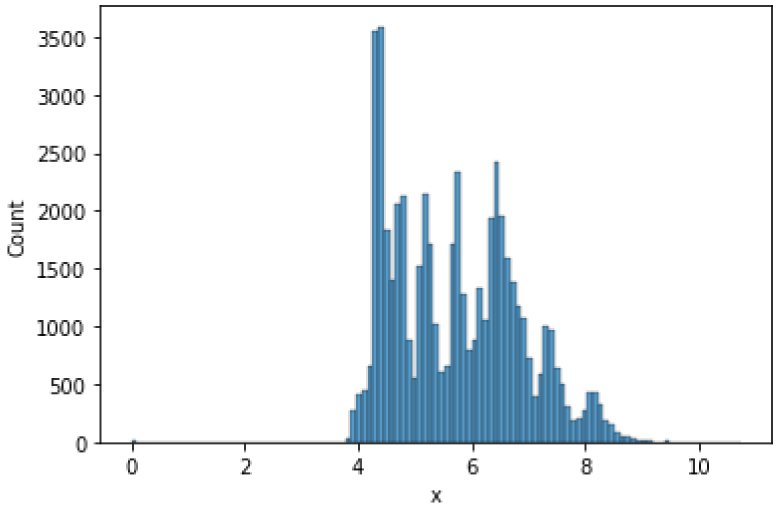
```
Desvio Padrao:  1.1420923330316735
Intervalo:  58.9

--------------------

Eixo z:
Minimo:  0.0
Maximo:  31.8
Media:  3.5387295849324203
Desvio Padrao:  0.7056729303858117
Intervalo:  31.8
```

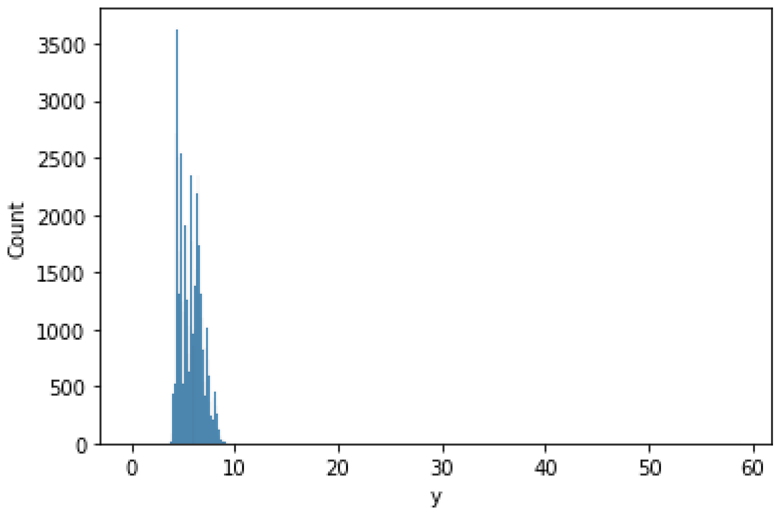
```
sns.histplot(numData['x'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c4588c10>
```



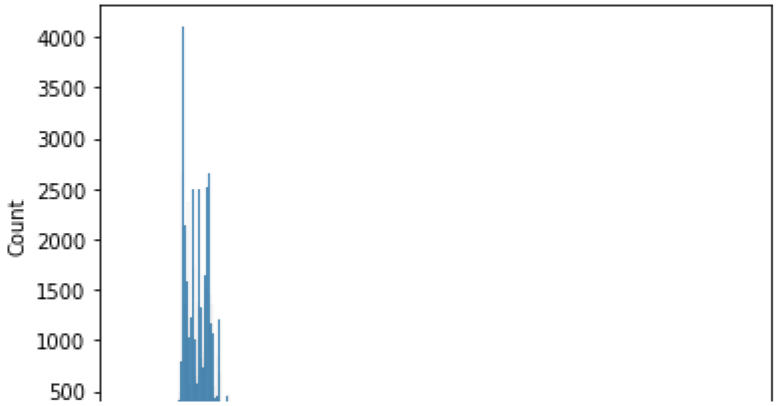

```
sns.histplot(numData['y'].sort_values())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c50089d0>
```




```
sns.histplot(numData['z'].sort_values())
```

