Laptop Price Prediction

Importing Libraries

In [91]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

Loading DataSet

In [2]:

```
df = pd.read_csv('/content/laptop_data.csv')
```

In [3]:

```
df.head()
```

Out[3]:

	Unnamed: 0	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
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	71378.6832
1	1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8GB	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34kg	47895.5232
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	30636.0000
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	135195.3360
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	96095.8080

Data Cleaning

In [4]:

```
df.shape
```

Out[4]:

```
(1303, 12)
```

In [5]:

```
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
```

Dropping unnecessary columms

In [6]:

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

Cleaning Ram and Weight column

In [7]:

```
df['Ram'] = df['Ram'].str.replace('GB', '')
```

In [8]:

```
df['Weight'] = df['Weight'].str.replace('kg','')
```

Changing their Dtypes

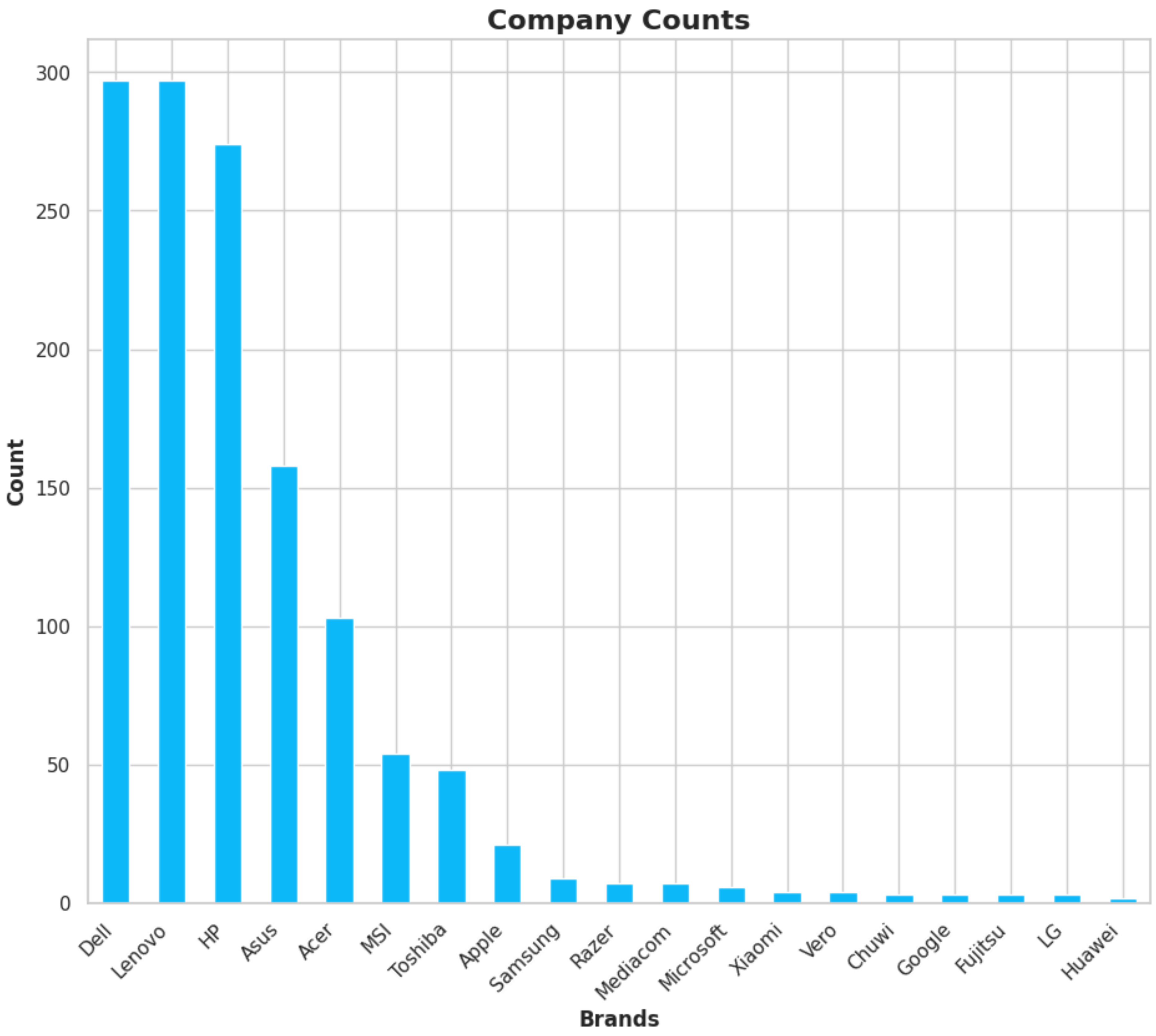
In [9]:

