In [21]:

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:

```python
df = pd.read_csv('laptop_data.csv')
```

In [3]:

```python
df.head()
```

Out[3]:

	Unnamed: 0	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight
0	0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8GB	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37kg
1	1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8GB	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34kg
2	2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8GB	256GB SSD	Intel HD Graphics 620	No OS	1.86kg
3	3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16GB	512GB SSD	AMD Radeon Pro 455	macOS	1.83kg
4	4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8GB	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37kg

In [4]:

```python
df.shape
```

Out[4]:

```
(1303, 12)
```

In [5]:

```python
df.info()
```

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

In [6]:

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

Out[6]:

```
0
```

In [7]:

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

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Out[7]:
```
Unnamed: 0          0
Company             0
TypeName            0
Inches              0
ScreenResolution    0
Cpu                 0
Ram                 0
Memory              0
Gpu                 0
OpSys               0
Weight              0
Price               0
dtype: int64
```

In [8]:
```
df.drop(columns=['Unnamed: 0'],inplace=True)
```

In [9]:
```
df.head()
```

Out[9]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Pric
0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8GB	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37kg	71378.683
1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8GB	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34kg	47895.523
2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8GB	256GB SSD	Intel HD Graphics 620	No OS	1.86kg	30636.000
3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16GB	512GB SSD	AMD Radeon Pro 455	macOS	1.83kg	135195.336
4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8GB	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37kg	96095.808

In [13]:
```
df['Ram'] = df['Ram'].str.replace('GB','')
df['Weight'] = df['Weight'].str.replace('kg','')
```

In [14]:
```
df.head()
```

Out[14]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832
1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232
2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000
3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360
4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus	macOS	1.37	96095.8080

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	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
								Graphics 650			

In [15]:

```
df['Ram'] = df['Ram'].astype('int32')
df['Weight'] = df['Weight'].astype('float32')
```

In [16]:

```
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
 3   ScreenResolution  1303 non-null   object 
 4   Cpu               1303 non-null   object 
 5   Ram               1303 non-null   int32  
 6   Memory            1303 non-null   object 
 7   Gpu               1303 non-null   object 
 8   OpSys             1303 non-null   object 
 9   Weight            1303 non-null   float32
 10  Price             1303 non-null   float64
dtypes: float32(1), float64(2), int32(1), object(7)
memory usage: 101.9+ KB
```

In [17]:

```
import seaborn as sns
```

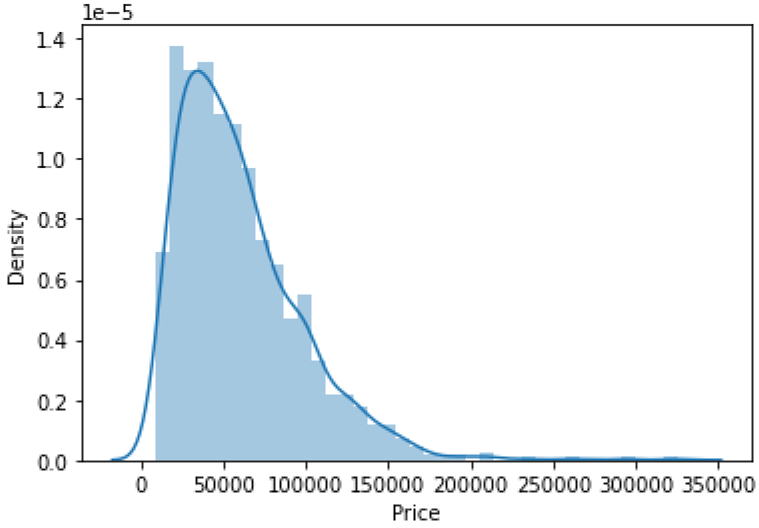
In [18]:

```
sns.distplot(df['Price'])
```

```
C:\Users\91842\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `
distplot` is a deprecated function and will be removed in a future version. Please adapt y
our code to use either `displot` (a figure-level function with similar flexibility) or `hi
stplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[18]:

```
<AxesSubplot:xlabel='Price', ylabel='Density'>
```

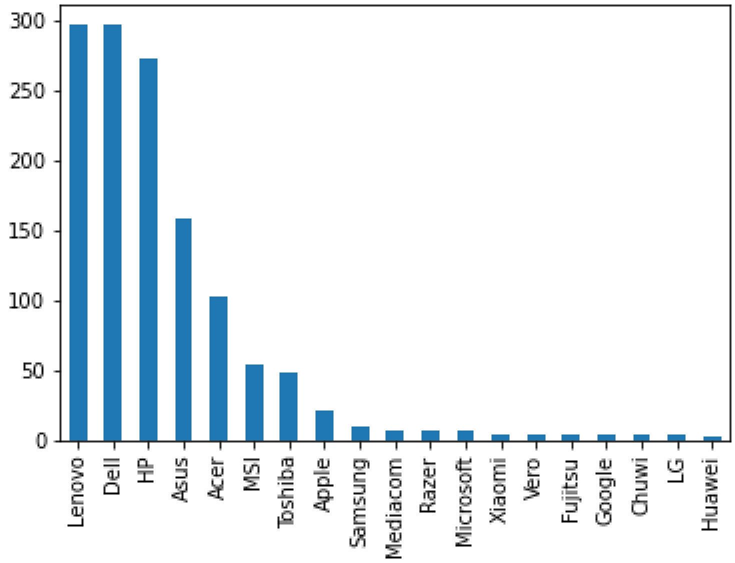


In [19]:

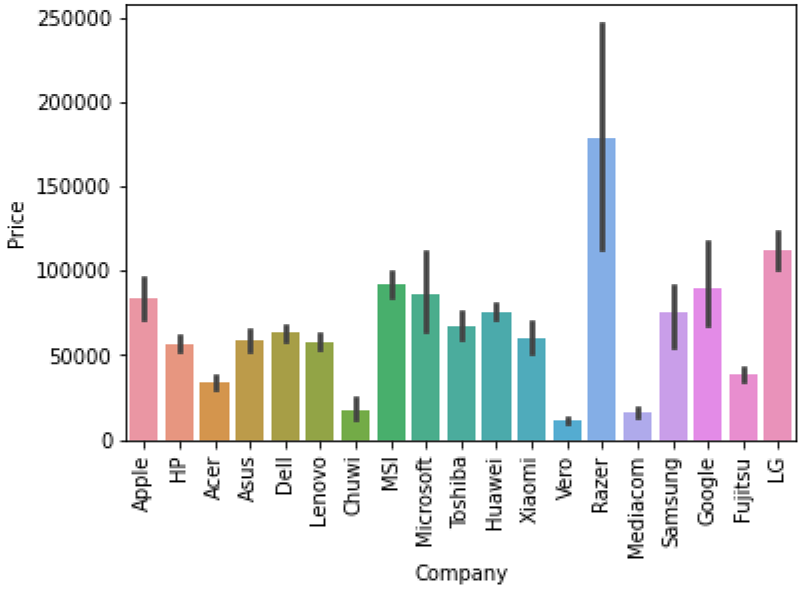
```
df['Company'].value_counts().plot(kind='bar')
```

Out[19]:

```
<AxesSubplot:>
```



```
In [27]: sns.barplot(x=df['Company'],y=df['Price'])
         plt.xticks(rotation='vertical')
         plt.show()
```



