dataset-eda-feature-engineering

August 10, 2024

1 Data Analysis on Laptop Dataset

```
[195]: import pandas as pd
       import numpy as np
       import matplotlib.pyplot as plt
       import seaborn as sns
       import warnings
       warnings.filterwarnings('ignore')
       from sklearn.preprocessing import StandardScaler
       from sklearn.model_selection import train_test_split
       from sklearn.linear_model import LinearRegression
       from sklearn.tree import DecisionTreeRegressor
       from sklearn.ensemble import RandomForestRegressor
       from sklearn.ensemble import AdaBoostRegressor
       from sklearn.ensemble import GradientBoostingRegressor
[196]: df=pd.read_csv("laptop_data.csv")
[197]: df
[197]:
             Unnamed: O Company
                                            TypeName
                                                      Inches \
                                           Ultrabook
                                                        13.3
                          Apple
       1
                                           Ultrabook
                                                        13.3
                          Apple
       2
                      2
                             ΗP
                                            Notebook
                                                        15.6
       3
                      3
                          Apple
                                           Ultrabook
                                                        15.4
                      4
                          Apple
                                           Ultrabook
                                                        13.3
                   1298 Lenovo
                                  2 in 1 Convertible
                                                        14.0
       1298
       1299
                                 2 in 1 Convertible
                                                        13.3
                   1299 Lenovo
       1300
                   1300
                         Lenovo
                                            Notebook
                                                        14.0
       1301
                   1301
                             ΗP
                                            Notebook
                                                        15.6
       1302
                   1302
                                            Notebook
                                                        15.6
                           Asus
```

ScreenResolution \

```
0
                     IPS Panel Retina Display 2560x1600
       1
                                                 1440x900
       2
                                       Full HD 1920x1080
       3
                      IPS Panel Retina Display 2880x1800
                      IPS Panel Retina Display 2560x1600
              IPS Panel Full HD / Touchscreen 1920x1080
       1298
             IPS Panel Quad HD+ / Touchscreen 3200x1800
       1299
       1300
                                                 1366x768
       1301
                                                 1366x768
       1302
                                                 1366x768
                                                Cpu
                                                      Ram
                                                                         Memory \
       0
                              Intel Core i5 2.3GHz
                                                      8GB
                                                                      128GB SSD
                              Intel Core i5 1.8GHz
       1
                                                      8GB
                                                            128GB Flash Storage
       2
                        Intel Core i5 7200U 2.5GHz
                                                      8GB
                                                                      256GB SSD
       3
                              Intel Core i7 2.7GHz
                                                     16GB
                                                                      512GB SSD
       4
                              Intel Core i5 3.1GHz
                                                                      256GB SSD
                                                      8GB
       1298
                        Intel Core i7 6500U 2.5GHz
                                                                      128GB SSD
                                                      4GB
                        Intel Core i7 6500U 2.5GHz
                                                                      512GB SSD
       1299
                                                     16GB
             Intel Celeron Dual Core N3050 1.6GHz
                                                             64GB Flash Storage
       1300
                                                      2GB
       1301
                        Intel Core i7 6500U 2.5GHz
                                                      6GB
                                                                        1TB HDD
       1302
            Intel Celeron Dual Core N3050 1.6GHz
                                                      4GB
                                                                      500GB HDD
                                                  OpSys
                                                         Weight
                                                                        Price
                                       Gpu
             Intel Iris Plus Graphics 640
       0
                                                  macOS
                                                         1.37kg
                                                                   71378.6832
       1
                   Intel HD Graphics 6000
                                                  macOS
                                                         1.34kg
                                                                   47895.5232
       2
                    Intel HD Graphics 620
                                                  No OS
                                                         1.86kg
                                                                   30636.0000
                        AMD Radeon Pro 455
       3
                                                  macOS
                                                         1.83kg
                                                                  135195.3360
       4
             Intel Iris Plus Graphics 650
                                                  macOS
                                                         1.37kg
                                                                   96095.8080
                    Intel HD Graphics 520
       1298
                                             Windows 10
                                                           1.8kg
                                                                   33992.6400
       1299
                     Intel HD Graphics 520
                                             Windows 10
                                                          1.3kg
                                                                   79866.7200
       1300
                         Intel HD Graphics
                                             Windows 10
                                                          1.5kg
                                                                   12201.1200
       1301
                        AMD Radeon R5 M330
                                             Windows 10
                                                         2.19kg
                                                                   40705.9200
       1302
                         Intel HD Graphics
                                                          2.2kg
                                            Windows 10
                                                                   19660.3200
       [1303 rows x 12 columns]
      df.shape
[198]: (1303, 12)
```

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

[198]:

[199]:

df.info()

RangeIndex: 1303 entries, 0 to 1302 Data columns (total 12 columns):

| # | Column | Non-Null Count | Dtype |
|----|------------------|----------------|---------|
| | | | |
| 0 | Unnamed: 0 | 1303 non-null | int64 |
| 1 | Company | 1303 non-null | object |
| 2 | TypeName | 1303 non-null | object |
| 3 | Inches | 1303 non-null | float64 |
| 4 | ScreenResolution | 1303 non-null | object |
| 5 | Cpu | 1303 non-null | object |
| 6 | Ram | 1303 non-null | object |
| 7 | Memory | 1303 non-null | object |
| 8 | Gpu | 1303 non-null | object |
| 9 | OpSys | 1303 non-null | object |
| 10 | Weight | 1303 non-null | object |
| 11 | Price | 1303 non-null | float64 |
| _ | | | |

dtypes: float64(2), int64(1), object(9)

memory usage: 122.3+ KB

[200]: df.describe()

| [200]: | | Unnamed: 0 | Inches | Price |
|--------|-------|------------|-------------|---------------|
| | count | 1303.00000 | 1303.000000 | 1303.000000 |
| | mean | 651.00000 | 15.017191 | 59870.042910 |
| | std | 376.28801 | 1.426304 | 37243.201786 |
| | min | 0.00000 | 10.100000 | 9270.720000 |
| | 25% | 325.50000 | 14.000000 | 31914.720000 |
| | 50% | 651.00000 | 15.600000 | 52054.560000 |
| | 75% | 976.50000 | 15.600000 | 79274.246400 |
| | max | 1302.00000 | 18.400000 | 324954.720000 |

[201]: df.describe(include=object)

[201]: Company TypeName ScreenResolution Cpu Ram 1303 count 1303 1303 1303 1303 unique 19 40 118 9 top Dell Notebook Full HD 1920x1080 Intel Core i5 7200U 2.5GHz 8GB freq 297 727 507 190 619

| | ${	t Memory}$ | | Gpu | OpSys | Weight |
|--------|---------------|----------|--------------|------------|--------|
| count | 1303 | | 1303 | 1303 | 1303 |
| unique | 39 | | 110 | 9 | 179 |
| top | 256GB SSD | Intel HD | Graphics 620 | Windows 10 | 2.2kg |
| freq | 412 | | 281 | 1072 | 121 |

[202]: df.isnull().sum()/len(df)*100

```
[202]: Unnamed: 0
                            0.0
                            0.0
       Company
       TypeName
                            0.0
       Inches
                            0.0
       ScreenResolution
                            0.0
       Cpu
                            0.0
       Ram
                            0.0
       Memory
                            0.0
                            0.0
       Gpu
       OpSys
                            0.0
                            0.0
       Weight
       Price
                            0.0
       dtype: float64
[203]: df.duplicated().sum()/len(df)*100
[203]: 0.0
[204]:
       df.head()
[204]:
          Unnamed: 0 Company
                                                                      ScreenResolution
                                TypeName
                                          Inches
                                                   IPS Panel Retina Display 2560x1600
       0
                   0
                        Apple
                               Ultrabook
                                             13.3
       1
                               Ultrabook
                   1
                        Apple
                                             13.3
                                                                              1440x900
       2
                   2
                           ΗP
                                Notebook
                                             15.6
                                                                    Full HD 1920x1080
       3
                               Ultrabook
                                             15.4
                                                   IPS Panel Retina Display 2880x1800
                   3
                        Apple
                        Apple Ultrabook
                                             13.3
                                                   IPS Panel Retina Display 2560x1600
                                                           Memory \
                                  Cpu
                                        Ram
       0
                Intel Core i5 2.3GHz
                                        8GB
                                                        128GB SSD
       1
                Intel Core i5 1.8GHz
                                        8GB
                                              128GB Flash Storage
       2
          Intel Core i5 7200U 2.5GHz
                                        8GB
                                                        256GB SSD
       3
                Intel Core i7 2.7GHz
                                       16GB
                                                        512GB SSD
       4
                Intel Core i5 3.1GHz
                                        8GB
                                                        256GB SSD
                                    Gpu OpSys Weight
                                                               Price
          Intel Iris Plus Graphics 640
                                         macOS
                                                          71378.6832
                                                 1.37kg
       1
                Intel HD Graphics 6000
                                         macOS
                                                 1.34kg
                                                          47895.5232
       2
                 Intel HD Graphics 620
                                         No OS
                                                 1.86kg
                                                          30636.0000
                    AMD Radeon Pro 455
       3
                                         macOS
                                                 1.83kg
                                                         135195.3360
          Intel Iris Plus Graphics 650
                                         macOS
                                                 1.37kg
                                                          96095.8080
          Data Cleaning
```

```
[205]: df.drop(columns=['Unnamed: 0'],inplace=True)

[206]: df
```

```
TypeName
[206]:
            Company
                                           Inches
       0
              Apple
                               Ultrabook
                                             13.3
       1
              Apple
                               Ultrabook
                                             13.3
       2
                 HP
                                Notebook
                                             15.6
       3
              Apple
                               Ultrabook
                                             15.4
       4
              Apple
                               Ultrabook
                                             13.3
       1298
             Lenovo
                      2 in 1 Convertible
                                             14.0
             Lenovo
       1299
                      2 in 1 Convertible
                                             13.3
       1300
             Lenovo
                                Notebook
                                             14.0
       1301
                 HP
                                Notebook
                                             15.6
       1302
               Asus
                                Notebook
                                             15.6
                                         ScreenResolution
       0
                      IPS Panel Retina Display 2560x1600
       1
                                                  1440x900
       2
                                        Full HD 1920x1080
       3
                      IPS Panel Retina Display 2880x1800
       4
                      IPS Panel Retina Display 2560x1600
       1298
              IPS Panel Full HD / Touchscreen 1920x1080
             IPS Panel Quad HD+ / Touchscreen 3200x1800
       1299
       1300
                                                  1366x768
       1301
                                                  1366x768
       1302
                                                  1366x768
                                                 Cpu
                                                       Ram
                                                                          Memory \
       0
                              Intel Core i5 2.3GHz
                                                       8GB
                                                                       128GB SSD
                              Intel Core i5 1.8GHz
       1
                                                       8GB
                                                            128GB Flash Storage
       2
                        Intel Core i5 7200U 2.5GHz
                                                       8GB
                                                                       256GB SSD
       3
                              Intel Core i7 2.7GHz
                                                      16GB
                                                                       512GB SSD
       4
                              Intel Core i5 3.1GHz
                                                       8GB
                                                                       256GB SSD
       1298
                        Intel Core i7 6500U 2.5GHz
                                                                       128GB SSD
                                                       4GB
                        Intel Core i7 6500U 2.5GHz
                                                                       512GB SSD
       1299
                                                      16GB
             Intel Celeron Dual Core N3050 1.6GHz
       1300
                                                       2GB
                                                             64GB Flash Storage
       1301
                        Intel Core i7 6500U 2.5GHz
                                                       6GB
                                                                         1TB HDD
       1302
             Intel Celeron Dual Core N3050 1.6GHz
                                                       4GB
                                                                       500GB HDD
                                        Gpu
                                                   0pSys
                                                          Weight
                                                                         Price
       0
             Intel Iris Plus Graphics 640
                                                   macOS
                                                          1.37kg
                                                                    71378.6832
       1
                    Intel HD Graphics 6000
                                                   macOS
                                                          1.34kg
                                                                    47895.5232
       2
                     Intel HD Graphics 620
                                                   No OS
                                                          1.86kg
                                                                    30636.0000
       3
                        AMD Radeon Pro 455
                                                   macOS
                                                          1.83kg
                                                                   135195.3360
             Intel Iris Plus Graphics 650
       4
                                                   macOS
                                                          1.37kg
                                                                    96095.8080
       1298
                     Intel HD Graphics 520
                                             Windows 10
                                                                    33992.6400
                                                           1.8kg
```

```
1299
                    Intel HD Graphics 520
                                            Windows 10
                                                         1.3kg
                                                                 79866.7200
       1300
                        Intel HD Graphics
                                            Windows 10
                                                                  12201.1200
                                                         1.5kg
       1301
                       AMD Radeon R5 M330
                                            Windows 10
                                                        2.19kg
                                                                 40705.9200
       1302
                        Intel HD Graphics
                                            Windows 10
                                                         2.2kg
                                                                 19660.3200
       [1303 rows x 11 columns]
[207]:
       df['Ram'] = df['Ram'].str.replace("GB","")
      df['Ram']=df['Ram'].astype(int)
[209]:
       df.info()
      <class 'pandas.core.frame.DataFrame'>
      RangeIndex: 1303 entries, 0 to 1302
      Data columns (total 11 columns):
       #
           Column
                              Non-Null Count
                                              Dtype
           _____
                              _____
                              1303 non-null
                                              object
       0
           Company
           TypeName
                                              object
       1
                              1303 non-null
       2
           Inches
                              1303 non-null
                                              float64
           ScreenResolution 1303 non-null
                                              object
       4
                              1303 non-null
           Cpu
                                              object
       5
           Ram
                              1303 non-null
                                              int32
       6
                              1303 non-null
                                              object
           Memory
       7
           Gpu
                              1303 non-null
                                              object
       8
           OpSys
                              1303 non-null
                                              object
       9
                              1303 non-null
           Weight
                                              object
       10 Price
                              1303 non-null
                                              float64
      dtypes: float64(2), int32(1), object(8)
      memory usage: 107.0+ KB
[210]: df['Weight']=df['Weight'].str.replace("kg","")
[211]:
      df['Weight']=df['Weight'].astype(float)
[212]: df.info()
      <class 'pandas.core.frame.DataFrame'>
      RangeIndex: 1303 entries, 0 to 1302
      Data columns (total 11 columns):
       #
           Column
                              Non-Null Count
                                              Dtype
                              _____
       0
           Company
                              1303 non-null
                                              object
       1
           TypeName
                              1303 non-null
                                              object
       2
           Inches
                              1303 non-null
                                              float64
           ScreenResolution 1303 non-null
                                              object
```

```
Cpu
                                        object
 4
                       1303 non-null
 5
     {\tt Ram}
                       1303 non-null
                                        int32
                       1303 non-null
                                        object
 6
     Memory
 7
     Gpu
                       1303 non-null
                                        object
     OpSys
                       1303 non-null
 8
                                        object
 9
     Weight
                       1303 non-null
                                        float64
10 Price
                       1303 non-null
                                        float64
dtypes: float64(3), int32(1), object(7)
memory usage: 107.0+ KB
```