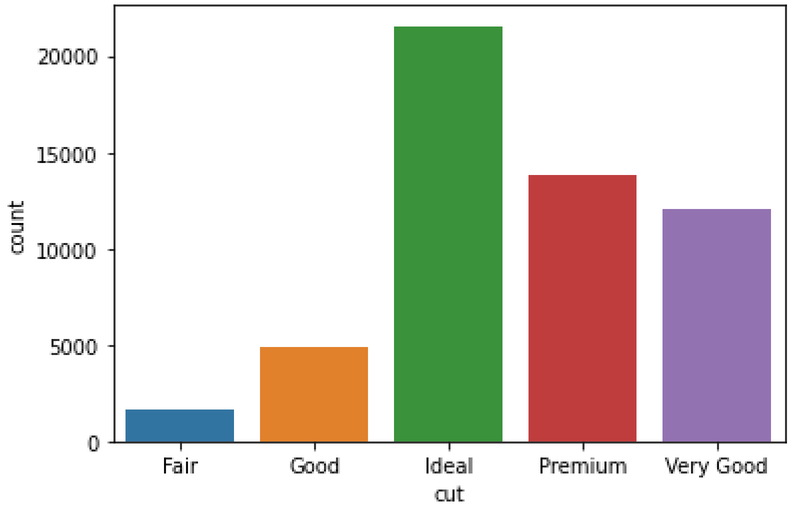
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c34df250>
```



Qualidade do Corte

```
sns.countplot(catData['cut'].sort_values())
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pas
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c2dca150>
```



Cor

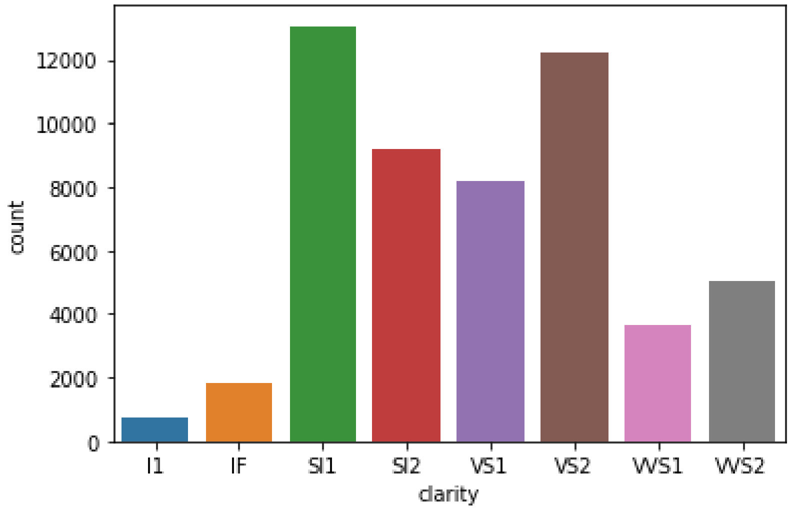
```
sns.countplot(catData['color'].sort_values())
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c2cd1090>
```

Clareza


```
sns.countplot(catData['clarity'].sort_values())
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f60c2ca6490>
```



Limpeza de Dados

```
print(data.isnull().any())
print()
```

```
carat       False
cut         False
color       False
clarity     False
depth       False
table       False
price       False
x           False
y           False
z           False
dtype: bool
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 53943 entries, 0 to 53942
Data columns (total 10 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   carat    53943 non-null  float64
 1   cut      53943 non-null  object 
 2   color    53943 non-null  object 
 3   clarity  53943 non-null  object 
 4   depth    53943 non-null  float64
 5   table    53943 non-null  float64
 6   price    53943 non-null  int64  
 7   x        53943 non-null  float64
 8   y        53943 non-null  float64
 9   z        53943 non-null  float64
dtypes: float64(6), int64(1), object(3)
memory usage: 4.1+ MB
```

Nenhum valor nulo encontrado

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 53943 entries, 0 to 53942
Data columns (total 10 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   carat    53943 non-null  float64
 1   cut      53943 non-null  object 
 2   color    53943 non-null  object 
 3   clarity  53943 non-null  object 
 4   depth    53943 non-null  float64
 5   table    53943 non-null  float64
 6   price    53943 non-null  int64  
 7   x        53943 non-null  float64
 8   y        53943 non-null  float64
 9   z        53943 non-null  float64
dtypes: float64(6), int64(1), object(3)
memory usage: 4.1+ MB
```