```
In [28]: df['TypeName'].value_counts().plot(kind='bar')
```

```
Out[28]: <AxesSubplot:>
```

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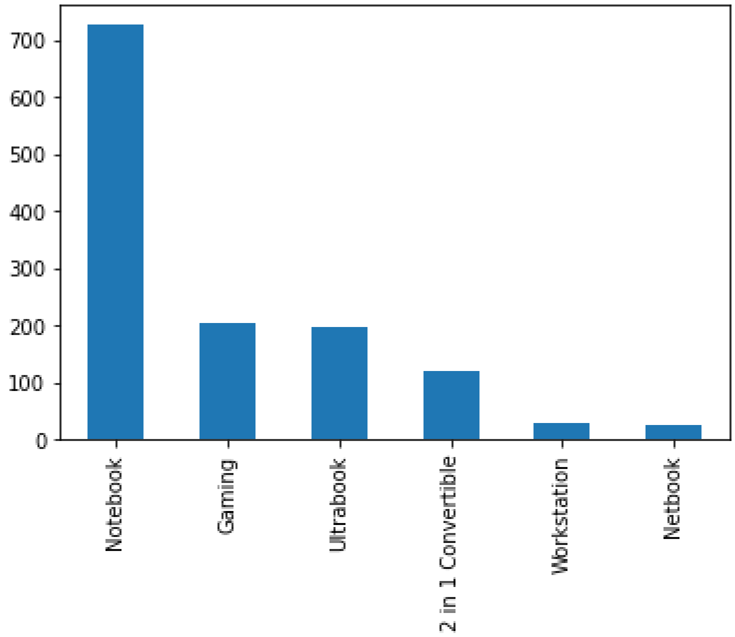
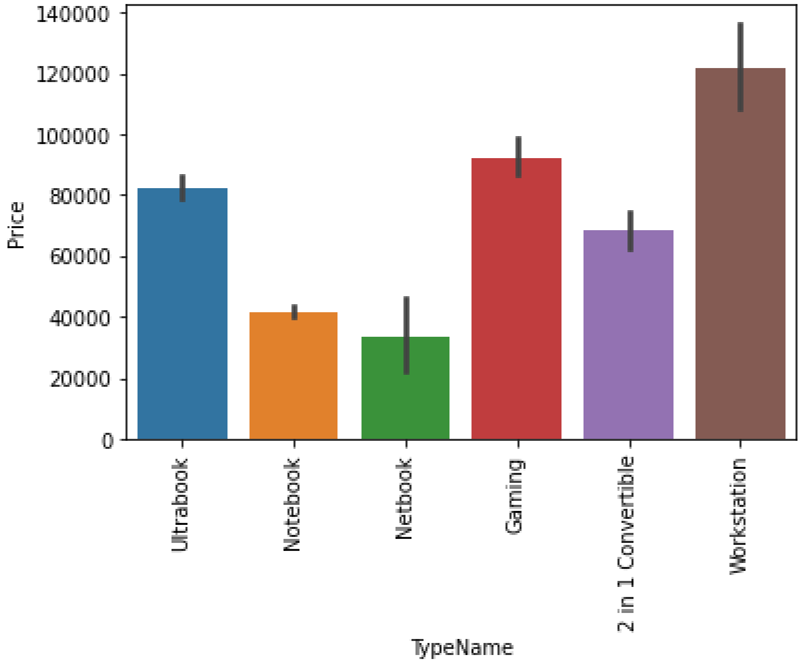


In [29]:
```python
sns.barplot(x=df['TypeName'],y=df['Price'])
plt.xticks(rotation='vertical')
plt.show()
```



In [30]:
```python
sns.distplot(df['Inches'])
```

```
C:\Users\91842\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `
distplot` is a deprecated function and will be removed in a future version. Please adapt y
our code to use either `displot` (a figure-level function with similar flexibility) or `hi
stplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[30]:
```
<AxesSubplot:xlabel='Inches', ylabel='Density'>
```

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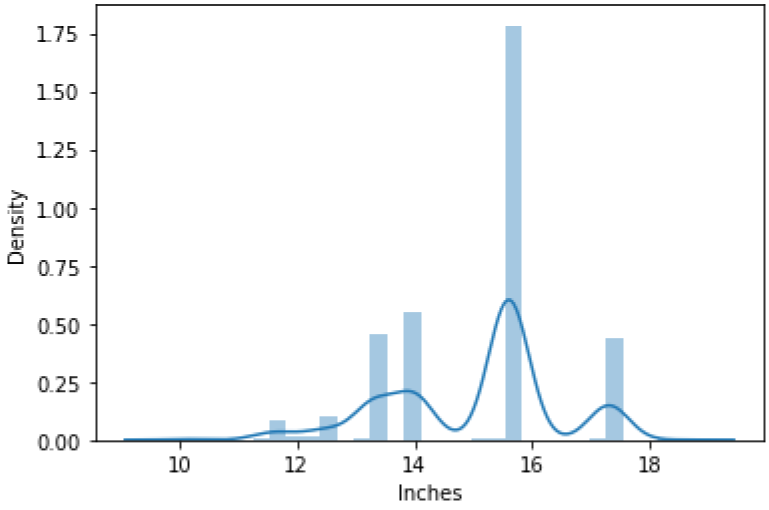
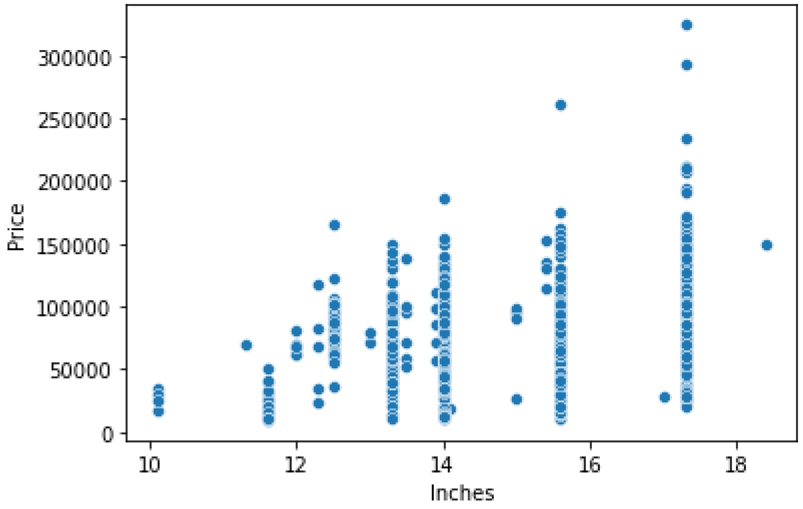


```
In [31]: sns.scatterplot(x=df['Inches'],y=df['Price'])
```

```
Out[31]: <AxesSubplot:xlabel='Inches', ylabel='Price'>
```



```
In [32]: df['ScreenResolution'].value_counts()
```

```
Out[32]: 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
Touchscreen 2560x1440                              7
IPS Panel 1366x768                                 7
4K Ultra HD 3840x2160                              7
IPS Panel Quad HD+ / Touchscreen 3200x1800         6
Touchscreen 2256x1504                              6
IPS Panel Retina Display 2304x1440                 6
IPS Panel Retina Display 2560x1600                 6
IPS Panel Touchscreen 2560x1440                    5
IPS Panel 2560x1440                                4
IPS Panel Retina Display 2880x1800                 4
IPS Panel Touchscreen 1920x1200                    4
1440x900                                           4
Quad HD+ 3200x1800                                 3
IPS Panel Quad HD+ 2560x1440                       3
1920x1080                                          3
```

```
Touchscreen 2400x1600                             3
IPS Panel Touchscreen 1366x768                    3
2560x1440                                         3
IPS Panel Full HD 2160x1440                       2
IPS Panel Touchscreen / 4K Ultra HD 3840x2160     2
IPS Panel Quad HD+ 3200x1800                      2
Touchscreen / Full HD 1920x1080                   1
IPS Panel Retina Display 2736x1824                1
IPS Panel Full HD 1920x1200                       1
IPS Panel Full HD 1366x768                        1
Touchscreen / 4K Ultra HD 3840x2160               1
IPS Panel Touchscreen 2400x1600                   1
IPS Panel Full HD 2560x1440                       1
Touchscreen / Quad HD+ 3200x1800                  1
Name: ScreenResolution, dtype: int64
```

In [34]:
```
df['Touchscreen'] = df['ScreenResolution'].apply(lambda x:1 if 'Touchscreen' in x else 0)
```