| [213]: | df | | | | | | | |
|--------|----------|----------|-------------------------|-------------|----------|---------|--------------|---|
| [213]: | | Company | TypeName | Inches \ | | | | |
| | 0 | Apple | Ultrabook | 13.3 | | | | |
| | 1 | Apple | Ultrabook | 13.3 | | | | |
| | 2 | HP | Notebook | 15.6 | | | | |
| | 3 | Apple | Ultrabook | 15.4 | | | | |
| | 4 | Apple | Ultrabook | 13.3 | | | | |
| | ••• | ••• | | | | | | |
| | 1298 | Lenovo | 2 in 1 Convertible | 14.0 | | | | |
| | 1299 | Lenovo | 2 in 1 Convertible | 13.3 | | | | |
| | 1300 | Lenovo | Notebook | 14.0 | | | | |
| | 1301 | HP | Notebook | 15.6 | | | | |
| | 1302 | Asus | Notebook | 15.6 | | | | |
| | | | _ | | | , | | |
| | • | | | ScreenResol | | \ | | |
| | 0 | | IPS Panel Retina Di | | | | | |
| | 1 | | Г. | | 0x900 | | | |
| | 2 | | | ill HD 1920 | | | | |
| | 3 4 | | IPS Panel Retina Di | | | | | |
| | _ | | IPS Panel Retina Di | Ispiay 2560 | X1000 | | | |
| | 1298 | TPS Pa | nel Full HD / Touchs | screen 1920 | 1080 | | | |
| | 1299 | | nel Quad HD+ / Touchs | | | | | |
| | 1300 | 110 1011 | ior quad lib. / rodolic | | 6x768 | | | |
| | 1301 | | | | 6x768 | | | |
| | 1302 | | | | 6x768 | | | |
| | | | | | | | | |
| | | | | Cpu | Ram | | Memory | \ |
| | 0 | | Intel Core | i5 2.3GHz | 8 | | 128GB SSD | |
| | 1 | | Intel Core | i5 1.8GHz | 8 | 128GB F | lash Storage | |
| | 2 | | Intel Core i5 720 |)OU 2.5GHz | 8 | | 256GB SSD | |
| | 3 | | Intel Core | i7 2.7GHz | 16 | | 512GB SSD | |
| | 4 | | Intel Core | i5 3.1GHz | 8 | | 256GB SSD | |
| | ••• | | | | | | ••• | |
| | 1298 | | Intel Core i7 650 |)OU 2.5GHz | 4 | | 128GB SSD | |
| | 1299 | | Intel Core i7 650 |)OU 2.5GHz | 16 | | 512GB SSD | |

```
1300
     Intel Celeron Dual Core N3050 1.6GHz
                                                2
                                                    64GB Flash Storage
1301
                 Intel Core i7 6500U 2.5GHz
                                                6
                                                                1TB HDD
1302 Intel Celeron Dual Core N3050 1.6GHz
                                                4
                                                              500GB HDD
                                Gpu
                                           OpSys
                                                  Weight
                                                                 Price
0
      Intel Iris Plus Graphics 640
                                           macOS
                                                     1.37
                                                            71378.6832
1
            Intel HD Graphics 6000
                                           macOS
                                                     1.34
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                     1.86
                                                            30636.0000
3
                AMD Radeon Pro 455
                                           macOS
                                                     1.83
                                                           135195.3360
4
      Intel Iris Plus Graphics 650
                                                     1.37
                                                            96095.8080
                                           macOS
1298
             Intel HD Graphics 520
                                      Windows 10
                                                    1.80
                                                            33992.6400
1299
             Intel HD Graphics 520
                                      Windows 10
                                                    1.30
                                                            79866.7200
1300
                  Intel HD Graphics
                                      Windows 10
                                                    1.50
                                                            12201.1200
1301
                AMD Radeon R5 M330
                                      Windows 10
                                                    2.19
                                                            40705.9200
1302
                  Intel HD Graphics
                                     Windows 10
                                                    2.20
                                                            19660.3200
```

[1303 rows x 11 columns]

```
[214]: df['OpSys'].value_counts()
```

| [214]: | Windows 10 | 1072 |
|--------|--------------|------|
| | No OS | 66 |
| | Linux | 62 |
| | Windows 7 | 45 |
| | Chrome OS | 27 |
| | macOS | 13 |
| | Windows 10 S | 8 |
| | Mac OS X | 8 |
| | Android | 2 |

Name: OpSys, dtype: int64

Exploratory data analysis

[215]: df [215]: Company TypeName Inches \ 13.3 0 Apple Ultrabook 1 Apple Ultrabook 13.3 2 ΗP Notebook 15.6 3 Apple Ultrabook 15.4 4 Apple Ultrabook 13.3 1298 Lenovo 2 in 1 Convertible 14.0 1299 Lenovo 2 in 1 Convertible 13.3 1300 Lenovo Notebook 14.0

```
1301
          ΗP
                         Notebook
                                      15.6
1302
                                      15.6
        Asus
                         Notebook
                                  ScreenResolution
0
              IPS Panel Retina Display 2560x1600
1
                                          1440x900
2
                                Full HD 1920x1080
3
              IPS Panel Retina Display 2880x1800
4
              IPS Panel Retina Display 2560x1600
       IPS Panel Full HD / Touchscreen 1920x1080
1298
1299
      IPS Panel Quad HD+ / Touchscreen 3200x1800
1300
                                          1366x768
1301
                                          1366x768
1302
                                          1366x768
                                         Cpu
                                              Ram
                                                                 Memory \
0
                       Intel Core i5 2.3GHz
                                                8
                                                              128GB SSD
                       Intel Core i5 1.8GHz
1
                                                8
                                                   128GB Flash Storage
2
                 Intel Core i5 7200U 2.5GHz
                                                8
                                                              256GB SSD
3
                       Intel Core i7 2.7GHz
                                               16
                                                              512GB SSD
4
                       Intel Core i5 3.1GHz
                                                              256GB SSD
                Intel Core i7 6500U 2.5GHz
                                                              128GB SSD
1298
                                                4
                Intel Core i7 6500U 2.5GHz
1299
                                               16
                                                              512GB SSD
1300
      Intel Celeron Dual Core N3050 1.6GHz
                                                2
                                                    64GB Flash Storage
                 Intel Core i7 6500U 2.5GHz
                                                                1TB HDD
1301
                                                6
     Intel Celeron Dual Core N3050 1.6GHz
                                                              500GB HDD
                                           OpSys
                                                  Weight
                                Gpu
                                                                 Price
0
      Intel Iris Plus Graphics 640
                                           macOS
                                                    1.37
                                                            71378.6832
1
            Intel HD Graphics 6000
                                           macOS
                                                    1.34
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                    1.86
                                                            30636.0000
3
                 AMD Radeon Pro 455
                                           macOS
                                                    1.83
                                                          135195.3360
      Intel Iris Plus Graphics 650
                                           macOS
                                                    1.37
                                                            96095.8080
1298
             Intel HD Graphics 520
                                                           33992.6400
                                      Windows 10
                                                    1.80
1299
             Intel HD Graphics 520
                                      Windows 10
                                                           79866.7200
                                                    1.30
1300
                  Intel HD Graphics
                                      Windows 10
                                                    1.50
                                                            12201.1200
1301
                AMD Radeon R5 M330
                                     Windows 10
                                                    2.19
                                                            40705.9200
1302
                 Intel HD Graphics
                                     Windows 10
                                                    2.20
                                                            19660.3200
```

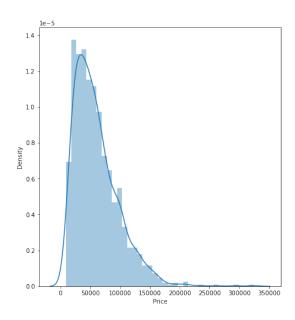
[1303 rows x 11 columns]

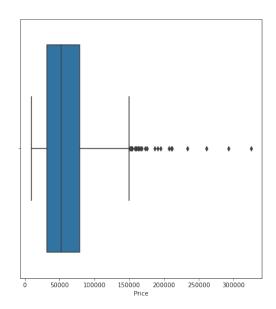
4 1. Target Feature

```
[216]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.distplot(df['Price'])

plt.subplot(1,2,2)
  sns.boxplot(df['Price'])
```

[216]: <AxesSubplot:xlabel='Price'>

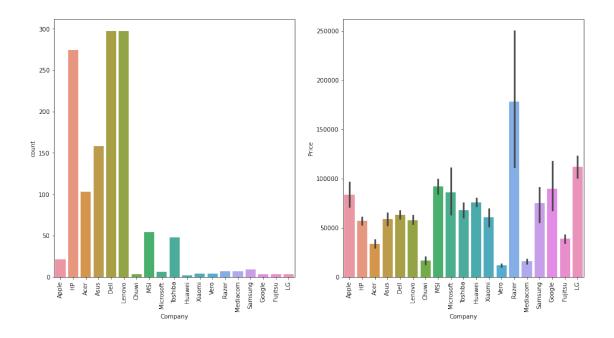




5 2 Company Feature

```
[217]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['Company'])
  plt.xticks(rotation=90)

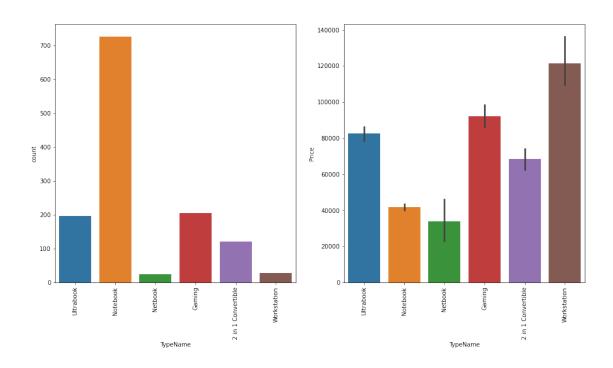
  plt.subplot(1,2,2)
  sns.barplot(df['Company'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



6 3 Type name feature

```
[218]: plt.figure(figsize=(16,8))
   plt.subplot(1,2,1)
   sns.countplot(df['TypeName'])
   plt.xticks(rotation=90)

plt.subplot(1,2,2)
   sns.barplot(df['TypeName'],df['Price'],data=df)
   plt.xticks(rotation=90)
   plt.show()
```

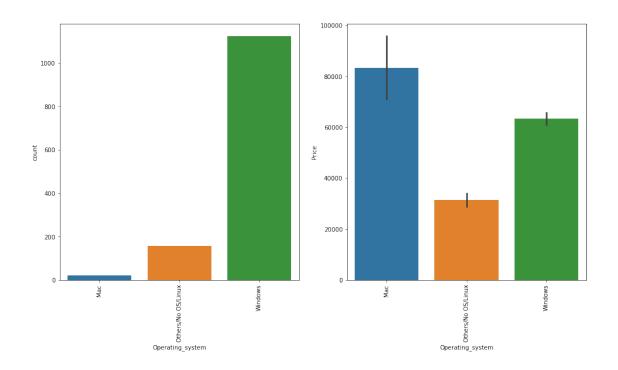