Buscando valores duplicados

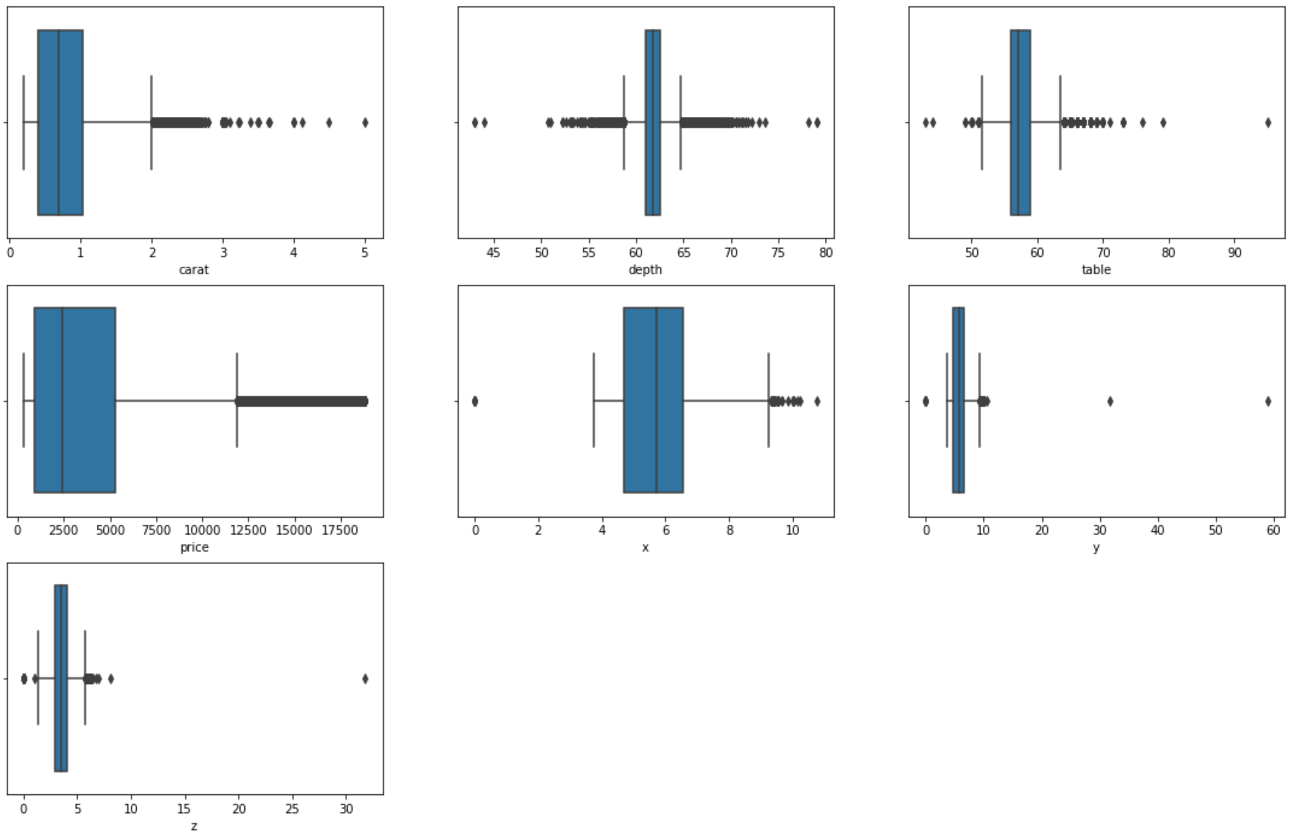
```
print(f'The number of duplicate rows : {data.duplicated().sum()}')
```

```
The number of duplicate rows : 149
```

Buscando Outliers

```
i = 1
plt.figure(figsize=(19, 12))
for c in numData.columns:
    plt.subplot(3, 3, i)
```