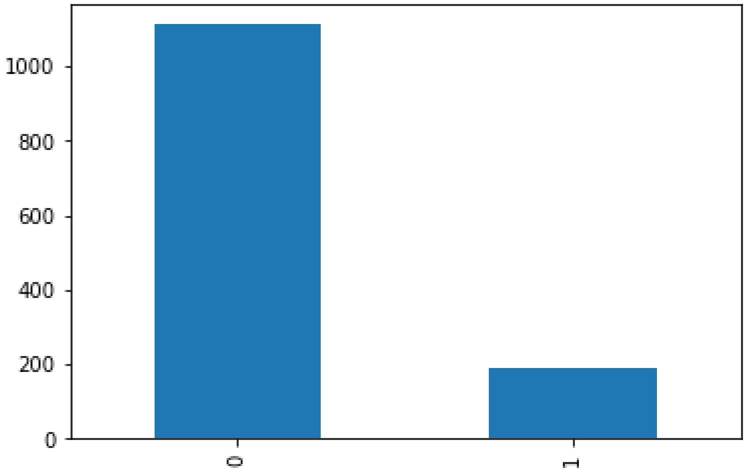
In [37]:
```
df.sample(5)
```

Out[37]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	
1154	Dell	Notebook	15.6	IPS Panel Touchscreen / 4K Ultra HD 3840x2160	Intel Core i5 6300HQ 2.3GHz	8	256GB SSD	Nvidia GeForce 960M	Windows 10	2.04	119916
750	Lenovo	Netbook	11.6	Touchscreen 1366x768	Intel Celeron Dual Core N3060 1.6GHz	4	128GB SSD	Intel HD Graphics 400	Windows 10	1.40	25308
1246	Dell	Notebook	14.0	1366x768	Intel Core i5 7200U 2.5GHz	4	500GB HDD	Intel HD Graphics 620	Windows 10	1.60	46620
879	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	4	256GB SSD	Intel HD Graphics 620	Windows 10	2.04	44701
1021	Toshiba	Ultrabook	13.3	Full HD 1920x1080	Intel Core i5 6200U 2.3GHz	8	256GB SSD	Intel HD Graphics 520	Windows 10	1.20	84715

In [38]:
```
df['Touchscreen'].value_counts().plot(kind='bar')
```

Out[38]:
```
<AxesSubplot:>
```



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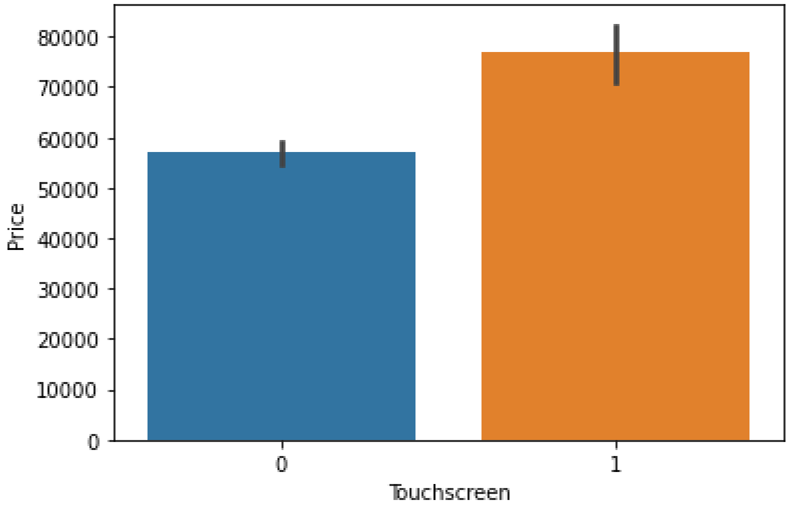
```
In [39]: sns.barplot(x=df['Touchscreen'],y=df['Price'])
```

```
Out[39]: <AxesSubplot:xlabel='Touchscreen', ylabel='Price'>
```



```
In [40]: df['Ips'] = df['ScreenResolution'].apply(lambda x:1 if 'IPS' in x else 0)
```

```
In [41]: df.head()
```

Out[41]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832
1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232
2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000
3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360
4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080

```
In [42]: df['Ips'].value_counts().plot(kind='bar')
```

```
Out[42]: <AxesSubplot:>
```

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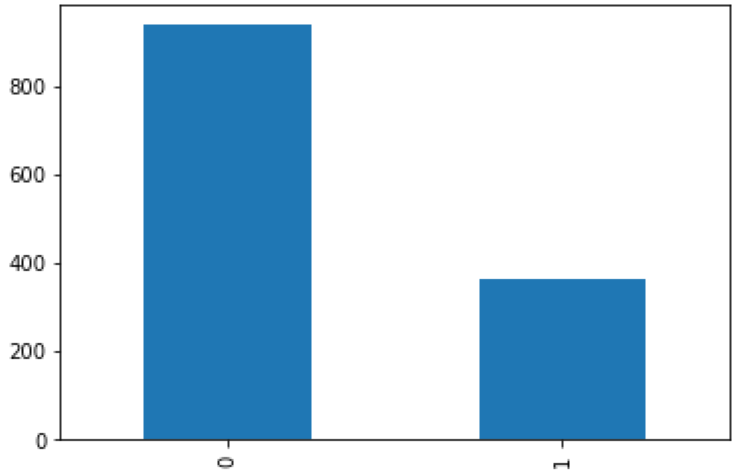
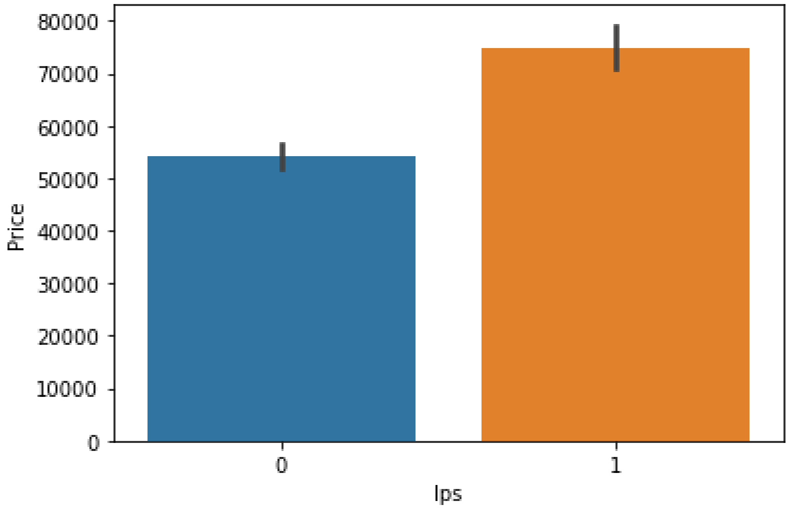


```
In [43]: sns.barplot(x=df['Ips'],y=df['Price'])
```

```
Out[43]: <AxesSubplot:xlabel='Ips', ylabel='Price'>
```



```
In [47]: new = df['ScreenResolution'].str.split('x',n=1,expand=True)
```

```
In [48]: df['X_res'] = new[0]
         df['Y_res'] = new[1]
```

```
In [50]: df.sample(5)
```

Out[50]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	P
141	Lenovo	Notebook	14.0	IPS Panel Full HD 1920x1080	Intel Core i5 8250U 1.6GHz	8	256GB SSD	AMD Radeon RX 550	Windows 10	1.75	59461.
1055	HP	Notebook	15.6	1366x768	Intel Core i3 6100U 2.3GHz	4	500GB HDD	Intel HD Graphics 520	Windows 10	2.31	37570.
75	Asus	Gaming	15.6	Full HD 1920x1080	Intel Core i7 7700HQ 2.8GHz	8	1TB HDD	Nvidia GeForce GTX 1050	Windows 10	2.20	50562.
984	Toshiba	Notebook	14.0	1366x768	Intel Core i5 6200U 2.3GHz	4	500GB HDD	Intel HD Graphics 520	Windows 10	1.75	48751.