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

Exploratory Data Analysis

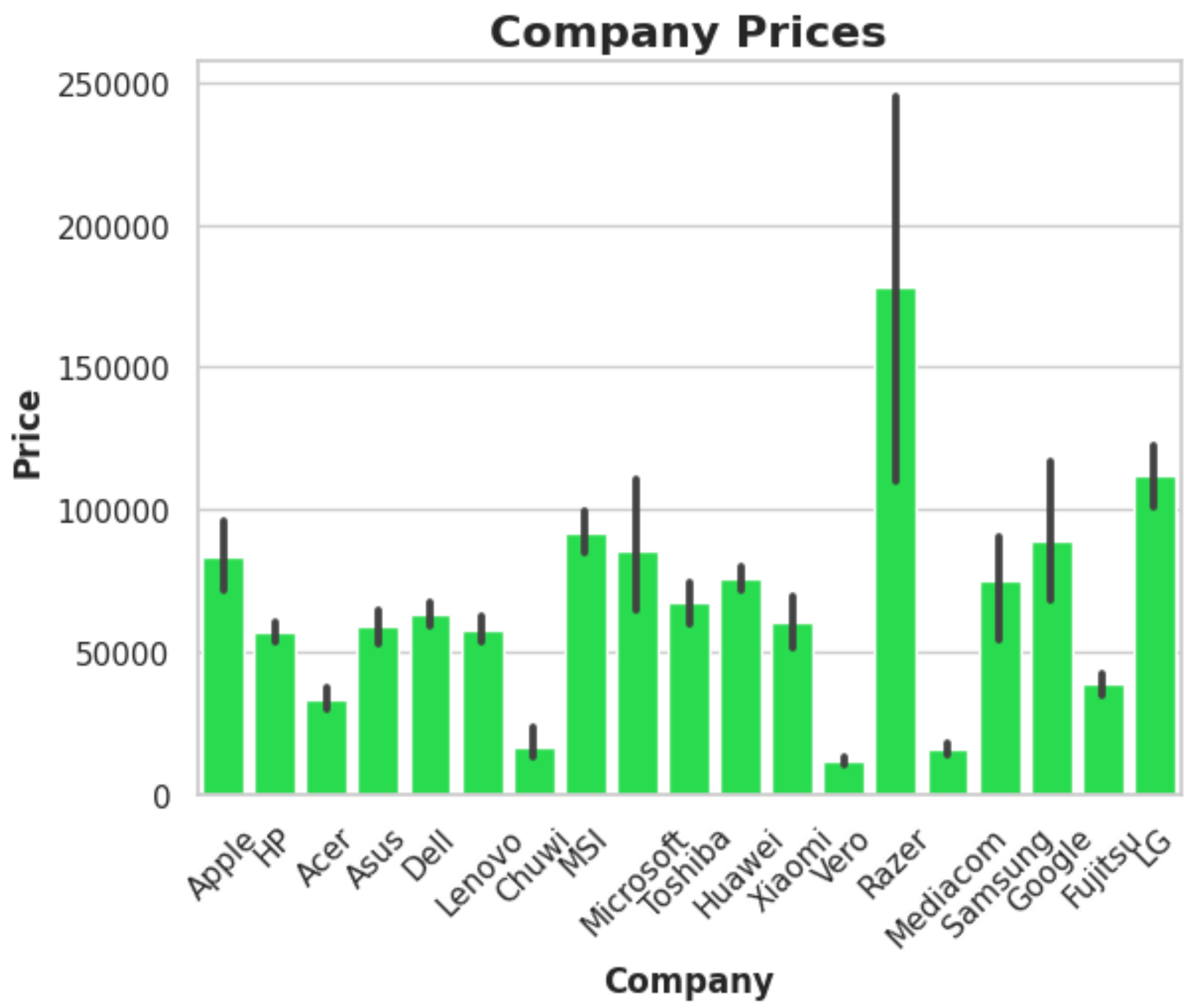
In [50]:

```
company_counts = df['Company'].value_counts()
sns.set(style='whitegrid')
fig, ax = plt.subplots(figsize=(11, 9))
ax = company_counts.plot(kind='bar', color='#0CB8F8')

ax.set_title('Company Counts', fontweight='bold', fontsize=16)
ax.set_xticklabels(company_counts.index, rotation=45, ha='right')

ax.set_xlabel('Brands', fontweight='bold')
ax.set_ylabel('Count', fontweight='bold')

plt.show()
```