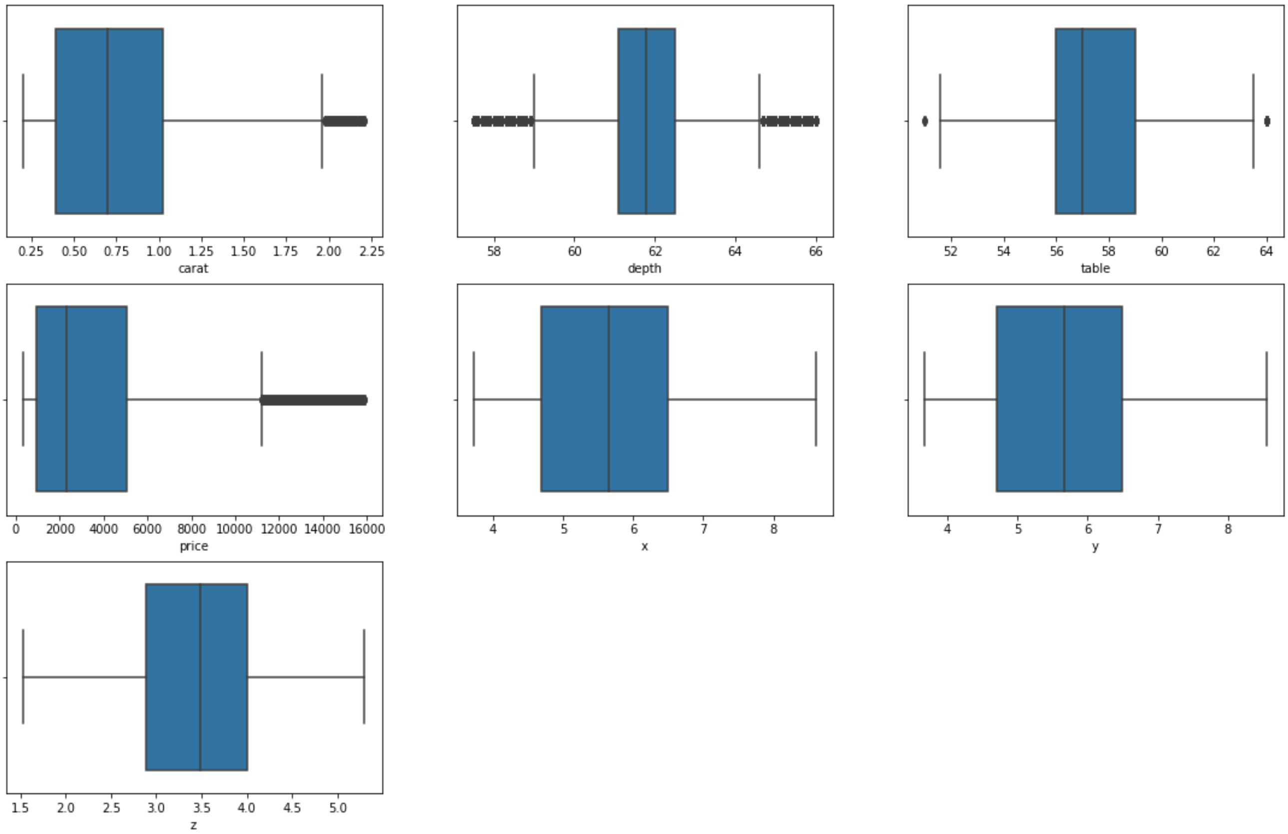
```
    sns.boxplot(x=data[c])
    i+=1
```



Fazendo o tratamento dos Outliers

```
data = data[(np.abs(stats.zscore(numData)) < 3).all(axis=1)]
```

```
numData = data.select_dtypes('number')
i = 1
plt.figure(figsize=(19, 12))
for c in numData.columns:
    plt.subplot(3, 3, i)
    sns.boxplot(x=data[c])
    i+=1
```