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	F
337	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	Windows 10	1.84	60952.:

In [59]:
```
df['X_res'] = df['X_res'].str.replace(',','').str.findall(r'(\d+\.?\d+)').apply(lambda x:
```

In [60]:
```
df.head()
```

Out[60]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832
1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232
2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000
3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360
4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080

In [62]:
```
df['X_res'] = df['X_res'].astype('int')
df['Y_res'] = df['Y_res'].astype('int')
```

In [63]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1303 entries, 0 to 1302
Data columns (total 15 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   Company           1303 non-null   object 
 1   TypeName          1303 non-null   object 
 2   Inches            1303 non-null   float64
 3   ScreenResolution  1303 non-null   object 
 4   Cpu               1303 non-null   object 
 5   Ram               1303 non-null   int32  
 6   Memory            1303 non-null   object 
 7   Gpu               1303 non-null   object 
 8   OpSys             1303 non-null   object 
 9   Weight            1303 non-null   float32
 10  Price             1303 non-null   float64
 11  Touchscreen       1303 non-null   int64  
 12  Ips               1303 non-null   int64  
 13  X_res             1303 non-null   int32  
 14  Y_res             1303 non-null   int32  
dtypes: float32(1), float64(2), int32(3), int64(2), object(7)
memory usage: 132.5+ KB
```

In [65]:
```
df.corr()['Price']
```

Out[65]:
```
Inches         0.068197
Ram            0.743007
```

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```
Weight         0.210370
Price          1.000000
Touchscreen    0.191226
Ips            0.252208
X_res          0.556529
Y_res          0.552809
Name: Price, dtype: float64
```

In [68]:
```
df['ppi'] = (((df['X_res']**2) + (df['Y_res']**2))**0.5/df['Inches']).astype('float')
```

In [69]:
```
df.corr()['Price']
```

Out[69]:
```
Inches         0.068197
Ram            0.743007
Weight         0.210370
Price          1.000000
Touchscreen    0.191226
Ips            0.252208
X_res          0.556529
Y_res          0.552809
ppi            0.473487
Name: Price, dtype: float64
```

In [70]:
```
df.drop(columns=['ScreenResolution'],inplace=True)
```

In [71]:
```
df.head()
```

Out[71]:

	Company	TypeName	Inches	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips
0	Apple	Ultrabook	13.3	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1
1	Apple	Ultrabook	13.3	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0
2	HP	Notebook	15.6	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0
3	Apple	Ultrabook	15.4	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1
4	Apple	Ultrabook	13.3	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1

In [72]:
```
df.drop(columns=['Inches','X_res','Y_res'],inplace=True)
```

In [73]:
```
df.head()
```

Out[73]:

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	
0	Apple	Ultrabook	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.98
1	Apple	Ultrabook	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.67
2	HP	Notebook	Intel Core i5	8	256GB SSD	Intel HD Graphics	No OS	1.86	30636.0000	0	0	141.21

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	
			7200U 2.5GHz			620						
3	Apple	Ultrabook	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.53
4	Apple	Ultrabook	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.98

In [74]:

```
df['Cpu'].value_counts()
```

Out[74]:

```
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 Celeron Quad Core N3710 1.6GHz        1
Intel Core i5 7200U 2.7GHz                  1
Intel Pentium Dual Core N4200 1.1GHz        1
AMD FX 8800P 2.1GHz                         1
Intel Atom x5-Z8300 1.44GHz                 1
Name: Cpu, Length: 118, dtype: int64
```

In [79]:

```
df['Cpu Name'] = df['Cpu'].apply(lambda x:" ".join(x.split()[0:3]))
```

In [80]:

```
df.head()
```

Out[80]:

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	
0	Apple	Ultrabook	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.98
1	Apple	Ultrabook	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.67
2	HP	Notebook	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.21
3	Apple	Ultrabook	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.53
4	Apple	Ultrabook	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.98

In [81]:

```
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 'Other Intel Processor'
        else:
            return 'AMD Processor'
```

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In [82]:

```
df['Cpu brand'] = df['Cpu Name'].apply(fetch_processor)
```

In [83]:

```
df.head()
```

Out[83]:

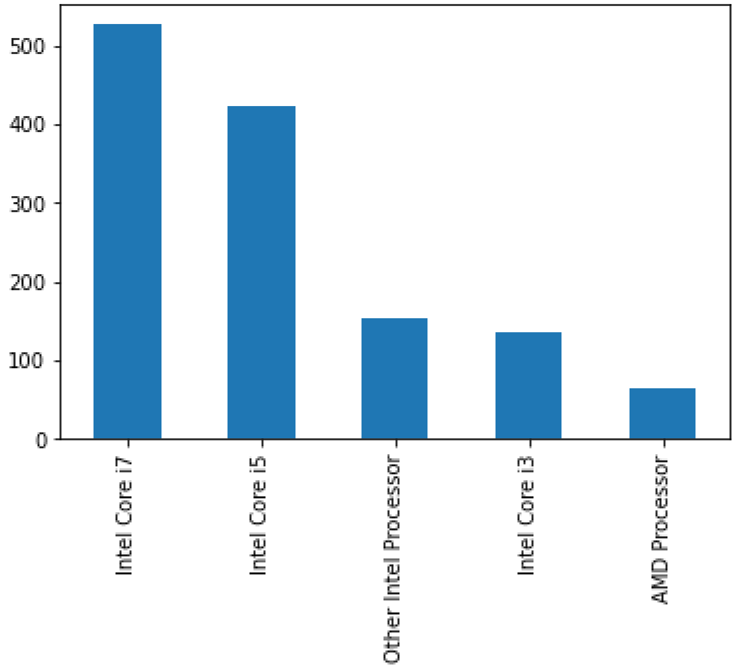
	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	
0	Apple	Ultrabook	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.98
1	Apple	Ultrabook	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.67
2	HP	Notebook	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.21
3	Apple	Ultrabook	Intel Core i7 2.7GHz	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.53
4	Apple	Ultrabook	Intel Core i5 3.1GHz	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.98

In [84]:

```
df['Cpu brand'].value_counts().plot(kind='bar')
```

Out[84]:

```
<AxesSubplot:>
```



In [87]:

```
sns.barplot(x=df['Cpu brand'],y=df['Price'])
plt.xticks(rotation='vertical')
plt.show()
```

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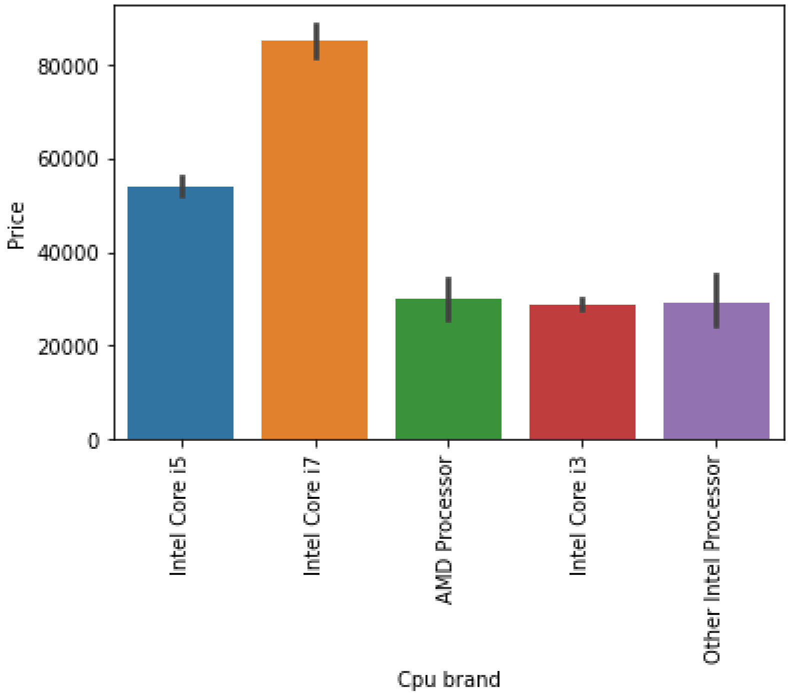


```
In [88]: df.drop(columns=['Cpu','Cpu Name'],inplace=True)
```

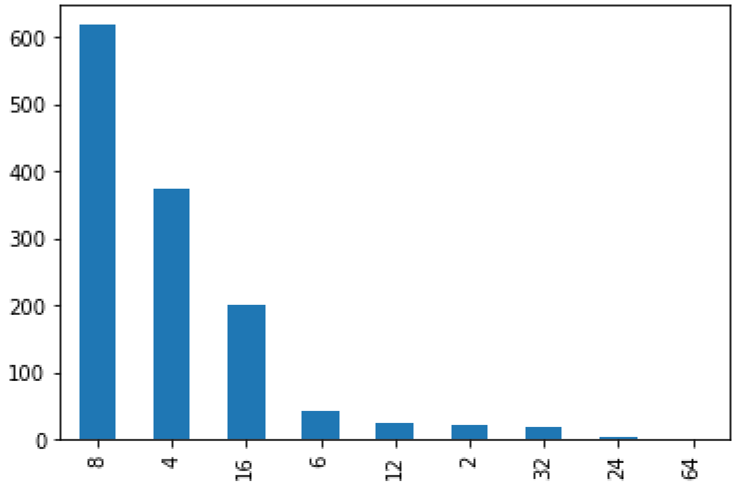
```
In [89]: df.head()
```

Out[89]:

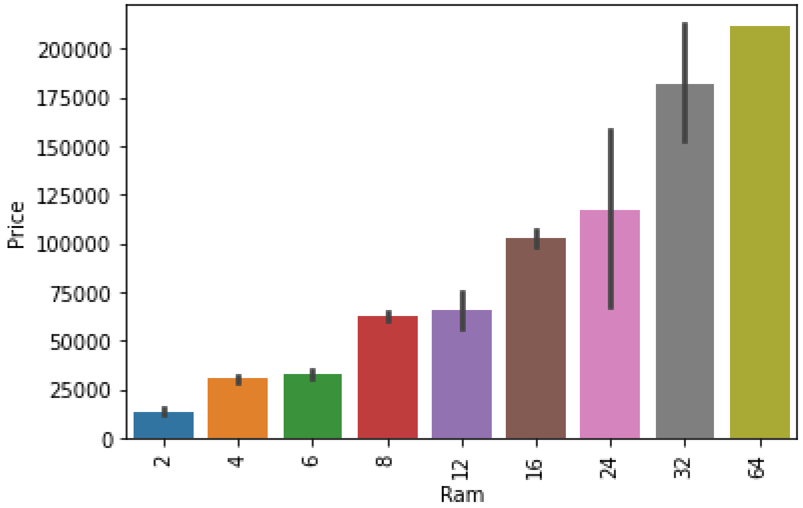
	Company	TypeName	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	C bra
0	Apple	Ultrabook	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	I C
1	Apple	Ultrabook	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	I C
2	HP	Notebook	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	I C
3	Apple	Ultrabook	16	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.534624	I C
4	Apple	Ultrabook	8	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.983005	I C

```
In [90]: df['Ram'].value_counts().plot(kind='bar')
```

```
Out[90]: <AxesSubplot:>
```



In [91]:
```
sns.barplot(x=df['Ram'],y=df['Price'])
plt.xticks(rotation='vertical')
plt.show()
```



In [92]:
```
df['Memory'].value_counts()
```

Out[92]:
```
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
16GB SSD                           3
512GB SSD +  2TB HDD               3
256GB SSD +  256GB SSD             2
128GB SSD +  2TB HDD               2
256GB SSD +  500GB HDD             2
512GB Flash Storage                2
1TB SSD +  1TB HDD                 2
                                   1
```

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```
64GB SSD                          1
1.0TB HDD                         1
512GB SSD +  256GB SSD            1
512GB SSD +  1.0TB Hybrid         1
8GB SSD                           1
240GB SSD                         1
128GB HDD                         1
1TB HDD +  1TB HDD                1
512GB SSD +  512GB SSD            1
256GB SSD +  1.0TB Hybrid         1
508GB Hybrid                      1
64GB Flash Storage +  1TB HDD     1
Name: Memory, dtype: int64
```

In [93]:

```
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 x 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" in 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_St

df.drop(columns=['first', 'second', 'Layer1HDD', 'Layer1SSD', 'Layer1Hybrid',
       'Layer1Flash_Storage', 'Layer2HDD', 'Layer2SSD', 'Layer2Hybrid',
       'Layer2Flash_Storage'],inplace=True)
```

```
<ipython-input-93-10829db803de>:16: FutureWarning: The default value of regex will change
from True to False in a future version.
  df['first'] = df['first'].str.replace(r'\D', '')
<ipython-input-93-10829db803de>:25: FutureWarning: The default value of regex will change
from True to False in a future version.
  df['second'] = df['second'].str.replace(r'\D', '')
```

In [98]:

```
df.sample(5)
```

Out[98]:

	Company	TypeName	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi
1247	Asus	Gaming	16	256 SSD +	Nvidia GeForce	Windows 10	2.34	123876.000	0	1	141.211998

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	Company	TypeName	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi
				1000 HDD	GTX 1070						
505	Lenovo	Notebook	8	256 SSD	Intel HD Graphics 620	Windows 10	1.44	50562.720	0	0	165.632118
820	Lenovo	Notebook	4	500 HDD	Intel HD Graphics 520	Windows 10	2.10	26101.872	0	0	100.454670
21	Lenovo	Gaming	8	128 SSD + 1000 HDD	Nvidia GeForce GTX 1050	Windows 10	2.50	53226.720	0	1	141.211998
301	Asus	Gaming	16	256 SSD + 1000 HDD	Nvidia GeForce GTX 1070	Windows 10	2.90	113060.160	0	0	127.335675

In [99]:

```
df.drop(columns=['Memory'],inplace=True)
```

In [100…

```
df.head()
```

Out[100…

	Company	TypeName	Ram	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD
0	Apple	Ultrabook	8	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5	0
1	Apple	Ultrabook	8	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5	0
2	HP	Notebook	8	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5	0
3	Apple	Ultrabook	16	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.534624	Intel Core i7	0
4	Apple	Ultrabook	8	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.983005	Intel Core i5	0

In [101…

```
df.corr()['Price']
```

Out[101…

```
Ram              0.743007
Weight           0.210370
Price            1.000000
Touchscreen      0.191226
Ips              0.252208
ppi              0.473487
HDD             -0.096441
SSD              0.670799
Hybrid           0.007989
Flash_Storage   -0.040511
Name: Price, dtype: float64
```

In [102…

```
df.drop(columns=['Hybrid','Flash_Storage'],inplace=True)
```

In [103…

```
df.head()
```

Out[103…

	Company	TypeName	Ram	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD
0	Apple	Ultrabook	8	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5	0
1	Apple	Ultrabook	8	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5	0
2	HP	Notebook	8	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5	0
3	Apple	Ultrabook	16	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.534624	Intel Core i7	0
4	Apple	Ultrabook	8	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.983005	Intel Core i5	0

In [104…

```
df['Gpu'].value_counts()
```

Out[104…

```
Intel HD Graphics 620      281
Intel HD Graphics 520      185
Intel UHD Graphics 620      68
Nvidia GeForce GTX 1050     66
Nvidia GeForce GTX 1060     48
                          ...
Intel HD Graphics 540        1
AMD FirePro W6150M           1
AMD Radeon R5 M315           1
AMD Radeon R7 M360           1
AMD FirePro W5130M           1
Name: Gpu, Length: 110, dtype: int64
```

In [106…

```
df['Gpu brand'] = df['Gpu'].apply(lambda x:x.split()[0])
```

In [107…

```
df.head()
```

Out[107…

	Company	TypeName	Ram	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD
0	Apple	Ultrabook	8	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5	0
1	Apple	Ultrabook	8	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5	0
2	HP	Notebook	8	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5	0
3	Apple	Ultrabook	16	AMD Radeon Pro 455	macOS	1.83	135195.3360	0	1	220.534624	Intel Core i7	0
4	Apple	Ultrabook	8	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080	0	1	226.983005	Intel Core i5	0

```
df['Gpu brand'].value_counts()
```

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Out[108…

```
Intel     722
Nvidia    400
AMD       180
ARM         1
Name: Gpu brand, dtype: int64
```

In [111…