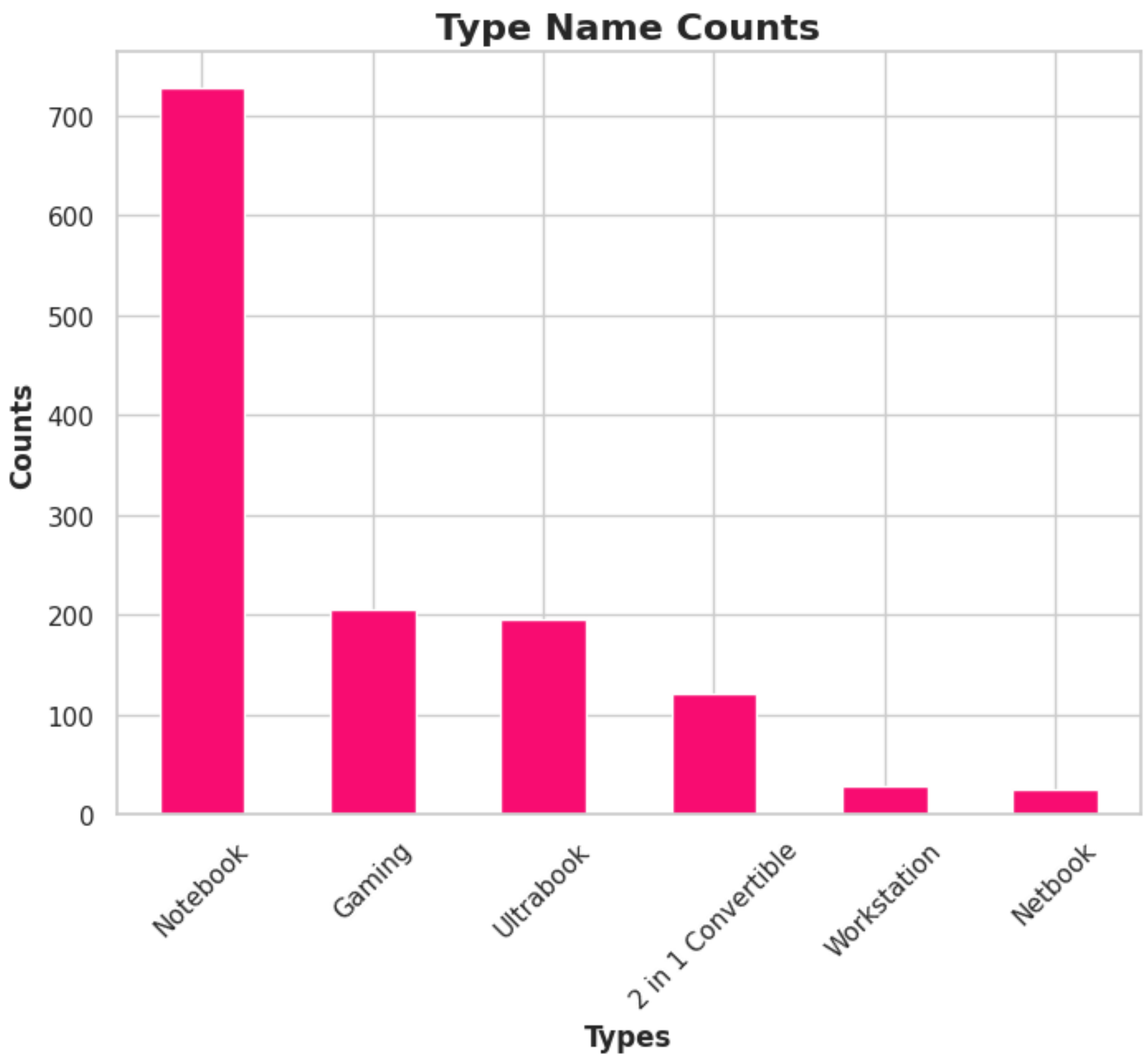
In [49]:

```
sns.barplot(x=df['Company'], y=df['Price'], color='#0CF83C')

plt.title('Company Prices', fontweight='bold', fontsize=16)

plt.xticks(rotation=45)
plt.xlabel('Company', fontweight='bold')
plt.ylabel('Price', fontweight='bold')
sns.set(style='whitegrid')
plt.show()
```