Correlação dos demais atributos com o preço

```
data.corrwith(data.price)
```

```
carat    0.922409
depth   -0.001882
table    0.131667
price    1.000000
x        0.890451
y        0.891716
z        0.887339
dtype: float64
```

```
data['table_xy'] = (data['table'].mean()*(data['x']*data['y']).mean()-data['table']*(data[
data['depth_z'] = (data['depth'].mean()*data['z'].mean()-data['depth']*data['z'])

print("\n",data['table_xy'])
print("\n-----------------------------------------------------\n")
print("\n",data['depth_z'])
```

```
 0        1036.549639
1         990.011039
3         870.776639
4         806.222639
5        1011.867839
            ...
53938    -281.799361
53939      18.989139
53940      73.301639
```

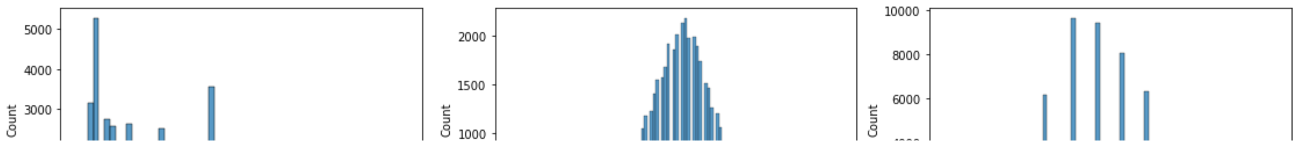
```
53941    -137.987761
53942     -39.281761
Name: table_xy, Length: 51593, dtype: float64

----------------------------------------------------


 0        66.359088
1        77.666088
3        51.692088
4        41.729088
5        60.060088
           ...
53938   -12.335912
53939   -10.603912
53940     4.659088
53941    10.690088
53942     5.869088
Name: depth_z, Length: 51593, dtype: float64
```

Distribuição de valores

```
numData = data.select_dtypes('number')
i = 1
plt.figure(figsize=(19, 12))
for c in numData.columns:
    plt.subplot(3, 3, i)
    sns.histplot(x = data[c])
    i+=1
```



Fazendo o tratamento dos atributos categoricos

```
data['cut'] = data['cut'].map({'Fair':0, 'Good':1, 'Very Good':2, 'Premium':3, 'Ideal':4})
data['color'] = data['color'].map({'J':0, 'I':1, 'H':2, 'G':3, 'F':4, 'E':5, 'D':6})
data['clarity'] = data['clarity'].map({'I1':0, 'SI2':1, 'SI1':2, 'VS2':3, 'VS1':4, 'VVS2':
```

Resultado das operações

```
data.describe()
```

	carat	cut	color	clarity	depth	tal
count	51593.000000	51593.000000	51593.000000	51593.000000	51593.000000	51593.000
mean	0.759929	2.952532	3.433625	3.086950	61.752751	57.369
std	0.424971	1.070644	1.694679	1.642551	1.269271	2.100
min	0.200000	0.000000	0.000000	0.000000	57.500000	51.000
25%	0.390000	2.000000	2.000000	2.000000	61.100000	56.000
50%	0.700000	3.000000	3.000000	3.000000	61.800000	57.000
75%	1.020000	4.000000	5.000000	4.000000	62.500000	59.000
max	2.210000	4.000000	6.000000	7.000000	66.000000	64.000

```
data.head()
```