```
df = df[df['Gpu brand'] != 'ARM']
```

In [112…

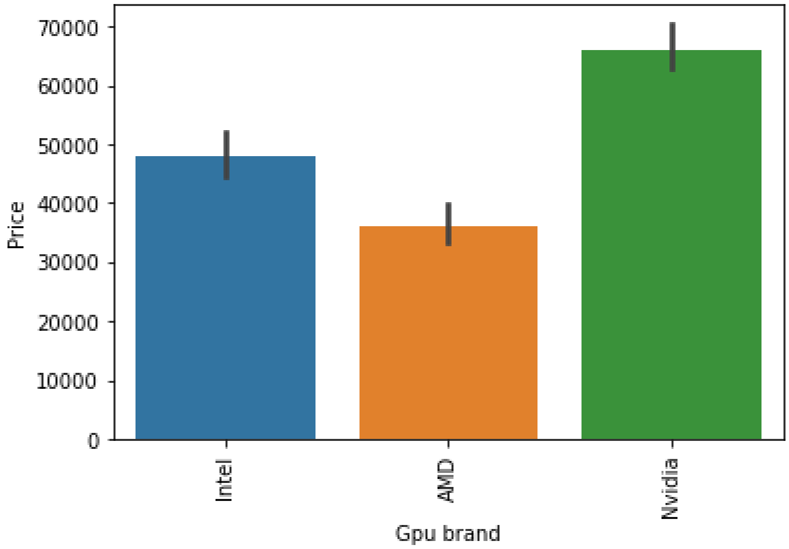
```
df['Gpu brand'].value_counts()
```

Out[112…

```
Intel     722
Nvidia    400
AMD       180
Name: Gpu brand, dtype: int64
```

In [115…

```
sns.barplot(x=df['Gpu brand'],y=df['Price'],estimator=np.median)
plt.xticks(rotation='vertical')
plt.show()
```



In [116…

```
df.drop(columns=['Gpu'],inplace=True)
```

```
C:\Users\91842\anaconda3\lib\site-packages\pandas\core\frame.py:4308: SettingWithCopyWarni
ng:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_gu
ide/indexing.html#returning-a-view-versus-a-copy
  return super().drop(
```

In [117…

```
df.head()
```

Out[117…

	Company	TypeName	Ram	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD
0	Apple	Ultrabook	8	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5	0	128
1	Apple	Ultrabook	8	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5	0	0
2	HP	Notebook	8	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5	0	256
3	Apple	Ultrabook	16	macOS	1.83	135195.3360	0	1	220.534624	Intel Core i7	0	512

	Company	TypeName	Ram	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	br
4	Apple	Ultrabook	8	macOS	1.37	96095.8080	0	1	226.983005	Intel Core i5	0	256	I

In [118…

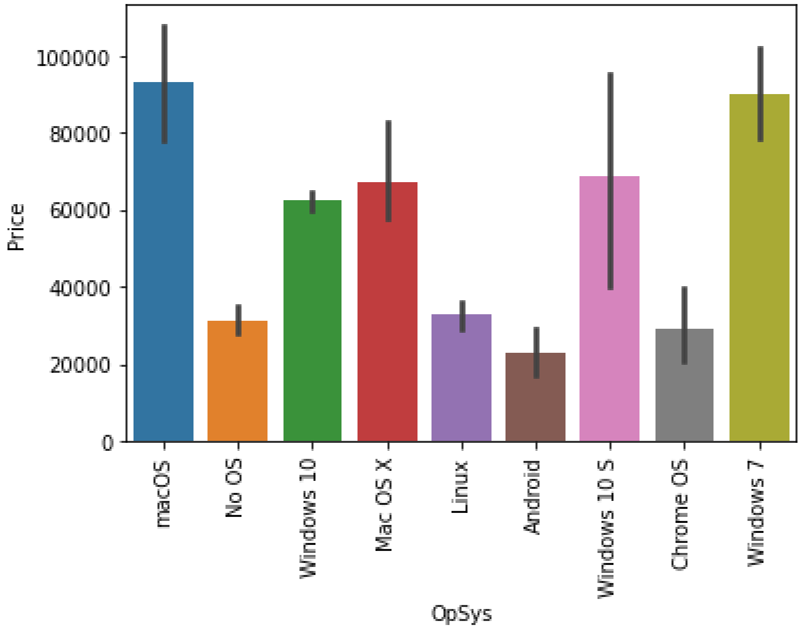
```
df['OpSys'].value_counts()
```

Out[118…

```
Windows 10      1072
No OS             66
Linux             62
Windows 7         45
Chrome OS         26
macOS             13
Windows 10 S       8
Mac OS X           8
Android            2
Name: OpSys, dtype: int64
```

In [120…

```
sns.barplot(x=df['OpSys'],y=df['Price'])
plt.xticks(rotation='vertical')
plt.show()
```



In [121…

```
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'
```

In [122…

```
df['os'] = df['OpSys'].apply(cat_os)
```

```
<ipython-input-122-38671a3c07bd>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_gu
ide/indexing.html#returning-a-view-versus-a-copy
  df['os'] = df['OpSys'].apply(cat_os)
```

In [123…

```
df.head()
```

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Out[123…

	Company	TypeName	Ram	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	(br
0	Apple	Ultrabook	8	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5	0	128	I
1	Apple	Ultrabook	8	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5	0	0	I
2	HP	Notebook	8	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5	0	256	I
3	Apple	Ultrabook	16	macOS	1.83	135195.3360	0	1	220.534624	Intel Core i7	0	512	A
4	Apple	Ultrabook	8	macOS	1.37	96095.8080	0	1	226.983005	Intel Core i5	0	256	I

In [124…

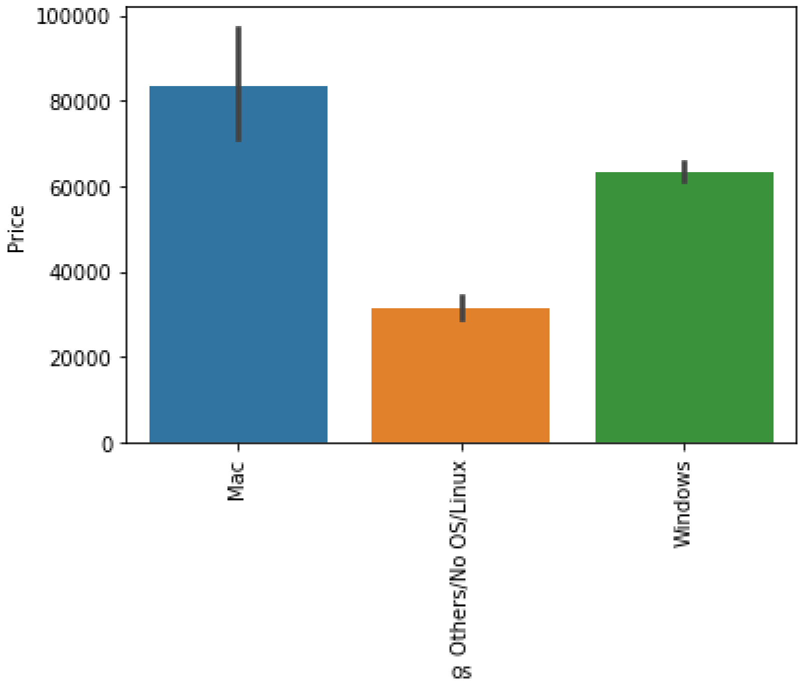
```
df.drop(columns=['OpSys'],inplace=True)
```

```
C:\Users\91842\anaconda3\lib\site-packages\pandas\core\frame.py:4308: SettingWithCopyWarni
ng:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_gu
ide/indexing.html#returning-a-view-versus-a-copy
  return super().drop(
```

In [125…

```
sns.barplot(x=df['os'],y=df['Price'])
plt.xticks(rotation='vertical')
plt.show()
```



In [126…

```
sns.distplot(df['Weight'])
```

```
C:\Users\91842\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `
distplot` is a deprecated function and will be removed in a future version. Please adapt y
our code to use either `displot` (a figure-level function with similar flexibility) or `hi
stplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