```
[219]: def cat_os(inp):
    if inp == 'Windows 10' or inp == 'Windows 7' or inp == 'Windows 10 S':
        return 'Windows'
    elif inp == 'macOS' or inp == 'Mac OS X':
        return 'Mac'
    else:
        return 'Others/No OS/Linux'
[220]: df['Operating_system']=df['OpSys'].apply(cat_os)
```

7 4 Operating_System Feature

```
[221]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['Operating_system'])
  plt.xticks(rotation=90)

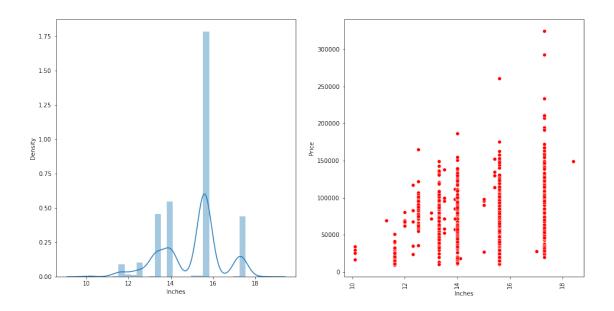
plt.subplot(1,2,2)
  sns.barplot(df['Operating_system'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



8 5 Inches Feature

```
[222]: plt.figure(figsize=(16,8))
   plt.subplot(1,2,1)
   sns.distplot(df['Inches'])

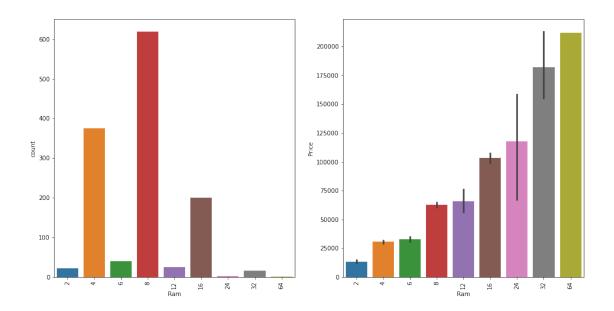
plt.subplot(1,2,2)
   sns.scatterplot(df['Inches'],df['Price'],color='red',data=df)
   plt.xticks(rotation=90)
   plt.show()
```



9 6 Ram Feature

```
[223]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['Ram'])
  plt.xticks(rotation=90)

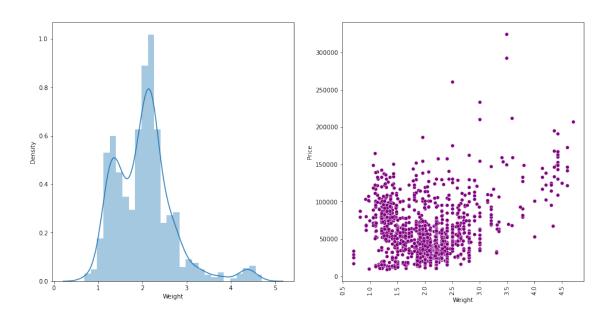
plt.subplot(1,2,2)
  sns.barplot(df['Ram'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



10 7 Weight Features

```
[224]: plt.figure(figsize=(16,8))
plt.subplot(1,2,1)
sns.distplot(df['Weight'])

plt.subplot(1,2,2)
sns.scatterplot(df['Weight'],df['Price'],color='purple',data=df)
plt.xticks(rotation=90)
plt.show()
```



11 Feature Engineering

```
[225]: df['ScreenResolution'].value_counts()
[225]: Full HD 1920x1080
                                                          507
       1366x768
                                                          281
       IPS Panel Full HD 1920x1080
                                                          230
       IPS Panel Full HD / Touchscreen 1920x1080
                                                           53
       Full HD / Touchscreen 1920x1080
                                                           47
       1600x900
                                                           23
       Touchscreen 1366x768
                                                           16
       Quad HD+ / Touchscreen 3200x1800
                                                           15
       IPS Panel 4K Ultra HD 3840x2160
                                                           12
       IPS Panel 4K Ultra HD / Touchscreen 3840x2160
                                                           11
       4K Ultra HD / Touchscreen 3840x2160
                                                           10
       4K Ultra HD 3840x2160
                                                            7
       IPS Panel 1366x768
                                                            7
       Touchscreen 2560x1440
                                                            7
       IPS Panel Quad HD+ / Touchscreen 3200x1800
                                                            6
       IPS Panel Retina Display 2560x1600
                                                            6
       Touchscreen 2256x1504
                                                            6
       IPS Panel Retina Display 2304x1440
                                                            6
       IPS Panel Touchscreen 2560x1440
                                                            5
       1440x900
                                                            4
       IPS Panel Retina Display 2880x1800
       IPS Panel Touchscreen 1920x1200
                                                            4
       IPS Panel 2560x1440
```

```
IPS Panel Quad HD+ 2560x1440
                                                            3
       Touchscreen 2400x1600
       Quad HD+ 3200x1800
                                                            3
                                                            3
       2560x1440
       IPS Panel Touchscreen 1366x768
                                                            3
       1920x1080
                                                            3
       IPS Panel Quad HD+ 3200x1800
                                                            2
       IPS Panel Full HD 2160x1440
                                                            2
                                                            2
       IPS Panel Touchscreen / 4K Ultra HD 3840x2160
       IPS Panel Full HD 1920x1200
                                                            1
       IPS Panel Retina Display 2736x1824
       IPS Panel Full HD 2560x1440
                                                            1
       Touchscreen / Quad HD+ 3200x1800
                                                            1
       Touchscreen / Full HD 1920x1080
                                                            1
       Touchscreen / 4K Ultra HD 3840x2160
                                                            1
       IPS Panel Full HD 1366x768
                                                            1
       IPS Panel Touchscreen 2400x1600
                                                            1
       Name: ScreenResolution, dtype: int64
[226]: df['TouchScreen']=df['ScreenResolution'].apply(lambda x:1 if 'Touchscreen' in_
        \rightarrowx else 0)
[227]:
       df
[227]:
            Company
                                TypeName
                                          Inches \
       0
              Apple
                               Ultrabook
                                            13.3
       1
              Apple
                               Ultrabook
                                            13.3
       2
                 ΗP
                                Notebook
                                            15.6
       3
              Apple
                               Ultrabook
                                            15.4
       4
              Apple
                               Ultrabook
                                            13.3
       1298 Lenovo 2 in 1 Convertible
                                            14.0
       1299 Lenovo 2 in 1 Convertible
                                            13.3
       1300 Lenovo
                                Notebook
                                            14.0
       1301
                 HP
                                Notebook
                                            15.6
       1302
               Asus
                                Notebook
                                            15.6
                                        ScreenResolution \
       0
                     IPS Panel Retina Display 2560x1600
       1
                                                 1440x900
       2
                                       Full HD 1920x1080
                     IPS Panel Retina Display 2880x1800
       3
       4
                     IPS Panel Retina Display 2560x1600
              IPS Panel Full HD / Touchscreen 1920x1080
       1298
             IPS Panel Quad HD+ / Touchscreen 3200x1800
       1299
       1300
                                                 1366x768
```

3

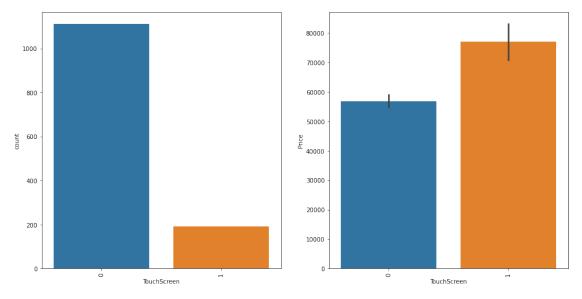
```
1301
                                          1366x768
1302
                                          1366x768
                                         Cpu
                                              Ram
                                                                  Memory \
0
                       Intel Core i5 2.3GHz
                                                 8
                                                               128GB SSD
1
                       Intel Core i5 1.8GHz
                                                 8
                                                    128GB Flash Storage
2
                 Intel Core i5 7200U 2.5GHz
                                                 8
                                                               256GB SSD
3
                       Intel Core i7 2.7GHz
                                                16
                                                               512GB SSD
                       Intel Core i5 3.1GHz
4
                                                               256GB SSD
                 Intel Core i7 6500U 2.5GHz
                                                               128GB SSD
1298
1299
                 Intel Core i7 6500U 2.5GHz
                                                16
                                                               512GB SSD
1300
      Intel Celeron Dual Core N3050 1.6GHz
                                                 2
                                                     64GB Flash Storage
1301
                 Intel Core i7 6500U 2.5GHz
                                                 6
                                                                 1TB HDD
1302 Intel Celeron Dual Core N3050 1.6GHz
                                                               500GB HDD
                                 Gpu
                                           OpSys
                                                  Weight
                                                                  Price
0
      Intel Iris Plus Graphics 640
                                           macOS
                                                     1.37
                                                            71378.6832
            Intel HD Graphics 6000
                                                     1.34
1
                                           macOS
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                     1.86
                                                            30636.0000
3
                 AMD Radeon Pro 455
                                           macOS
                                                     1.83
                                                           135195.3360
4
      Intel Iris Plus Graphics 650
                                                     1.37
                                                             96095.8080
                                           macOS
1298
             Intel HD Graphics 520
                                      Windows 10
                                                     1.80
                                                            33992.6400
1299
             Intel HD Graphics 520
                                      Windows 10
                                                     1.30
                                                            79866.7200
1300
                  Intel HD Graphics
                                      Windows 10
                                                     1.50
                                                            12201.1200
1301
                 AMD Radeon R5 M330
                                                            40705.9200
                                      Windows 10
                                                     2.19
1302
                  Intel HD Graphics
                                      Windows 10
                                                     2.20
                                                            19660.3200
        Operating_system
                           TouchScreen
0
                                      0
                      Mac
1
                                      0
                      Mac
2
      Others/No OS/Linux
3
                      Mac
4
                      Mac
                                      0
1298
                  Windows
                                      1
1299
                  Windows
                                      1
1300
                  Windows
                                      0
1301
                  Windows
                                      0
1302
                  Windows
```

[1303 rows x 13 columns]

12 8 TouchScreen Feature

```
[228]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['TouchScreen'])
  plt.xticks(rotation=90)

plt.subplot(1,2,2)
  sns.barplot(df['TouchScreen'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



```
df['IPS']=df['ScreenResolution'].apply(lambda x:1 if 'IPS' in x else 0)
[229]:
[230]:
      df
[230]:
            Company
                                TypeName
                                           Inches
                               Ultrabook
       0
              Apple
                                             13.3
       1
              Apple
                               Ultrabook
                                             13.3
       2
                 ΗP
                                Notebook
                                             15.6
       3
                               Ultrabook
                                             15.4
              Apple
       4
                                             13.3
              Apple
                               Ultrabook
                      2 in 1 Convertible
                                             14.0
       1298
             Lenovo
                      2 in 1 Convertible
                                             13.3
       1299
             Lenovo
       1300
             Lenovo
                                Notebook
                                             14.0
       1301
                 ΗP
                                Notebook
                                             15.6
       1302
                Asus
                                Notebook
                                             15.6
```

```
ScreenResolution
              IPS Panel Retina Display 2560x1600
0
1
                                          1440x900
2
                                 Full HD 1920x1080
3
              IPS Panel Retina Display 2880x1800
4
              IPS Panel Retina Display 2560x1600
       IPS Panel Full HD / Touchscreen 1920x1080
1298
1299
      IPS Panel Quad HD+ / Touchscreen 3200x1800
1300
                                          1366x768
1301
                                          1366x768
1302
                                          1366x768
                                         Cpu
                                                                  Memory
                                              Ram
0
                       Intel Core i5 2.3GHz
                                                 8
                                                               128GB SSD
                                                 8
1
                       Intel Core i5 1.8GHz
                                                    128GB Flash Storage
2
                 Intel Core i5 7200U 2.5GHz
                                                 8
                                                              256GB SSD
3
                       Intel Core i7 2.7GHz
                                                16
                                                              512GB SSD
                       Intel Core i5 3.1GHz
                                                              256GB SSD
                                                 8
                 Intel Core i7 6500U 2.5GHz
1298
                                                 4
                                                              128GB SSD
1299
                 Intel Core i7 6500U 2.5GHz
                                                              512GB SSD
                                                16
      Intel Celeron Dual Core N3050 1.6GHz
                                                 2
1300
                                                     64GB Flash Storage
1301
                 Intel Core i7 6500U 2.5GHz
                                                 6
                                                                 1TB HDD
1302
     Intel Celeron Dual Core N3050 1.6GHz
                                                              500GB HDD
                                                  Weight
                                 Gpu
                                           0pSys
                                                                  Price
      Intel Iris Plus Graphics 640
                                                            71378.6832
0
                                           macOS
                                                     1.37
                                           macOS
1
            Intel HD Graphics 6000
                                                     1.34
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                     1.86
                                                            30636.0000
3
                 AMD Radeon Pro 455
                                                     1.83
                                                           135195.3360
                                           macOS
4
                                                     1.37
      Intel Iris Plus Graphics 650
                                           macOS
                                                            96095.8080
1298
             Intel HD Graphics 520
                                      Windows 10
                                                     1.80
                                                            33992.6400
1299
             Intel HD Graphics 520
                                      Windows 10
                                                     1.30
                                                            79866.7200
1300
                  Intel HD Graphics
                                      Windows 10
                                                     1.50
                                                            12201.1200
1301
                 AMD Radeon R5 M330
                                      Windows 10
                                                            40705.9200
                                                     2.19
1302
                  Intel HD Graphics
                                      Windows 10
                                                     2.20
                                                            19660.3200
        Operating_system
                           TouchScreen
                                         IPS
0
                      Mac
                      Mac
1
2
      Others/No OS/Linux
                                      0
                                           0
3
                                      0
                      Mac
                                           1
4
                                      0
                      Mac
                                           1
```

```
      1298
      Windows
      1
      1

      1299
      Windows
      1
      1

      1300
      Windows
      0
      0

      1301
      Windows
      0
      0

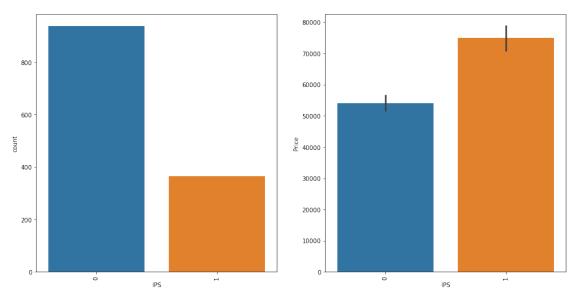
      1302
      Windows
      0
      0
```