	carat	cut	color	clarity	depth	table	price	x	y	z	table_xy	de
0	0.23	4	5	1	61.5	55.0	326	3.95	3.98	2.43	1036.549639	66.3
1	0.21	3	5	2	59.8	61.0	326	3.89	3.84	2.31	990.011039	77.6
3	0.29	3	1	3	62.4	58.0	334	4.20	4.23	2.63	870.776639	51.6
4	0.31	1	0	1	63.3	58.0	335	4.34	4.35	2.75	806.222639	41.7
5	0.24	2	0	5	62.8	57.0	336	3.94	3.96	2.48	1011.867839	60.0

```
print(data.sort_values('carat', ascending=False).head(5)['carat'])
print(data.sort_values('carat', ascending=True).head(5)['carat'])
```

```
25250    2.21
24072    2.21
24922    2.21
26321    2.21
25506    2.21
Name: carat, dtype: float64
31598    0.2
31591    0.2
31592    0.2
31593    0.2
31594    0.2
Name: carat, dtype: float64
```

```
print(data.sort_values('depth', ascending=False).head(5)['depth'])
print(data.sort_values('depth', ascending=True).head(5)['depth'])
```

```
2534     66.0
1523     66.0
46742    66.0
15331    66.0
1097     66.0
Name: depth, dtype: float64
5481     57.5
50486    57.5
11639    57.5
34938    57.5
50211    57.5
Name: depth, dtype: float64
```

```
print(data.sort_values('table', ascending=False).head(5)['table'])
print(data.sort_values('table', ascending=True).head(5)['table'])
```

```
4582     64.0
10570    64.0
20481    64.0
24787    64.0
3595     64.0
Name: table, dtype: float64
46040    51.0
47630    51.0
33586    51.0
3979     51.0
45798    51.0
Name: table, dtype: float64
```

```
print(data.sort_values('price', ascending=False).head(5)['price'])
print(data.sort_values('price', ascending=True).head(5)['price'])
```

```
26393    15898
26392    15897
26391    15897
26390    15897
26389    15889
Name: price, dtype: int64
0    326
1    326
3    334
```

```
4    335
5    336
Name: price, dtype: int64
```

```
print(data.sort_values('x', ascending=False).head(5)['x'])
print(data.sort_values('x', ascending=True).head(5)['x'])
```

```
24739    8.60
22140    8.57
25562    8.57
25749    8.54
23121    8.52
Name: x, dtype: float64
31596    3.73
31600    3.73
31598    3.74
31599    3.76
31601    3.77
Name: x, dtype: float64
```

```
print(data.sort_values('y', ascending=False).head(5)['y'])
print(data.sort_values('y', ascending=True).head(5)['y'])
```

```
26242    8.55
24739    8.53
25717    8.53
22140    8.53
26223    8.51
Name: y, dtype: float64
31600    3.68
31598    3.71
31596    3.71
31601    3.72
31599    3.73
Name: y, dtype: float64
```

```
print(data.sort_values('z', ascending=False).head(5)['z'])
print(data.sort_values('z', ascending=True).head(5)['z'])
```

```
23194    5.30
23690    5.23
13118    5.23
25305    5.23
23513    5.23
Name: z, dtype: float64
20694    1.53
39246    2.06
31592    2.24
47138    2.25
31591    2.26
Name: z, dtype: float64
```

Tratamento dos dados continuos para intervalos

Carat

```
bins=1000
min = np.min(data['carat'])
max = np.max(data['carat'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['carat'] = data['carat'] //gaps
print("\n",(data.sort_values('carat', ascending=True).head(10)['carat']))
print("\n",(data.sort_values('carat', ascending=False).head(10)['carat']))
```

```
Intervalo dos Valores: 2.01

Tamanho das Bins: 0.0020099999999999996

 31598    99.0
31591    99.0
31592    99.0
31593    99.0
31594    99.0
31595    99.0
31596    99.0
31597    99.0
31599    99.0
31600    99.0
Name: carat, dtype: float64

 25250    1099.0
24072    1099.0
24922    1099.0
26321    1099.0
25506    1099.0
25106    1099.0
25306    1099.0
24153    1099.0
25330    1099.0
25089    1099.0
Name: carat, dtype: float64
```

Depth

```
bins=1000
min = np.min(data['depth'])
max = np.max(data['depth'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['depth'] = data['depth'] //gaps
```

```
print("\n",(data.sort_values('depth', ascending=True).head(10)['depth']))
print("\n",(data.sort_values('depth', ascending=False).head(10)['depth']))
```

```
Intervalo dos Valores: 8.5

Tamanho das Bins: 0.0085

 5481     6764.0
50486    6764.0
11639    6764.0
34938    6764.0
50211    6764.0
34024    6764.0
46085    6764.0
25562    6764.0
12641    6764.0
12692    6764.0
Name: depth, dtype: float64

 2534     7764.0
1523     7764.0
46742    7764.0
15331    7764.0
1097     7764.0
15139    7764.0
17716    7764.0
49151    7764.0
49328    7764.0
3115     7764.0
Name: depth, dtype: float64
```