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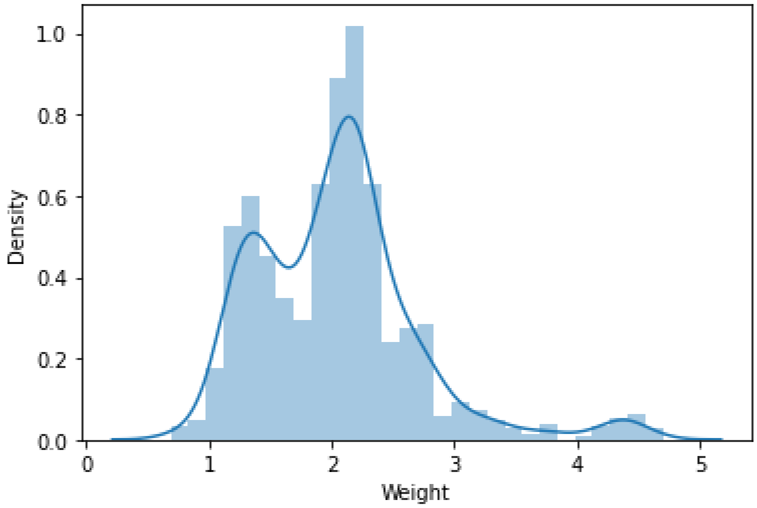
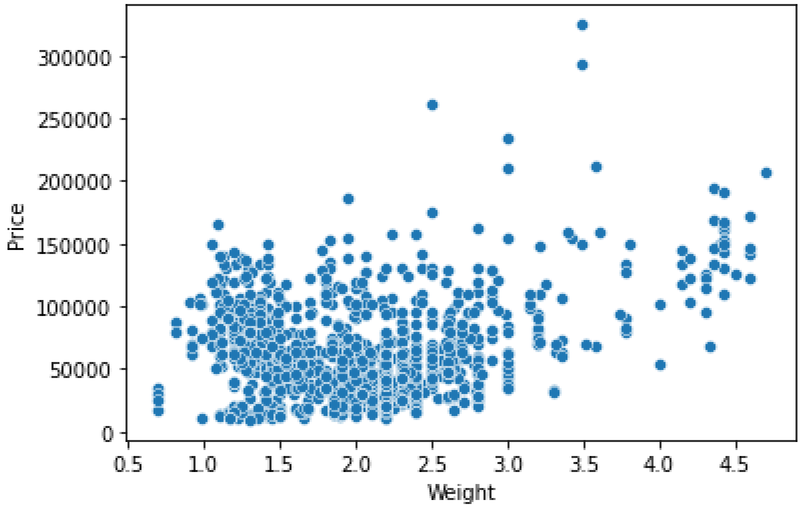
```
Out[126… <AxesSubplot:xlabel='Weight', ylabel='Density'>
```



```
In [127… sns.scatterplot(x=df['Weight'],y=df['Price'])
```

```
Out[127… <AxesSubplot:xlabel='Weight', ylabel='Price'>
```

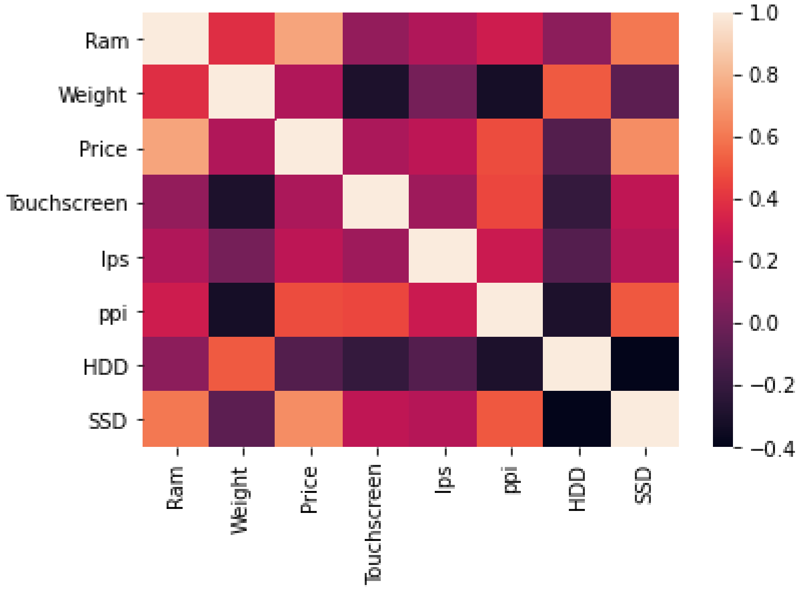


```
In [128… df.corr()['Price']
```

```
Out[128… Ram            0.742905
         Weight         0.209867
         Price          1.000000
         Touchscreen    0.192917
         Ips            0.253320
         ppi            0.475368
         HDD           -0.096891
         SSD            0.670660
         Name: Price, dtype: float64
```

```
In [130… sns.heatmap(df.corr())
```

```
Out[130… <AxesSubplot:>
```



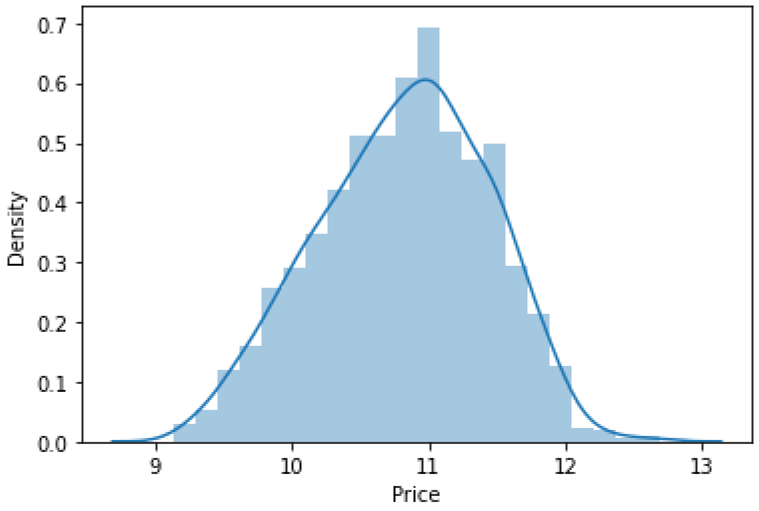
In [133…

```
sns.distplot(np.log(df['Price']))
```

```
C:\Users\91842\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `
distplot` is a deprecated function and will be removed in a future version. Please adapt y
our code to use either `displot` (a figure-level function with similar flexibility) or `hi
stplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[133…

```
<AxesSubplot:xlabel='Price', ylabel='Density'>
```



In [134…

```
X = df.drop(columns=['Price'])
y = np.log(df['Price'])
```

In [135…

```
X
```

Out[135…

	Company	TypeName	Ram	Weight	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
0	Apple	Ultrabook	8	1.37	0	1	226.983005	Intel Core i5	0	128	Intel	Mac
1	Apple	Ultrabook	8	1.34	0	0	127.677940	Intel Core i5	0	0	Intel	Mac
2	HP	Notebook	8	1.86	0	0	141.211998	Intel Core i5	0	256	Intel	Others/No OS/Linux
3	Apple	Ultrabook	16	1.83	0	1	220.534624	Intel Core i7	0	512	AMD	Mac

	Company	TypeName	Ram	Weight	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
4	Apple	Ultrabook	8	1.37	0	1	226.983005	Intel Core i5	0	256	Intel	Mac
...	...	...	...	...	...	...	...	...	...	...	...	...
1298	Lenovo	2 in 1 Convertible	4	1.80	1	1	157.350512	Intel Core i7	0	128	Intel	Windows
1299	Lenovo	2 in 1 Convertible	16	1.30	1	1	276.053530	Intel Core i7	0	512	Intel	Windows
1300	Lenovo	Notebook	2	1.50	0	0	111.935204	Other Intel Processor	0	0	Intel	Windows
1301	HP	Notebook	6	2.19	0	0	100.454670	Intel Core i7	1000	0	AMD	Windows
1302	Asus	Notebook	4	2.20	0	0	100.454670	Other Intel Processor	500	0	Intel	Windows

1302 rows × 12 columns

In [136…

```
y
```

Out[136…

```
0       11.175755
1       10.776777
2       10.329931
3       11.814476
4       11.473101
          ...
1298    10.433899
1299    11.288115
1300     9.409283
1301    10.614129
1302     9.886358
Name: Price, Length: 1302, dtype: float64
```

In [137…

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.15,random_state=2)
```