[1303 rows x 14 columns]

13 9 IPS Feature

```
[231]: plt.figure(figsize=(16,8))
   plt.subplot(1,2,1)
   sns.countplot(df['IPS'])
   plt.xticks(rotation=90)

plt.subplot(1,2,2)
   sns.barplot(df['IPS'],df['Price'],data=df)
   plt.xticks(rotation=90)
   plt.show()
```



```
TypeName
[233]:
            Company
                                           Inches
       0
              Apple
                               Ultrabook
                                              13.3
       1
              Apple
                               Ultrabook
                                             13.3
       2
                 HP
                                Notebook
                                             15.6
       3
              Apple
                               Ultrabook
                                             15.4
       4
              Apple
                               Ultrabook
                                              13.3
       1298
             Lenovo
                      2 in 1 Convertible
                                             14.0
       1299
             Lenovo
                      2 in 1 Convertible
                                             13.3
       1300
             Lenovo
                                Notebook
                                             14.0
       1301
                 HP
                                Notebook
                                              15.6
       1302
               Asus
                                Notebook
                                              15.6
                                         ScreenResolution
       0
                      IPS Panel Retina Display 2560x1600
       1
                                                  1440x900
       2
                                        Full HD 1920x1080
       3
                      IPS Panel Retina Display 2880x1800
       4
                      IPS Panel Retina Display 2560x1600
       1298
              IPS Panel Full HD / Touchscreen 1920x1080
             IPS Panel Quad HD+ / Touchscreen 3200x1800
       1299
       1300
                                                  1366x768
       1301
                                                  1366x768
       1302
                                                  1366x768
                                                 Cpu
                                                      Ram
                                                                         Memory
       0
                              Intel Core i5 2.3GHz
                                                        8
                                                                      128GB SSD
                               Intel Core i5 1.8GHz
       1
                                                        8
                                                           128GB Flash Storage
       2
                        Intel Core i5 7200U 2.5GHz
                                                        8
                                                                      256GB SSD
       3
                              Intel Core i7 2.7GHz
                                                                      512GB SSD
                                                       16
       4
                              Intel Core i5 3.1GHz
                                                        8
                                                                      256GB SSD
       1298
                        Intel Core i7 6500U 2.5GHz
                                                        4
                                                                      128GB SSD
                        Intel Core i7 6500U 2.5GHz
                                                                      512GB SSD
       1299
                                                       16
             Intel Celeron Dual Core N3050 1.6GHz
                                                        2
       1300
                                                            64GB Flash Storage
       1301
                        Intel Core i7 6500U 2.5GHz
                                                        6
                                                                        1TB HDD
       1302
             Intel Celeron Dual Core N3050 1.6GHz
                                                                      500GB HDD
                                        Gpu
                                                   0pSys
                                                          Weight
                                                                         Price
       0
             Intel Iris Plus Graphics 640
                                                   macOS
                                                            1.37
                                                                    71378.6832
       1
                    Intel HD Graphics 6000
                                                            1.34
                                                   macOS
                                                                    47895.5232
       2
                     Intel HD Graphics 620
                                                   No OS
                                                            1.86
                                                                    30636.0000
       3
                        AMD Radeon Pro 455
                                                   macOS
                                                            1.83
                                                                   135195.3360
             Intel Iris Plus Graphics 650
       4
                                                   macOS
                                                            1.37
                                                                    96095.8080
       1298
                     Intel HD Graphics 520
                                                            1.80
                                                                    33992.6400
                                             Windows 10
```

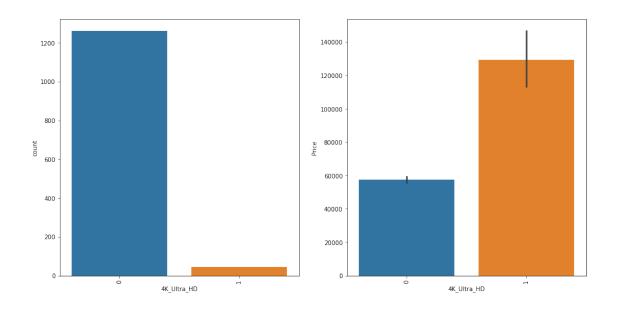
| 1299 | Intel HD Gra | phics 520 | Wi | ndows | 10 | 1.30 | 79866.7200 |
|------|--------------------|-----------|----|-------|-------|--------|------------|
| 1300 | Intel HD | Graphics | Wi | ndows | 10 | 1.50 | 12201.1200 |
| 1301 | AMD Radeo | n R5 M330 | Wi | ndows | 10 | 2.19 | 40705.9200 |
| 1302 | Intel HD | Graphics | Wi | ndows | 10 | 2.20 | 19660.3200 |
| | | - | | | | | |
| | Operating_system | TouchScre | en | IPS | 4K_U1 | tra_HD | |
| 0 | Mac | | 0 | 1 | | 0 | |
| 1 | Mac | | 0 | 0 | | 0 | |
| 2 | Others/No OS/Linux | | 0 | 0 | | 0 | |
| 3 | Mac | | 0 | 1 | | 0 | |
| 4 | Mac | | 0 | 1 | | 0 | |
| | ••• | | | | ••• | | |
| 1298 | Windows | | 1 | 1 | | 0 | |
| 1299 | Windows | | 1 | 1 | | 0 | |
| 1300 | Windows | | 0 | 0 | | 0 | |
| 1301 | Windows | | 0 | 0 | | 0 | |
| 1302 | Windows | | 0 | 0 | | 0 | |
| | | | | | | | |
| | | | | | | | |

[1303 rows x 15 columns]

$14 10 4K_Ultra_Hd$ Features

```
[234]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['4K_Ultra_HD'])
  plt.xticks(rotation=90)

plt.subplot(1,2,2)
  sns.barplot(df['4K_Ultra_HD'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



```
[235]: df["Cpu"].value_counts()
[235]: Intel Core i5 7200U 2.5GHz
                                                190
       Intel Core i7 7700HQ 2.8GHz
                                                146
       Intel Core i7 7500U 2.7GHz
                                                134
       Intel Core i7 8550U 1.8GHz
                                                  73
       Intel Core i5 8250U 1.6GHz
                                                  72
       Intel Core i7 2.9GHz
                                                   1
       Intel Core i3 6100U 2.1GHz
                                                   1
       Intel Pentium Dual Core 4405U 2.1GHz
                                                   1
       Intel Atom x5-Z8300 1.44GHz
                                                   1
       Intel Celeron Quad Core N3710 1.6GHz
                                                   1
       Name: Cpu, Length: 118, dtype: int64
      df['CPU_Name']=df['Cpu'].apply(lambda x:" ".join(x.split()[0:3]))
[237]: df
[237]:
            Company
                                TypeName
                                          Inches
       0
              Apple
                               Ultrabook
                                            13.3
                               Ultrabook
              Apple
       1
                                            13.3
       2
                 ΗP
                                Notebook
                                            15.6
       3
              Apple
                               Ultrabook
                                            15.4
       4
              Apple
                               Ultrabook
                                            13.3
                     2 in 1 Convertible
                                            14.0
       1298
             Lenovo
       1299
             Lenovo 2 in 1 Convertible
                                            13.3
```

```
1300
      Lenovo
                         Notebook
                                      14.0
1301
          HP
                         Notebook
                                      15.6
1302
        Asus
                         Notebook
                                      15.6
                                  ScreenResolution
0
              IPS Panel Retina Display 2560x1600
1
                                          1440x900
2
                                Full HD 1920x1080
3
               IPS Panel Retina Display 2880x1800
               IPS Panel Retina Display 2560x1600
1298
       IPS Panel Full HD / Touchscreen 1920x1080
1299
      IPS Panel Quad HD+ / Touchscreen 3200x1800
1300
                                          1366x768
1301
                                          1366x768
1302
                                          1366x768
                                         Cpu
                                              Ram
                                                                  Memory
                                                 8
0
                       Intel Core i5 2.3GHz
                                                               128GB SSD
                       Intel Core i5 1.8GHz
                                                 8
                                                    128GB Flash Storage
1
2
                 Intel Core i5 7200U 2.5GHz
                                                 8
                                                              256GB SSD
3
                       Intel Core i7 2.7GHz
                                                              512GB SSD
                                                16
4
                       Intel Core i5 3.1GHz
                                                              256GB SSD
                                                 8
1298
                 Intel Core i7 6500U 2.5GHz
                                                               128GB SSD
                                                 4
1299
                 Intel Core i7 6500U 2.5GHz
                                                16
                                                              512GB SSD
      Intel Celeron Dual Core N3050 1.6GHz
                                                     64GB Flash Storage
1300
                                                 2
1301
                 Intel Core i7 6500U 2.5GHz
                                                 6
                                                                 1TB HDD
1302
     Intel Celeron Dual Core N3050 1.6GHz
                                                 4
                                                              500GB HDD
                                 Gpu
                                           OpSys
                                                   Weight
                                                                  Price
0
      Intel Iris Plus Graphics 640
                                           macOS
                                                     1.37
                                                            71378.6832
1
            Intel HD Graphics 6000
                                           macOS
                                                     1.34
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                     1.86
                                                            30636.0000
3
                 AMD Radeon Pro 455
                                                     1.83
                                                           135195.3360
                                           macOS
                                                     1.37
4
      Intel Iris Plus Graphics 650
                                           macOS
                                                            96095.8080
1298
             Intel HD Graphics 520
                                      Windows 10
                                                     1.80
                                                            33992.6400
1299
             Intel HD Graphics 520
                                      Windows 10
                                                     1.30
                                                            79866.7200
1300
                  Intel HD Graphics
                                      Windows 10
                                                     1.50
                                                            12201.1200
                 AMD Radeon R5 M330
1301
                                      Windows 10
                                                     2.19
                                                            40705.9200
1302
                  Intel HD Graphics
                                      Windows 10
                                                     2.20
                                                            19660.3200
        Operating_system TouchScreen
                                         IPS
                                              4K_Ultra_HD
                                                                       CPU_Name
0
                                                         0
                                      0
                                           1
                                                                  Intel Core i5
                      Mac
                                           0
1
                                      0
                                                         0
                                                                  Intel Core i5
                      Mac
2
                                      0
                                           0
      Others/No OS/Linux
                                                         0
                                                                  Intel Core i5
```