Table

```
bins=1000
min = np.min(data['table'])
max = np.max(data['table'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['table'] = data['table'] //gaps
print("\n",(data.sort_values('table', ascending=True).head(10)['table']))
print("\n",(data.sort_values('table', ascending=False).head(10)['table']))
```

```
Intervalo dos Valores: 13.0

Tamanho das Bins: 0.013

 46040    3923.0
47630    3923.0
33586    3923.0
3979     3923.0
45798    3923.0
1515     3923.0
26387    3923.0
```

```
4150     3923.0
24815    3969.0
5144     4000.0
Name: table, dtype: float64

 4582     4923.0
10570    4923.0
20481    4923.0
24787    4923.0
3595     4923.0
17781    4923.0
13749    4923.0
14861    4923.0
30409    4923.0
19089    4923.0
Name: table, dtype: float64
```

Price

```
bins=1000
min = np.min(data['price'])
max = np.max(data['price'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['price'] = data['price'] //gaps
print("\n",(data.sort_values('price', ascending=True).head(10)['price']))
print("\n",(data.sort_values('price', ascending=False).head(10)['price']))
```

```
Intervalo dos Valores: 15572

Tamanho das Bins: 15.572

 0     20.0
1     20.0
11    21.0
10    21.0
9     21.0
8     21.0
12    21.0
6     21.0
5     21.0
4     21.0
Name: price, dtype: float64

 26393    1020.0
26392    1020.0
26391    1020.0
26390    1020.0
26389    1020.0
26387    1020.0
26386    1020.0
26382    1019.0
26383    1019.0
```

```
26381    1019.0
Name: price, dtype: float64
```

X

```
bins=1000
min = np.min(data['x'])
max = np.max(data['x'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['x'] = data['x'] //gaps
print("\n",(data.sort_values('x', ascending=True).head(10)['x']))
print("\n",(data.sort_values('x', ascending=False).head(10)['x']))
```

```
Intervalo dos Valores: 4.869999999999999

Tamanho das Bins: 0.004869999999999999

 31596    765.0
31600    765.0
31598    767.0
31599    772.0
31601    774.0
31591    778.0
14       778.0
31592    782.0
31593    782.0
31597    782.0
Name: x, dtype: float64

 24739    1765.0
22140    1759.0
25562    1759.0
25749    1753.0
23121    1749.0
22251    1749.0
26242    1747.0
25250    1747.0
24211    1743.0
25717    1741.0
Name: x, dtype: float64
```

Y

```
bins=1000
min = np.min(data['y'])
max = np.max(data['y'])
inter=max-min
print("\nIntervalo dos Valores:",inter)
gaps=inter/bins
print("\nTamanho das Bins:",gaps)
data['y'] = data['y'] //gaps
```

```
print("\n",(data.sort_values('y', ascending=True).head(10)['y']))
print("\n",(data.sort_values('y', ascending=False).head(10)['y']))
```

```
Intervalo dos Valores: 4.870000000000001

Tamanho das Bins: 0.004870000000000001

 31600    755.0
31598    761.0
31596    761.0
31601    763.0
31599    765.0
14       770.0
31591    774.0
31597    774.0
31593    776.0
38276    776.0
Name: y, dtype: float64

 26242    1755.0
24739    1751.0
25717    1751.0
22140    1751.0
26223    1747.0
22251    1745.0
25749    1743.0
26133    1743.0
25562    1741.0
26321    1741.0
Name: y, dtype: float64
```