In [138…

```
X_train
```

Out[138…

	Company	TypeName	Ram	Weight	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
183	Toshiba	Notebook	8	2.00	0	0	100.454670	Intel Core i5	0	128	Intel	Windows
1141	MSI	Gaming	8	2.40	0	0	141.211998	Intel Core i7	1000	128	Nvidia	Windows
1049	Asus	Netbook	4	1.20	0	0	135.094211	Other Intel Processor	0	0	Intel	Others/No OS/Linux
1020	Dell	2 in 1 Convertible	4	2.08	1	1	141.211998	Intel Core i3	1000	0	Intel	Windows
878	Dell	Notebook	4	2.18	0	0	141.211998	Intel Core i5	1000	128	Nvidia	Windows
...	...	...	...	...	...	...	...	...	...	...	...	...
466	Acer	Notebook	4	2.20	0	0	100.454670	Intel Core i3	500	0	Nvidia	Windows

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	Company	TypeName	Ram	Weight	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
299	Asus	Ultrabook	16	1.63	0	0	141.211998	Intel Core i7	0	512	Nvidia	Windows
493	Acer	Notebook	8	2.20	0	0	100.454670	AMD Processor	1000	0	AMD	Windows
527	Lenovo	Notebook	8	2.20	0	0	100.454670	Intel Core i3	2000	0	Nvidia	Others/No OS/Linux
1193	Apple	Ultrabook	8	0.92	0	1	226.415547	Other Intel Processor	0	0	Intel	Mac

1106 rows × 12 columns

In [144…

```
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import OneHotEncoder
from sklearn.metrics import r2_score,mean_absolute_error
```

In [141…

```
from sklearn.linear_model import LinearRegression,Ridge,Lasso
from sklearn.neighbors import KNeighborsRegressor
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor,GradientBoostingRegressor,AdaBoostRegre
from sklearn.svm import SVR
from xgboost import XGBRegressor
```

Linear regression

In [145…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = LinearRegression()

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8073277448418521
MAE 0.21017827976429174
```

Ridge Regression

In [158…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = Ridge(alpha=10)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8127331031311811
MAE 0.20926802242582954
```

Lasso Regression

In [171…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = Lasso(alpha=0.001)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8071853945317105
MAE 0.21114361613472565
```

KNN

In [180…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = KNeighborsRegressor(n_neighbors=3)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8021984604448553
MAE 0.19319716721521116
```

Decision Tree

In [191…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = DecisionTreeRegressor(max_depth=8)
```

```
pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8466456692979233
MAE 0.1806340977609143
```

SVM

In [213…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = SVR(kernel='rbf',C=10000,epsilon=0.1)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8083180902257614
MAE 0.20239059427481307
```

Random Forest

In [306…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = RandomForestRegressor(n_estimators=100,
                              random_state=3,
                              max_samples=0.5,
                              max_features=0.75,
                              max_depth=15)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8873402378382488
MAE 0.15860130110457718
```

ExtraTrees

In [228…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = ExtraTreesRegressor(n_estimators=100,
                              random_state=3,
                              max_samples=0.5,
                              max_features=0.75,
                              max_depth=15)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8753793123440623
MAE 0.15979519126758127
```

AdaBoost

In [244…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = AdaBoostRegressor(n_estimators=15,learning_rate=1.0)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.7929652659237908
MAE 0.23296532406396742
```

Gradient Boost

In [260…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = GradientBoostingRegressor(n_estimators=500)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])
```

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```
pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8823244736036472
MAE 0.15929506744611283
```

XgBoost

In [287…

```
step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')

step2 = XGBRegressor(n_estimators=45,max_depth=5,learning_rate=0.5)

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8811773435850243
MAE 0.16496203512600974
```

Voting Regressor

In [305…

```
from sklearn.ensemble import VotingRegressor,StackingRegressor

step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')


rf = RandomForestRegressor(n_estimators=350,random_state=3,max_samples=0.5,max_features=0.
gbdt = GradientBoostingRegressor(n_estimators=100,max_features=0.5)
xgb = XGBRegressor(n_estimators=25,learning_rate=0.3,max_depth=5)
et = ExtraTreesRegressor(n_estimators=100,random_state=3,max_samples=0.5,max_features=0.75

step2 = VotingRegressor([('rf', rf), ('gbdt', gbdt), ('xgb',xgb), ('et',et)],weights=[5,1,

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8901036732986811
MAE 0.15847265699907628
```

Stacking

In [296…

```
from sklearn.ensemble import VotingRegressor,StackingRegressor

step1 = ColumnTransformer(transformers=[
    ('col_tnf',OneHotEncoder(sparse=False,drop='first'),[0,1,7,10,11])
],remainder='passthrough')


estimators = [
    ('rf', RandomForestRegressor(n_estimators=350,random_state=3,max_samples=0.5,max_featu
    ('gbdt',GradientBoostingRegressor(n_estimators=100,max_features=0.5)),
    ('xgb', XGBRegressor(n_estimators=25,learning_rate=0.3,max_depth=5))
]

step2 = StackingRegressor(estimators=estimators, final_estimator=Ridge(alpha=100))

pipe = Pipeline([
    ('step1',step1),
    ('step2',step2)
])

pipe.fit(X_train,y_train)

y_pred = pipe.predict(X_test)

print('R2 score',r2_score(y_test,y_pred))
print('MAE',mean_absolute_error(y_test,y_pred))
```

```
R2 score 0.8816958647512341
MAE 0.1663048975120589
```

Exporting the Model

In [308…

```
import pickle

pickle.dump(df,open('df.pkl','wb'))
pickle.dump(pipe,open('pipe.pkl','wb'))
```

In [307…

```
df
```

Out[307…

	Company	TypeName	Ram	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gp brar
0	Apple	Ultrabook	8	1.37	71378.6832	0	1	226.983005	Intel Core i5	0	128	Int
1	Apple	Ultrabook	8	1.34	47895.5232	0	0	127.677940	Intel Core i5	0	0	Int
2	HP	Notebook	8	1.86	30636.0000	0	0	141.211998	Intel Core i5	0	256	Int
3	Apple	Ultrabook	16	1.83	135195.3360	0	1	220.534624	Intel Core i7	0	512	AM
4	Apple	Ultrabook	8	1.37	96095.8080	0	1	226.983005	Intel Core i5	0	256	Int
...	...	...	...	...	...	...	...	...	...	...	...	
1298	Lenovo	2 in 1 Convertible	4	1.80	33992.6400	1	1	157.350512	Intel Core i7	0	128	Int
1299	Lenovo	2 in 1 Convertible	16	1.30	79866.7200	1	1	276.053530	Intel Core i7	0	512	Int
1300	Lenovo	Notebook	2	1.50	12201.1200	0	0	111.935204	Other Intel Processor	0	0	Int

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	Company	TypeName	Ram	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gp bran
1301	HP	Notebook	6	2.19	40705.9200	0	0	100.454670	Intel Core i7	1000	0	AM
1302	Asus	Notebook	4	2.20	19660.3200	0	0	100.454670	Other Intel Processor	500	0	Int

1302 rows × 13 columns

In [309…

```
X_train
```

Out[309…

	Company	TypeName	Ram	Weight	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
183	Toshiba	Notebook	8	2.00	0	0	100.454670	Intel Core i5	0	128	Intel	Windows
1141	MSI	Gaming	8	2.40	0	0	141.211998	Intel Core i7	1000	128	Nvidia	Windows
1049	Asus	Netbook	4	1.20	0	0	135.094211	Other Intel Processor	0	0	Intel	Others/No OS/Linux
1020	Dell	2 in 1 Convertible	4	2.08	1	1	141.211998	Intel Core i3	1000	0	Intel	Windows
878	Dell	Notebook	4	2.18	0	0	141.211998	Intel Core i5	1000	128	Nvidia	Windows
...	...	...	...	...	...	...	...	...	...	...	...	...
466	Acer	Notebook	4	2.20	0	0	100.454670	Intel Core i3	500	0	Nvidia	Windows
299	Asus	Ultrabook	16	1.63	0	0	141.211998	Intel Core i7	0	512	Nvidia	Windows
493	Acer	Notebook	8	2.20	0	0	100.454670	AMD Processor	1000	0	AMD	Windows
527	Lenovo	Notebook	8	2.20	0	0	100.454670	Intel Core i3	2000	0	Nvidia	Others/No OS/Linux
1193	Apple	Ultrabook	8	0.92	0	1	226.415547	Other Intel Processor	0	0	Intel	Mac

1106 rows × 12 columns

In [ ]:

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