```
4
                                                                       Intel Core i5
                            Mac
                                                 1
                                                                       Intel Core i7
       1298
                        Windows
                                            1
       1299
                        Windows
                                            1
                                                                       Intel Core i7
                                                 1
       1300
                                                                 Intel Celeron Dual
                        Windows
                                            0
                                                 0
       1301
                        Windows
                                            0
                                                 0
                                                                       Intel Core i7
       1302
                                                                 Intel Celeron Dual
                        Windows
                                                 0
       [1303 rows x 16 columns]
[238]: def fetch_processor(text):
           if text== "Intel Core i7" or text=='Intel Core i5' or text=="Intel Core i3":
               return text
           else:
               if text.split()[0] == 'Intel':
                   return 'Intel Other Processor'
               else:
                   return 'AMD Processor'
[239]: df['CPU_BRAND']=df['CPU_Name'].apply(fetch_processor)
[240]: df
[240]:
            Company
                               TypeName
                                          Inches \
       0
              Apple
                              Ultrabook
                                            13.3
       1
              Apple
                              Ultrabook
                                            13.3
       2
                 HP
                               Notebook
                                            15.6
       3
              Apple
                               Ultrabook
                                            15.4
              Apple
                               Ultrabook
                                            13.3
       1298 Lenovo
                                            14.0
                     2 in 1 Convertible
       1299
            Lenovo 2 in 1 Convertible
                                            13.3
       1300
            Lenovo
                                Notebook
                                            14.0
       1301
                 ΗP
                               Notebook
                                            15.6
       1302
               Asus
                               Notebook
                                            15.6
                                        ScreenResolution \
       0
                     IPS Panel Retina Display 2560x1600
       1
                                                1440x900
                                       Full HD 1920x1080
       3
                     IPS Panel Retina Display 2880x1800
       4
                     IPS Panel Retina Display 2560x1600
              IPS Panel Full HD / Touchscreen 1920x1080
       1298
             IPS Panel Quad HD+ / Touchscreen 3200x1800
       1299
       1300
                                                1366x768
```

1

Intel Core i7

3

Mac

```
1301
                                          1366x768
1302
                                          1366x768
                                         Cpu
                                              Ram
                                                                  Memory \
0
                       Intel Core i5 2.3GHz
                                                 8
                                                               128GB SSD
1
                       Intel Core i5 1.8GHz
                                                 8
                                                    128GB Flash Storage
2
                 Intel Core i5 7200U 2.5GHz
                                                 8
                                                               256GB SSD
3
                       Intel Core i7 2.7GHz
                                                16
                                                               512GB SSD
4
                                                               256GB SSD
                       Intel Core i5 3.1GHz
                                                 8
                 Intel Core i7 6500U 2.5GHz
1298
                                                               128GB SSD
1299
                 Intel Core i7 6500U 2.5GHz
                                                16
                                                               512GB SSD
1300
      Intel Celeron Dual Core N3050 1.6GHz
                                                 2
                                                     64GB Flash Storage
1301
                 Intel Core i7 6500U 2.5GHz
                                                 6
                                                                 1TB HDD
1302 Intel Celeron Dual Core N3050 1.6GHz
                                                               500GB HDD
                                           OpSys
                                                   Weight
                                 Gpu
                                                                  Price
0
      Intel Iris Plus Graphics 640
                                                     1.37
                                           macOS
                                                            71378.6832
            Intel HD Graphics 6000
                                                     1.34
1
                                           macOS
                                                            47895.5232
2
             Intel HD Graphics 620
                                           No OS
                                                     1.86
                                                            30636.0000
3
                 AMD Radeon Pro 455
                                           macOS
                                                     1.83
                                                           135195.3360
                                                             96095.8080
4
      Intel Iris Plus Graphics 650
                                                     1.37
                                           macOS
1298
             Intel HD Graphics 520
                                      Windows 10
                                                     1.80
                                                            33992.6400
1299
             Intel HD Graphics 520
                                      Windows 10
                                                     1.30
                                                            79866.7200
1300
                  Intel HD Graphics
                                      Windows 10
                                                     1.50
                                                            12201.1200
                 AMD Radeon R5 M330
                                      Windows 10
1301
                                                     2.19
                                                            40705.9200
1302
                  Intel HD Graphics Windows 10
                                                     2.20
                                                            19660.3200
                                                                       CPU_Name
        Operating_system
                          TouchScreen
                                              4K_Ultra_HD
                                         IPS
0
                                                         0
                                                                  Intel Core i5
                      Mac
                                           1
1
                                      0
                                           0
                                                         0
                                                                  Intel Core i5
                      Mac
2
      Others/No OS/Linux
                                           0
                                                                  Intel Core i5
3
                                                                  Intel Core i7
                      Mac
                                      0
4
                      Mac
                                      0
                                                                  Intel Core i5
                                           1
1298
                                                         0
                                                                  Intel Core i7
                  Windows
                                      1
                                           1
1299
                  Windows
                                      1
                                                                  Intel Core i7
                                           1
                                                         0
1300
                  Windows
                                      0
                                           0
                                                         0
                                                            Intel Celeron Dual
1301
                 Windows
                                      0
                                           0
                                                                  Intel Core i7
1302
                 Windows
                                                            Intel Celeron Dual
                                           0
                   CPU BRAND
0
              Intel Core i5
1
              Intel Core i5
2
              Intel Core i5
3
              Intel Core i7
```

```
1298
                      Intel Core i7
       1299
                      Intel Core i7
       1300
             Intel Other Processor
       1301
                      Intel Core i7
       1302
             Intel Other Processor
       [1303 rows x 17 columns]
      df.drop(columns=['Cpu', 'ScreenResolution', 'CPU_Name'],inplace=True)
[242]: df
[242]:
                                                                        Memory \
            Company
                                 TypeName
                                            Inches
                                                    Ram
                                Ultrabook
                                                                     128GB SSD
       0
               Apple
                                              13.3
                                                       8
       1
                                                       8
               Apple
                                Ultrabook
                                              13.3
                                                          128GB Flash Storage
       2
                  HP
                                              15.6
                                                       8
                                 Notebook
                                                                     256GB SSD
       3
               Apple
                                Ultrabook
                                              15.4
                                                      16
                                                                     512GB SSD
       4
                                              13.3
                                                       8
                                                                     256GB SSD
               Apple
                                Ultrabook
       1298
                      2 in 1 Convertible
                                              14.0
                                                       4
                                                                     128GB SSD
             Lenovo
       1299
             Lenovo
                      2 in 1 Convertible
                                              13.3
                                                                     512GB SSD
                                                      16
       1300
                                                       2
             Lenovo
                                 Notebook
                                              14.0
                                                           64GB Flash Storage
       1301
                  ΗP
                                 Notebook
                                              15.6
                                                       6
                                                                       1TB HDD
       1302
                Asus
                                 Notebook
                                              15.6
                                                       4
                                                                     500GB HDD
                                                                          Price
                                        Gpu
                                                   OpSys
                                                           Weight
       0
              Intel Iris Plus Graphics 640
                                                   macOS
                                                             1.37
                                                                     71378.6832
       1
                    Intel HD Graphics 6000
                                                   macOS
                                                             1.34
                                                                     47895.5232
       2
                     Intel HD Graphics 620
                                                   No OS
                                                             1.86
                                                                     30636.0000
       3
                        AMD Radeon Pro 455
                                                   macOS
                                                             1.83
                                                                    135195.3360
       4
              Intel Iris Plus Graphics 650
                                                   macOS
                                                             1.37
                                                                     96095.8080
       1298
                     Intel HD Graphics 520
                                              Windows 10
                                                             1.80
                                                                     33992.6400
       1299
                     Intel HD Graphics 520
                                              Windows 10
                                                             1.30
                                                                     79866.7200
       1300
                         Intel HD Graphics
                                              Windows 10
                                                             1.50
                                                                     12201.1200
       1301
                        AMD Radeon R5 M330
                                              Windows 10
                                                             2.19
                                                                     40705.9200
       1302
                                                             2.20
                         Intel HD Graphics
                                              Windows 10
                                                                     19660.3200
                                                                                  CPU BRAND
                Operating_system TouchScreen
                                                 IPS
                                                       4K Ultra HD
       0
                              Mac
                                                   1
                                                                             Intel Core i5
       1
                              Mac
                                              0
                                                   0
                                                                 0
                                                                             Intel Core i5
       2
              Others/No OS/Linux
                                              0
                                                   0
                                                                 0
                                                                             Intel Core i5
                                                                             Intel Core i7
       3
                              Mac
                                              0
                                                   1
                                                                 0
       4
                                              0
                                                                 0
                                                                             Intel Core i5
                              Mac
                                                   1
```

4

Intel Core i5

```
1298
                                                                  Intel Core i7
                 Windows
                                          1
                                                       0
1299
                 Windows
                                    1
                                                                  Intel Core i7
                                          1
                                                       0
1300
                 Windows
                                         0
                                                       O Intel Other Processor
                                                                  Intel Core i7
1301
                 Windows
                                         0
1302
                 Windows
                                          0
                                                       O Intel Other Processor
```

[1303 rows x 14 columns]

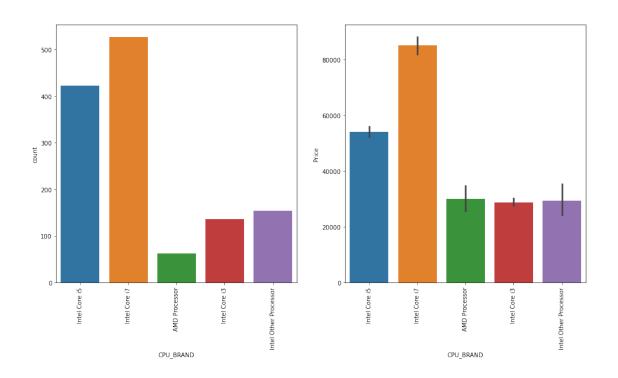
```
[243]: df['CPU_BRAND'].value_counts()
```

```
[243]: Intel Core i7 527
Intel Core i5 423
Intel Other Processor 154
Intel Core i3 136
AMD Processor 63
Name: CPU_BRAND, dtype: int64
```

15 11 CPU_BRAND feature

```
[244]: plt.figure(figsize=(16,8))
   plt.subplot(1,2,1)
   sns.countplot(df['CPU_BRAND'])
   plt.xticks(rotation=90)

   plt.subplot(1,2,2)
   sns.barplot(df['CPU_BRAND'],df['Price'],data=df)
   plt.xticks(rotation=90)
   plt.show()
```



[245]: df['Memory'].value_counts()

| [245]: | 256GB SSD | 412 |
|--------|---------------------|-----|
| | 1TB HDD | 223 |
| | 500GB HDD | 132 |
| | 512GB SSD | 118 |
| | 128GB SSD + 1TB HDD | 94 |
| | 128GB SSD | 76 |
| | 256GB SSD + 1TB HDD | 73 |
| | 32GB Flash Storage | 38 |
| | 2TB HDD | 16 |
| | 64GB Flash Storage | 15 |
| | 512GB SSD + 1TB HDD | 14 |
| | 1TB SSD | 14 |
| | 256GB SSD + 2TB HDD | 10 |
| | 1.0TB Hybrid | 9 |
| | 256GB Flash Storage | 8 |
| | 16GB Flash Storage | 7 |
| | 32GB SSD | 6 |
| | 180GB SSD | 5 |
| | 128GB Flash Storage | 4 |
| | 512GB SSD + 2TB HDD | 3 |
| | 16GB SSD | 3 |
| | 128GB SSD + 2TB HDD | 2 |
| | 1TB SSD + 1TB HDD | 2 |

```
512GB Flash Storage
                                           2
       256GB SSD + 500GB HDD
                                           2
       256GB SSD + 256GB SSD
                                           2
       64GB Flash Storage + 1TB HDD
       8GB SSD
                                           1
       512GB SSD + 256GB SSD
                                           1
       64GB SSD
                                           1
       256GB SSD + 1.0TB Hybrid
                                           1
       128GB HDD
                                           1
       1TB HDD + 1TB HDD
                                           1
       240GB SSD
                                           1
       508GB Hybrid
       1.OTB HDD
                                           1
       32GB HDD
                                           1
       512GB SSD + 1.0TB Hybrid
                                           1
       512GB SSD + 512GB SSD
                                           1
       Name: Memory, dtype: int64
[246]: df['Memory'] = df['Memory'].astype(str).replace('\.0', '', regex=True)
       df["Memory"] = df["Memory"].str.replace('GB', '')
       df["Memory"] = df["Memory"].str.replace('TB', '000')
       new = df["Memory"].str.split("+", n = 1, expand = True)
       df["first"] = new[0]
       df["first"]=df["first"].str.strip()
       df["second"] = new[1]
       df["Layer1HDD"] = df["first"].apply(lambda x: 1 if "HDD" in x else 0)
       df["Layer1SSD"] = df["first"].apply(lambda x: 1 if "SSD" in x else 0)
       df["Layer1Hybrid"] = df["first"].apply(lambda x: 1 if "Hybrid" in x else 0)
       df["Layer1Flash_Storage"] = df["first"].apply(lambda x: 1 if "Flash Storage" in_
        \rightarrowx else 0)
       df['first'] = df['first'].str.replace(r'\D', '')
       df["second"].fillna("0", inplace = True)
       df["Layer2HDD"] = df["second"].apply(lambda x: 1 if "HDD" in x else 0)
       df["Layer2SSD"] = df["second"].apply(lambda x: 1 if "SSD" in x else 0)
       df["Layer2Hybrid"] = df["second"].apply(lambda x: 1 if "Hybrid" in x else 0)
       df["Layer2Flash_Storage"] = df["second"].apply(lambda x: 1 if "Flash Storage"
        \rightarrowin x else 0)
       df['second'] = df['second'].str.replace(r'\D', '')
       df["first"] = df["first"].astype(int)
```