Z

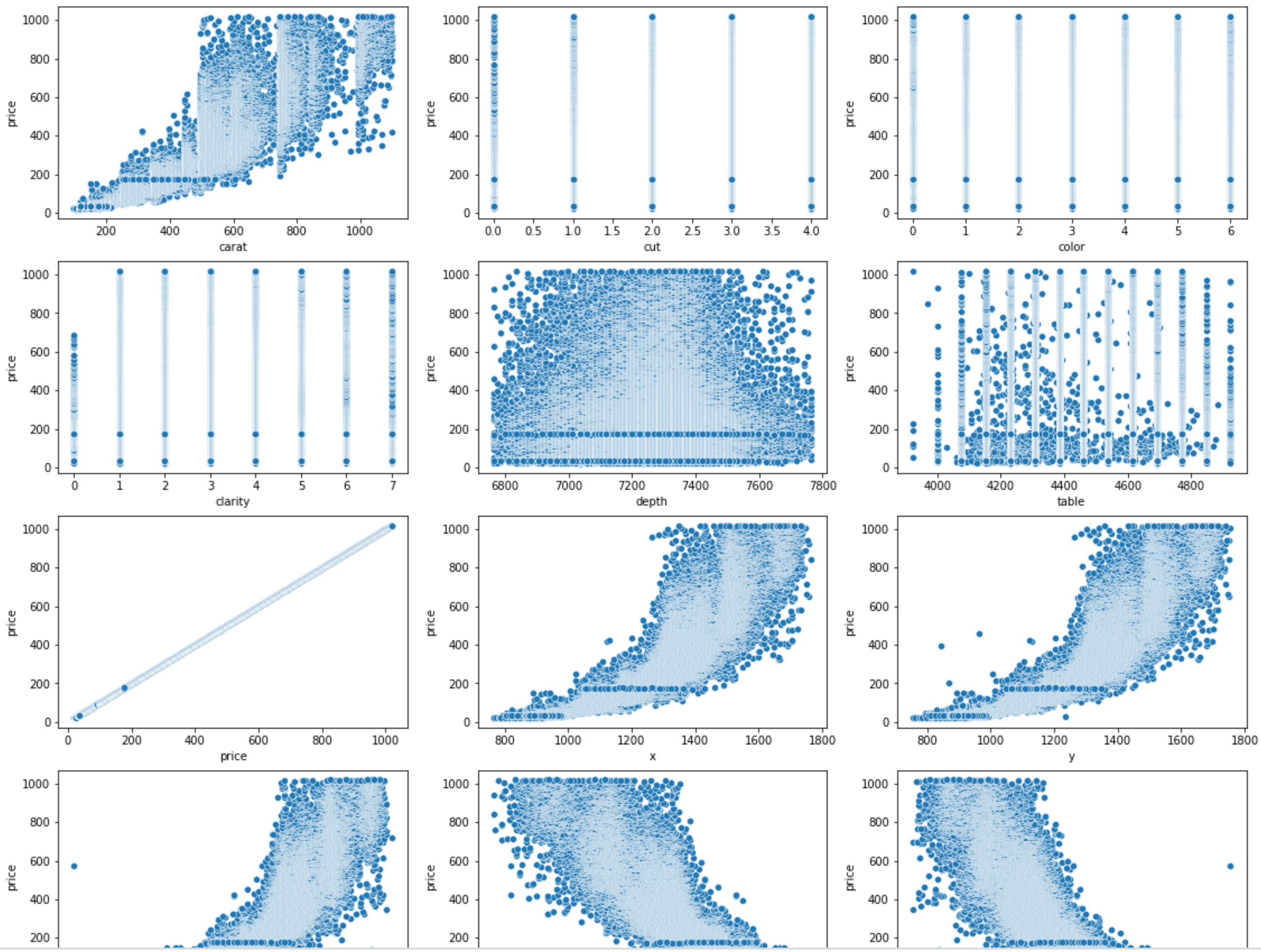
```
bins=1000
min = np.min(data['z'])
max = np.max(data['z'])
inter=max-min
print(inter)
gaps=inter/bins
print(gaps)
data['z'] = data['z'] //gaps
print((data.sort_values('z', ascending=True).head(10)['z']))
print((data.sort_values('z', ascending=False).head(10)['z']))
```

```
3.7699999999999996
0.0037699999999999995
20694    405.0
39246    546.0
31592    594.0
47138    596.0
31591    599.0
14       602.0
31594    604.0
38278    607.0
31595    610.0
38279    610.0
```

```
Name: z, dtype: float64
23194    1405.0
23690    1387.0
13118    1387.0
25305    1387.0
23513    1387.0
24536    1387.0
24396    1384.0
24857    1384.0
25225    1384.0
23841    1381.0
Name: z, dtype: float64
```

Relação entre o preço e os demais atributos

```
i = 1
plt.figure(figsize=(19, 16))
for c in data.columns:
    plt.subplot(4, 3, i)
    sns.scatterplot(x=data[c], y=data['price'])
    i+=1
```



✓ 6s conclusão: 07:53