```
df["second"] = df["second"].astype(int)
       df["HDD"]=(df["first"]*df["Layer1HDD"]+df["second"]*df["Layer2HDD"])
       df["SSD"]=(df["first"]*df["Layer1SSD"]+df["second"]*df["Layer2SSD"])
       df["Hybrid"]=(df["first"]*df["Layer1Hybrid"]+df["second"]*df["Layer2Hybrid"])
       df["Flash_Storage"]=(df["first"]*df["Layer1Flash_Storage"]+df["second"]*df["Layer2Flash_Storage"]
       df.drop(columns=['first', 'second', 'Layer1HDD', 'Layer1SSD', 'Layer1Hybrid',
               'Layer1Flash_Storage', 'Layer2HDD', 'Layer2SSD', 'Layer2Hybrid',
               'Layer2Flash_Storage'],inplace=True)
[247]:
      df
[247]:
            Company
                                TypeName
                                           Inches
                                                   Ram
                                                                    Memory \
       0
              Apple
                               Ultrabook
                                             13.3
                                                     8
                                                                   128 SSD
       1
              Apple
                               Ultrabook
                                             13.3
                                                     8
                                                         128 Flash Storage
       2
                 HP
                                Notebook
                                             15.6
                                                     8
                                                                   256 SSD
       3
                                             15.4
              Apple
                               Ultrabook
                                                     16
                                                                   512 SSD
       4
              Apple
                               Ultrabook
                                             13.3
                                                                   256 SSD
       1298
             Lenovo
                      2 in 1 Convertible
                                             14.0
                                                     4
                                                                   128 SSD
       1299
             Lenovo 2 in 1 Convertible
                                             13.3
                                                     16
                                                                   512 SSD
       1300 Lenovo
                                Notebook
                                             14.0
                                                     2
                                                          64 Flash Storage
       1301
                 HP
                                Notebook
                                             15.6
                                                      6
                                                                  1000 HDD
       1302
                                Notebook
                                             15.6
                                                     4
                                                                   500 HDD
               Asus
                                        Gpu
                                                  OpSys
                                                          Weight
                                                                        Price
             Intel Iris Plus Graphics 640
       0
                                                  macOS
                                                            1.37
                                                                   71378.6832
       1
                    Intel HD Graphics 6000
                                                  macOS
                                                            1.34
                                                                   47895.5232
       2
                     Intel HD Graphics 620
                                                  No OS
                                                            1.86
                                                                   30636.0000
       3
                        AMD Radeon Pro 455
                                                  macOS
                                                            1.83
                                                                  135195.3360
       4
             Intel Iris Plus Graphics 650
                                                  macOS
                                                            1.37
                                                                   96095.8080
       1298
                     Intel HD Graphics 520
                                             Windows 10
                                                            1.80
                                                                   33992.6400
       1299
                     Intel HD Graphics 520
                                             Windows 10
                                                            1.30
                                                                   79866.7200
       1300
                         Intel HD Graphics
                                             Windows 10
                                                            1.50
                                                                   12201.1200
       1301
                        AMD Radeon R5 M330
                                             Windows 10
                                                            2.19
                                                                   40705.9200
       1302
                         Intel HD Graphics
                                             Windows 10
                                                            2.20
                                                                   19660.3200
                                                IPS
                                                      4K_Ultra_HD
               Operating_system
                                  TouchScreen
       0
       1
                             Mac
                                             0
                                                  0
                                                                0
       2
             Others/No OS/Linux
                                             0
                                                  0
                                                                0
       3
                                             0
                                                                0
                             Mac
                                                  1
       4
                             Mac
                                             0
                                                  1
                                                                0
```

1

1

1298

Windows

0

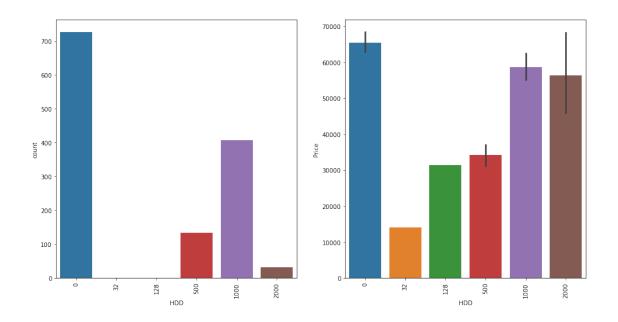
| 1299 | | Windows | | 1 | 1 | 0 |
|------|-------|-----------------|------|-----|--------|---------------|
| 1300 | | Windows | | 0 | 0 | 0 |
| 1301 | | Windows | | 0 | 0 | 0 |
| 1302 | | Windows | | 0 | 0 | 0 |
| | | | | | | |
| | | CPU_BRAND | HDD | SSD | Hybrid | Flash_Storage |
| 0 | | Intel Core i5 | 0 | 128 | 0 | 0 |
| 1 | | Intel Core i5 | 0 | 0 | 0 | 128 |
| 2 | | Intel Core i5 | 0 | 256 | 0 | 0 |
| 3 | | Intel Core i7 | 0 | 512 | 0 | 0 |
| 4 | | Intel Core i5 | 0 | 256 | 0 | 0 |
| ••• | | | ••• | ••• | | ••• |
| 1298 | | Intel Core i7 | 0 | 128 | 0 | 0 |
| 1299 | | Intel Core i7 | 0 | 512 | 0 | 0 |
| 1300 | Intel | Other Processor | 0 | 0 | 0 | 64 |
| 1301 | | Intel Core i7 | 1000 | 0 | 0 | 0 |
| 1302 | Intel | Other Processor | 500 | 0 | 0 | 0 |
| | | | | | | |

[1303 rows x 18 columns]

16 12 HDD Feature

```
[248]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['HDD'])
  plt.xticks(rotation=90)

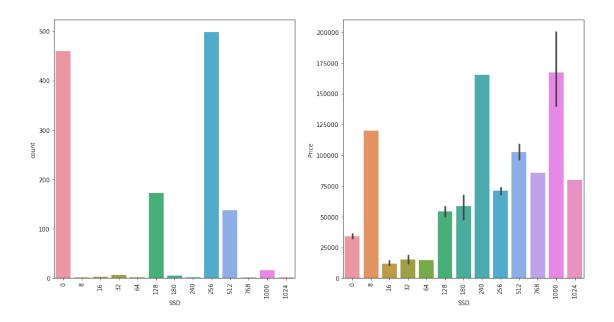
plt.subplot(1,2,2)
  sns.barplot(df['HDD'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



17 13 SSD Feature

```
[249]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['SSD'])
  plt.xticks(rotation=90)

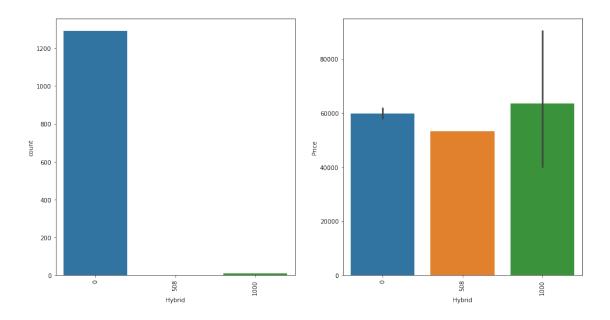
plt.subplot(1,2,2)
  sns.barplot(df['SSD'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



18 14 Hybrid Feature

```
[250]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['Hybrid'])
  plt.xticks(rotation=90)

plt.subplot(1,2,2)
  sns.barplot(df['Hybrid'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



| [251]: | <pre>df.drop(columns=['Memory'],inplace=True)</pre> | |
|--------|---|--|
| | 1 · · · · · · · · · · · · · · · · · · · | |

| [252] | df |
|-------|-----------|
| 1 202 | u u i |

| df | | | | | | | | | | | |
|------------------------------|---|--|--|---|--|--|--|---|--|---|---|
| | Company | | F | Γ ype N ame | Inche | es Ram | | | | Gpu | \ |
| 0 | Apple | | U. | ltrabook | 13. | .3 8 | Intel | Iris 1 | Plus Graphics | 640 | |
| 1 | Apple | | U | ltrabook | 13. | .3 8 | | Intel | HD Graphics | 6000 | |
| 2 | HP | | I | Notebook | 15. | .6 8 | | Inte | l HD Graphics | 620 | |
| 3 | Apple | | U | ltrabook | 15. | .4 16 | | Al | MD Radeon Pro | 455 | |
| 4 | Apple | | U. | ltrabook | 13. | .3 8 | Intel | Iris 1 | Plus Graphics | 650 | |
| ••• | | | | | ••• | | | | ••• | | |
| 1298 | Lenovo | 2 i | n 1 Con | vertible | | | | | _ | | |
| 1299 | Lenovo | 2 i | n 1 Con | vertible | 13. | .3 16 | | Inte | l HD Graphics | 520 | |
| 1300 | Lenovo | | 1 | Notebook | | | | | Intel HD Grap | hics | |
| | HP | | I | Notebook | 15. | .6 6 | | | | | |
| 1302 | Asus | | I | Notebook | 15. | .6 4 | | | Intel HD Grap | hics | |
| | | | | | | | | | | | |
| | 0 | C | 11 | т |): | 0 | | | T | TDC | \ |
| 0 | _ | Sys | Weight | | Price | Oper | ating_sy | | TouchScreen | IPS | \ |
| 0 | ma | cOS | 1.37 | 71378 | .6832 | Oper | ating_sy | Mac | 0 | 1 | \ |
| 1 | ma ma | cOS cOS | 1.37 1.34 | 71378 47895 | .6832 .5232 | | | Mac Mac | 0 0 | 1 0 | \ |
| 1 2 | ma ma No | cOS cOS OS | 1.37 1.34 1.86 | 71378 47895 30636 | .6832 .5232 .0000 | | ating_sy | Mac Mac Linux | 0 0 0 | 1 0 0 | \ |
| 1 2 3 | ma ma No ma | cOS cOS OS cOS | 1.37 1.34 1.86 1.83 | 71378 47895 30636 135195 | .6832 .5232 .0000 .3360 | | | Mac Mac Linux Mac | 0 0 0 | 1 0 0 1 | \ |
| 1 2 3 4 | ma ma No ma | cOS cOS OS | 1.37 1.34 1.86 1.83 1.37 | 71378 47895 30636 135195 96095 | .6832 .5232 .0000 .3360 | | /No OS/I | Mac Mac Linux | 0 0 0 | 1 0 0 | \ |
| 1 2 3 4 | ma ma No ma ma | cOS cOS OS cOS cOS | 1.37 1.34 1.86 1.83 1.37 | 71378 47895 30636 135195 96095 | .6832 .5232 .0000 .3360 .8080 | | /No OS/I | Mac Mac Linux Mac Mac | 0 0 0 0 0 | 1 0 0 1 1 | \ |
| 1 2 3 4 | ma ma No ma | cOS cOS OS cOS cOS | 1.37 1.34 1.86 1.83 1.37 | 71378 47895 30636 135195 96095 33992 | .6832 .5232 .0000 .3360 .8080 | | /No OS/I Win | Mac Mac Linux Mac | 0 0 0 | 1 0 0 1 | \ |
| 1 2 3 4 1298 | ma ma No ma ma Windows | cOS cOS OS cOS cOS 10 | 1.37 1.34 1.86 1.83 1.37 | 71378 47895 30636 135195 96095 | .6832 .5232 .0000 .3360 .8080 | | /No OS/I Win | Mac Mac Linux Mac Mac Mac | 0 0 0 0 0 | 1 0 0 1 1 | \ |
| | 0 1 2 3 4 1298 1299 | Company O Apple 1 Apple 2 HP 3 Apple 4 Apple 1298 Lenovo 1299 Lenovo 1300 Lenovo 1301 HP | Company 0 Apple 1 Apple 2 HP 3 Apple 4 Apple 1298 Lenovo 2 i 1299 Lenovo 2 i 1300 Lenovo 1301 HP | Company | Company TypeName O Apple Ultrabook 1 Apple Ultrabook 2 HP Notebook 3 Apple Ultrabook 4 Apple Ultrabook 1298 Lenovo 2 in 1 Convertible 1299 Lenovo 2 in 1 Convertible 1300 Lenovo Notebook 1301 HP Notebook | Company TypeName Inches 0 Apple Ultrabook 13 1 Apple Ultrabook 15 2 HP Notebook 15 3 Apple Ultrabook 15 4 Apple Ultrabook 13 1298 Lenovo 2 in 1 Convertible 14 1299 Lenovo 2 in 1 Convertible 13 1300 Lenovo Notebook 14 1301 HP Notebook 15 | Company TypeName Inches Ram 0 Apple Ultrabook 13.3 8 1 Apple Ultrabook 15.6 8 2 HP Notebook 15.4 16 3 Apple Ultrabook 15.4 16 4 Apple Ultrabook 13.3 8 1298 Lenovo 2 in 1 Convertible 14.0 4 1299 Lenovo 2 in 1 Convertible 13.3 16 1300 Lenovo Notebook 14.0 2 1301 HP Notebook 15.6 6 | Company TypeName Inches Ram 0 Apple Ultrabook 13.3 8 Intel 1 Apple Ultrabook 13.3 8 2 HP Notebook 15.6 8 3 Apple Ultrabook 15.4 16 4 Apple Ultrabook 13.3 8 Intel 1298 Lenovo 2 in 1 Convertible 14.0 4 1299 Lenovo 2 in 1 Convertible 13.3 16 1300 Lenovo Notebook 14.0 2 1301 HP Notebook 15.6 6 | Company TypeName Inches Ram 0 Apple Ultrabook 13.3 8 Intel Iris 1 Apple Ultrabook 13.3 8 Intel 2 HP Notebook 15.6 8 Intel 3 Apple Ultrabook 15.4 16 Al 4 Apple Ultrabook 13.3 8 Intel Iris 1298 Lenovo 2 in 1 Convertible 14.0 4 Intel 1299 Lenovo 2 in 1 Convertible 13.3 16 Intel 1300 Lenovo Notebook 14.0 2 14.0 1301 HP Notebook 15.6 6 Al | Company TypeName Inches Ram O Apple Ultrabook 13.3 8 Intel Iris Plus Graphics 1 Apple Ultrabook 13.3 8 Intel HD Graphics 2 HP Notebook 15.6 8 Intel HD Graphics 3 Apple Ultrabook 15.4 16 AMD Radeon Pro 4 Apple Ultrabook 13.3 8 Intel Iris Plus Graphics 1298 Lenovo 2 in 1 Convertible 14.0 4 Intel HD Graphics 1299 Lenovo 2 in 1 Convertible 13.3 16 Intel HD Graphics 1300 Lenovo Notebook 14.0 2 Intel HD Graphics 1301 HP Notebook 15.6 6 AMD Radeon R5 | Company TypeName Inches Ram Gpu 0 Apple Ultrabook 13.3 8 Intel Iris Plus Graphics 640 1 Apple Ultrabook 13.3 8 Intel HD Graphics 6000 2 HP Notebook 15.6 8 Intel HD Graphics 620 3 Apple Ultrabook 15.4 16 AMD Radeon Pro 455 4 Apple Ultrabook 13.3 8 Intel Iris Plus Graphics 650 1298 Lenovo 2 in 1 Convertible 14.0 4 Intel HD Graphics 520 1299 Lenovo 2 in 1 Convertible 13.3 16 Intel HD Graphics 520 1300 Lenovo Notebook 14.0 2 Intel HD Graphics 1301 HP Notebook 15.6 6 AMD Radeon R5 M330 |

| | 1302 | Windows | 10 | 2.20 | 19660. | 3200 | | Wi | ndows | 0 0 | |
|--------|----------|------------|--|---------|------------|-----------|--------|--------|---------|-----------------|--|
| | | 4K_Ultr | a HD | | CF | PU_BRAND | HDD | SSD | Hybrid | Flash_Storage | |
| | 0 | | 0 | | | Core i5 | 0 | 128 | 0 | 0 | |
| | 1 | | 0 | | | Core i5 | | 0 | 0 | 128 | |
| | 2 | | 0 | | | Core i5 | | 256 | 0 | 0 | |
| | 3 | | 0 | | | Core i7 | | 512 | 0 | 0 | |
| | 4 | | 0 | | | Core i5 | | 256 | 0 | 0 | |
| | | | | | 111001 | 0010 10 | | | | | |
| | 1298 | ••• | 0 | | Tnt⊖l | Core i7 | 0 | | 0 | 0 | |
| | 1299 | | 0 | | | Core i7 | 0 | 512 | 0 | 0 | |
| | 1300 | | 0 | Tn+ol | Other Pr | | 0 | 0 | 0 | 64 | |
| | 1301 | | 0 | THIGH | | Core i7 | | 0 | 0 | 0 | |
| | | | 0 | Tn+ol | Other Pr | | | | 0 | | |
| | 1302 | | U | Intel | other Pi | rocessor | 500 | U | U | 0 | |
| | [1303 | 3 rows x | 17 co | lumns] | | | | | | | |
| [253]: | df['0 | pu'].val | ue_co | unts() | | | | | | | |
| F0=03 | | | | 200 | 004 | | | | | | |
| [253]: | | HD Grap | | | 281 | | | | | | |
| | | . HD Grap | | | 185 | | | | | | |
| | | . UHD Gra | _ | | 68 | | | | | | |
| | | a GeForc | | | 66 | | | | | | |
| | Nvidi | a GeForc | e GTX | 1060 | 48 | | | | | | |
| | | a = | amu | 000 | | | | | | | |
| | | a GeForc | | | 1 | | | | | | |
| | | a GeForc | | | 1 | | | | | | |
| | | .a GeForc | | | 1 | | | | | | |
| | | irePro W | | | 1 | | | | | | |
| | | adeon R5 | | | 1 | | | | | | |
| | Name: | Gpu, Le | ngth: | 110, | dtype: in | ıt64 | | | | | |
| [254]: | df['G | PU BRAND | ']=df | ['Gpu' |].apply(1 | Lambda x: | x.spli | it()[0 | 1) | | |
| | | | | - · r · | - II -J (- | | 1 | ,, _, | - | | |
| [255]: | df | | | | | | | | | | |
| [255]: | | Company | | | TypeName | Inches | Ram | | | Gpu ∖ | |
| | 0 | Apple | | U: | ltrabook | 13.3 | 8 | Intel | Iris Pl | us Graphics 640 | |
| | 1 | Apple | | U: | ltrabook | 13.3 | 8 | | Intel H | D Graphics 6000 | |
| | 2 | HP | |] | Notebook | 15.6 | 8 | | | HD Graphics 620 | |
| | 3 | Apple | | | ltrabook | 15.4 | 16 | | | Radeon Pro 455 | |
| | 4 | Apple | | | ltrabook | 13.3 | 8 | Intel | | us Graphics 650 | |
| | | | | 0. | | | Ŭ | | | | |
| | 1298 | Lenovo | 2 in | 1 Con | wertible | 14.0 | 4 | | Intel | HD Graphics 520 | |
| | 1299 | Lenovo | | | vertible | 13.3 | 16 | | | HD Graphics 520 | |
| | 1300 | Lenovo | ــــــــــــــــــــــــــــــــــــــ | | Notebook | 14.0 | 2 | | | tel HD Graphics | |
| | | | | | | | | | | _ | |
| | 1301 | HP | | | Notebook | 15.6 | 6 | | AMD | Radeon R5 M330 | |

| 1302 | Asus | I | Notebook 15 | 5.6 | 4 | | In | itel HD Grap | hics | |
|--------------------------|-------------|--------|---------------|------------|--------|-------|---------|--------------|------|---|
| | OpSys | Weight | Price | | Operat | ing s | vstem T | CouchScreen | IPS | \ |
| 0 | macOS | 1.37 | | | 1 | 0_ | Mac | 0 | 1 | • |
| 1 | macOS | 1.34 | | | | | Mac | 0 | 0 | |
| 2 | No OS | 1.86 | 30636.0000 | Ot | hers/N | o OS/ | Linux | 0 | 0 | |
| 3 | macOS | 1.83 | 135195.3360 | | | | Mac | 0 | 1 | |
| 4 | macOS | 1.37 | 96095.8080 | | | | Mac | 0 | 1 | |
| ••• | . | •• | ••• | | ••• | | ••• | ••• | | |
| 1298 | Windows 10 | 1.80 | 33992.6400 | | | Wi | ndows | 1 | 1 | |
| 1299 | Windows 10 | 1.30 | 79866.7200 | | | Wi | ndows | 1 | 1 | |
| 1300 | Windows 10 | 1.50 | 12201.1200 | | | Wi | ndows | 0 | 0 | |
| 1301 | Windows 10 | 2.19 | 40705.9200 | | | Wi | ndows | 0 | 0 | |
| 1302 | Windows 10 | 2.20 | 19660.3200 | | | Wi | ndows | 0 | 0 | |
| | 4K_Ultra_HD | | CPU_BRA | AND | HDD | SSD | Hybrid | Flash_Stor | age | \ |
| 0 | 0 | | Intel Core | i 5 | 0 | 128 | 0 | | 0 | |
| 1 | 0 | | Intel Core | i 5 | 0 | 0 | 0 | | 128 | |
| 2 | 0 | | Intel Core | i 5 | 0 | 256 | 0 | | 0 | |
| 3 | 0 | | Intel Core | | 0 | 512 | 0 | | 0 | |
| 4 | 0 | | Intel Core | i 5 | 0 | 256 | 0 | | 0 | |
| ••• | ••• | | ••• | | | | ••• | • | | |
| 1298 | 0 | | Intel Core | | 0 | 128 | 0 | | 0 | |
| 1299 | 0 | | Intel Core | | 0 | 512 | 0 | | 0 | |
| 1300 | 0 | Intel | Other Process | | 0 | 0 | 0 | | 64 | |
| 1301 | 0 | | Intel Core | | 1000 | 0 | 0 | | 0 | |
| 1302 | 0 | Intel | Other Process | sor | 500 | 0 | 0 | | 0 | |
| GPU_BRAND | | | | | | | | | | |
| 0 | Intel | | | | | | | | | |
| 1 | Intel | | | | | | | | | |
| 2 | Intel | | | | | | | | | |
| 3 | AMD | | | | | | | | | |
| 4 | Intel | | | | | | | | | |
| | | | | | | | | | | |
| 1298 | Intel | | | | | | | | | |
| 1299 | Intel | | | | | | | | | |
| 1300 | Intel | | | | | | | | | |
| 1301 | AMD | | | | | | | | | |
| 1302 | Intel | | | | | | | | | |
| [1303 rows x 18 columns] | | | | | | | | | | |

[256]: df['GPU_BRAND'].value_counts()

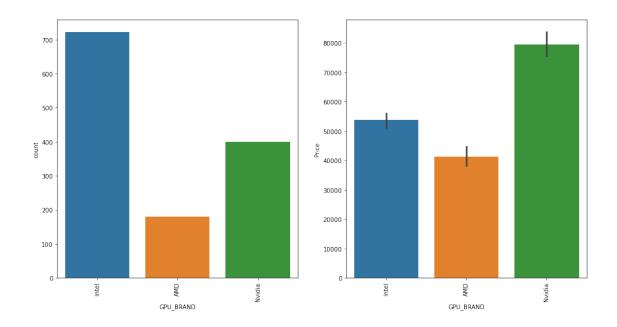
[256]: Intel 722 Nvidia 400

```
AMD
                  180
       ARM
                    1
       Name: GPU_BRAND, dtype: int64
[257]: df = df[df['GPU_BRAND'] != 'ARM']
[258]:
       df.head()
[258]:
                    TypeName
                                                                       Gpu
                                                                            OpSys
         Company
                              Inches
                                       Ram
           Apple
                  Ultrabook
                                 13.3
                                            Intel Iris Plus Graphics 640
                                                                             macOS
                  Ultrabook
           Apple
                                 13.3
                                         8
                                                   Intel HD Graphics 6000
                                                                             macOS
       1
       2
              ΗP
                    Notebook
                                 15.6
                                         8
                                                    Intel HD Graphics 620
                                                                            No OS
       3
           Apple
                  Ultrabook
                                 15.4
                                        16
                                                       AMD Radeon Pro 455
                                                                            macOS
                                 13.3
                                            Intel Iris Plus Graphics 650
           Apple
                  Ultrabook
                                                                            macOS
                                                                         4K_Ultra_HD
          Weight
                         Price
                                   Operating_system
                                                      TouchScreen
                                                                    IPS
            1.37
       0
                    71378.6832
                                                 Mac
                                                                 0
                                                                      1
                                                                                    0
       1
            1.34
                    47895.5232
                                                                 0
                                                                      0
                                                                                    0
                                                 Mac
            1.86
                                                                                    0
                    30636.0000
                                Others/No OS/Linux
       3
            1.83
                  135195.3360
                                                 Mac
                                                                 0
                                                                      1
                                                                                    0
            1.37
                    96095.8080
                                                                                    0
                                                 Mac
              CPU_BRAND
                          HDD
                                SSD
                                     Hybrid
                                             Flash_Storage GPU_BRAND
          Intel Core i5
                                128
                                          0
                                                          0
                                                                 Intel
          Intel Core i5
                            0
                                  0
                                          0
                                                        128
                                                                 Intel
       2 Intel Core i5
                                256
                                          0
                                                          0
                                                                 Intel
       3 Intel Core i7
                               512
                                          0
                                                          0
                                                                   AMD
       4 Intel Core i5
                                256
                                          0
                                                          0
                                                                 Intel
```

19 15 GPU_BRAND Feature

```
[259]: plt.figure(figsize=(16,8))
  plt.subplot(1,2,1)
  sns.countplot(df['GPU_BRAND'])
  plt.xticks(rotation=90)

plt.subplot(1,2,2)
  sns.barplot(df['GPU_BRAND'],df['Price'],data=df)
  plt.xticks(rotation=90)
  plt.show()
```



|]: df | | | | | | | | | | | |
|-------|---------|-----|-----------|----------|-------|-----|--------|------------|----------------|-------|---|
|): | Company | | Т | 'ypeName | Inche | es | Ram | | | Gpu | \ |
| 0 | Apple | | Ul | trabook | 13 | .3 | 8 | Intel Iris | s Plus Graphic | s 640 | |
| 1 | Apple | | Ul | trabook | 13 | .3 | 8 | Inte | el HD Graphics | 6000 | |
| 2 | HP | | N | otebook | 15 | .6 | 8 | Int | el HD Graphic | s 620 | |
| 3 | Apple | | Ul | trabook | 15 | . 4 | 16 | | AMD Radeon Pr | o 455 | |
| 4 | Apple | | U1 | trabook | 13 | .3 | 8 | Intel Iris | s Plus Graphic | s 650 | |
| ••• | ••• | | | | ••• | | | | ••• | | |
| 1298 | Lenovo | | in 1 Conv | | 14 | | 4 | | cel HD Graphic | | |
| 1299 | Lenovo | 2 i | n 1 Conv | ertible | 13 | .3 | 16 | Int | cel HD Graphic | | |
| 1300 | Lenovo | | N | otebook | 14 | | 2 | | Intel HD Gra | phics | |
| 1301 | HP | | N | otebook | 15 | | 6 | | AMD Radeon R5 | M330 | |
| 1302 | Asus | | N | otebook | 15 | .6 | 4 | | Intel HD Gra | phics | |
| | Ор | Sys | Weight | I | Price | (| Operat | ing_system | n TouchScreen | IPS | \ |
| 0 | ma | cOS | 1.37 | 71378 | .6832 | | | Mad | 0 | 1 | |
| 1 | ma | cOS | 1.34 | 47895 | .5232 | | | Mad | 0 | 0 | |
| 2 | No | 0S | 1.86 | 30636 | .0000 | Ot1 | ners/N | o OS/Linux | 0 2 | 0 | |
| 3 | ma | cOS | 1.83 | 135195 | .3360 | | | Mad | 0 | 1 | |
| 4 | ma | cOS | 1.37 | 96095 | .8080 | | | Mac | 0 | 1 | |
| ••• | ••• | | | ••• | | | ••• | | | | |
| 1298 | Windows | 10 | 1.80 | 33992 | .6400 | | | Windows | 3 1 | 1 | |
| 1299 | Windows | 10 | 1.30 | 79866 | .7200 | | | Windows | 3 1 | 1 | |
| 1300 | Windows | 10 | 1.50 | 12201 | | | | Windows | 0 | 0 | |
| 1301 | Windows | 10 | 2.19 | 40705 | .9200 | | | Windows | 0 | 0 | |
| 1302 | Windows | 10 | 2.20 | 19660 | 2000 | | | Windows | s 0 | 0 | |

```
0
                         0
                                      Intel Core i5
                                                          0
                                                             128
                                                                        0
                                                                                         0
                         0
                                      Intel Core i5
                                                               0
                                                                        0
                                                                                       128
       1
       2
                         0
                                      Intel Core i5
                                                             256
                                                                        0
                                                                                         0
                                      Intel Core i7
       3
                         0
                                                          0
                                                             512
                                                                        0
                                                                                         0
       4
                         0
                                      Intel Core i5
                                                             256
                                                                        0
                                                                                         0
       1298
                                      Intel Core i7
                                                                                         0
                         0
                                                          0
                                                             128
                                                                        0
       1299
                         0
                                      Intel Core i7
                                                             512
                                                                                         0
                                                                        0
       1300
                             Intel Other Processor
                                                               0
                                                                        0
                                                                                        64
       1301
                         0
                                      Intel Core i7
                                                      1000
                                                               0
                                                                        0
                                                                                         0
       1302
                             Intel Other Processor
                                                       500
                                                               0
                                                                        0
                                                                                         0
             GPU_BRAND
       0
                 Intel
       1
                 Intel
       2
                 Intel
       3
                    AMD
                 Intel
       1298
                 Intel
       1299
                 Intel
       1300
                 Intel
       1301
                    AMD
       1302
                 Intel
       [1302 rows x 18 columns]
[261]: df.drop(columns=['Gpu'],inplace=True)
[262]: df
[262]:
             Company
                                  TypeName
                                                                         Weight
                                             Inches
                                                      Ram
                                                                  OpSys
       0
               Apple
                                 Ultrabook
                                                13.3
                                                        8
                                                                  macOS
                                                                            1.37
       1
               Apple
                                 Ultrabook
                                                13.3
                                                        8
                                                                 macOS
                                                                            1.34
       2
                  ΗP
                                                                            1.86
                                  Notebook
                                                15.6
                                                        8
                                                                 No OS
       3
               Apple
                                 Ultrabook
                                                15.4
                                                        16
                                                                 macOS
                                                                            1.83
       4
                                                13.3
                                                                            1.37
               Apple
                                 Ultrabook
                                                        8
                                                                 macOS
                       2 in 1 Convertible
                                                            Windows 10
                                                                            1.80
       1298
              Lenovo
                                                14.0
       1299
              Lenovo
                       2 in 1 Convertible
                                                13.3
                                                        16
                                                            Windows 10
                                                                            1.30
       1300
              Lenovo
                                  Notebook
                                                14.0
                                                        2
                                                            Windows 10
                                                                            1.50
       1301
                  ΗP
                                  Notebook
                                                15.6
                                                            Windows 10
                                                                            2.19
       1302
                Asus
                                  Notebook
                                                15.6
                                                            Windows 10
                                                                            2.20
```

CPU_BRAND

HDD

SSD

4K_Ultra_HD

Price

Hybrid

Flash_Storage

Operating_system TouchScreen IPS 4K_Ultra_HD \

```
0
       71378.6832
                                     Mac
                                                            1
                                                                          0
                                                                          0
1
       47895.5232
                                     Mac
                                                      0
                                                            0
2
       30636.0000 Others/No OS/Linux
                                                                          0
3
      135195.3360
                                                                          0
4
       96095.8080
                                     Mac
                                                                          0
                                                            1
1298
       33992.6400
                                 Windows
                                                                          0
                                                      1
                                                            1
1299
       79866.7200
                                 Windows
                                                      1
                                                            1
                                                                          0
1300
                                                      0
                                                            0
                                                                          0
       12201.1200
                                 Windows
1301
       40705.9200
                                                      0
                                                            0
                                                                          0
                                 Windows
1302
       19660.3200
                                                      0
                                                                          0
                                 Windows
                   CPU_BRAND
                                 HDD
                                      SSD
                                            Hybrid
                                                     Flash_Storage GPU_BRAND
0
               Intel Core i5
                                   0
                                      128
                                                  0
                                                                  0
                                                                         Intel
               Intel Core i5
                                         0
                                                  0
                                                                128
1
                                   0
                                                                         Intel
2
                                      256
               Intel Core i5
                                   0
                                                  0
                                                                  0
                                                                         Intel
3
               Intel Core i7
                                      512
                                                  0
                                                                  0
                                                                           AMD
4
               Intel Core i5
                                      256
                                                  0
                                                                  0
                                                                         Intel
1298
               Intel Core i7
                                   0
                                      128
                                                  0
                                                                  0
                                                                         Intel
1299
                                      512
                                                                  0
                                                                         Intel
               Intel Core i7
                                                  0
1300 Intel Other Processor
                                         0
                                                  0
                                                                 64
                                                                         Intel
                                   0
1301
               Intel Core i7
                                         0
                                                  0
                                                                  0
                                                                           AMD
                                1000
1302 Intel Other Processor
                                 500
                                                  0
                                                                  0
                                                                         Intel
```

[1302 rows x 17 columns]

```
[263]: df['TypeName'].value_counts()
```

```
[263]: Notebook 727
Gaming 205
Ultrabook 196
2 in 1 Convertible 120
Workstation 29
Netbook 25
Name: TypeName, dtype: int64
```

```
[264]: df.drop(columns=['OpSys'],inplace=True)
```

20 Apply One hot Encoding on Categorical Columns For ML model

```
[267]: df= pd.

Get_dummies(columns=['Company','TypeName','Operating_system','CPU_BRAND','GPU_BRAND'],data=

[268]: df
```

```
[268]:
                                                   TouchScreen
                                                                  IPS
                                                                         4K_Ultra_HD
                                                                                        HDD
              Inches
                       Ram
                            Weight
                                            Price
       0
                13.3
                         8
                               1.37
                                       71378.6832
                                                                     1
                                                                                           0
       1
                13.3
                               1.34
                                                                0
                                                                     0
                                                                                    0
                         8
                                       47895.5232
                                                                                           0
       2
                15.6
                         8
                               1.86
                                       30636.0000
                                                                0
                                                                     0
                                                                                    0
                                                                                           0
       3
                                                                0
                                                                     1
                15.4
                               1.83
                                      135195.3360
                                                                                    0
                                                                                           0
                        16
       4
                13.3
                         8
                               1.37
                                       96095.8080
                                                                0
                                                                     1
                                                                                    0
                                                                                           0
               ... ...
                14.0
                                       33992.6400
                                                                                           0
       1298
                         4
                               1.80
                                                                1
                                                                     1
                                                                                    0
       1299
                13.3
                               1.30
                                       79866.7200
                                                                1
                                                                                    0
                                                                                           0
                        16
                                                                     1
       1300
                14.0
                               1.50
                                                                0
                                                                     0
                                                                                    0
                         2
                                       12201.1200
                                                                                           0
       1301
                15.6
                         6
                               2.19
                                       40705.9200
                                                                0
                                                                     0
                                                                                    0
                                                                                       1000
       1302
                15.6
                         4
                               2.20
                                       19660.3200
                                                                     0
                                                                                        500
              SSD
                   Hybrid
                                Operating_system_Others/No OS/Linux
       0
              128
                         0
                                                                      0
                0
                         0
       1
       2
              256
                         0
                                                                      1
                                                                      0
       3
              512
                         0
       4
              256
                         0
                                                                      0
                                                                      0
       1298 128
                         0
       1299
              512
                         0
                                                                      0
       1300
                                                                      0
                0
                         0
       1301
                0
                                                                      0
                         0
       1302
                0
                         0
                                                                      0
              Operating_system_Windows
                                          CPU_BRAND_AMD Processor
       0
                                        0
                                                                    0
                                        0
                                                                    0
       1
       2
                                        0
                                                                    0
       3
                                        0
                                                                    0
       4
                                        0
                                                                    0
       1298
                                        1
                                                                    0
       1299
                                        1
                                                                    0
       1300
                                                                    0
                                                                    0
       1301
                                        1
       1302
              CPU_BRAND_Intel Core i3
                                          CPU_BRAND_Intel Core i5
       0
                                                                   1
                                       0
       1
                                                                   1
       2
                                       0
                                                                   1
       3
                                       0
                                                                   0
       4
                                       0
                                                                   1
       1298
                                       0
                                                                   0
```

| 1299 | 0 | | 0 | |
|------|-------------------------|-----------------|-----------------|-----------------|
| 1300 | 0 | | 0 | |
| 1301 | 0 | | 0 | |
| 1302 | 0 | | 0 | |
| | | | | |
| | CPU_BRAND_Intel Core i7 | CPU_BRAND_Intel | Other Processor | GPU_BRAND_AMD \ |
| 0 | 0 | | 0 | 0 |
| 1 | 0 | | 0 | 0 |
| 2 | 0 | | 0 | 0 |
| 3 | 1 | | 0 | 1 |
| 4 | 0 | | 0 | 0 |
| ••• | | | ••• | ••• |
| 1298 | 1 | | 0 | 0 |
| 1299 | 1 | | 0 | 0 |
| 1300 | 0 | | 1 | 0 |
| 1301 | 1 | | 0 | 1 |
| 1302 | 0 | | 1 | 0 |
| | | | | |
| | GPU_BRAND_Intel GPU_BRA | ND_Nvidia | | |
| 0 | 1 | 0 | | |
| 1 | 1 | 0 | | |
| 2 | 1 | 0 | | |
| 3 | 0 | 0 | | |
| 4 | 1 | 0 | | |
| ••• | | ••• | | |
| 1298 | 1 | 0 | | |
| 1299 | 1 | 0 | | |
| 1300 | 1 | 0 | | |
| 1301 | 0 | 0 | | |
| 1302 | 1 | 0 | | |

[1302 rows x 47 columns]