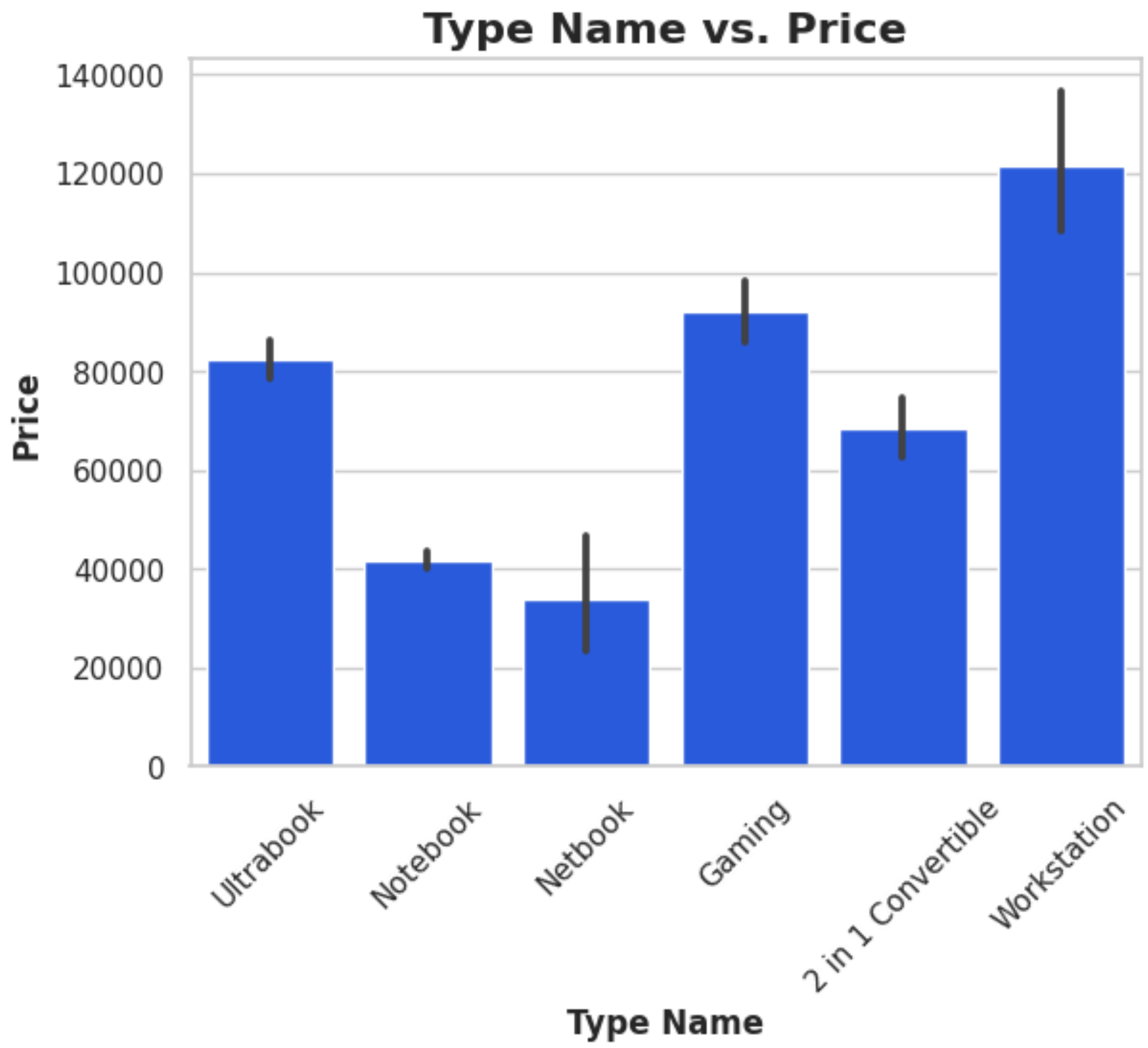
In [48]:

```
type_counts = df['TypeName'].value_counts()

fig, ax = plt.subplots(figsize=(8, 6))
ax = type_counts.plot(kind='bar', color='#F80C71')

ax.set_title('Type Name Counts', fontweight='bold', fontsize=16)

ax.set_xlabel('Types', fontweight='bold')
ax.set_ylabel('Counts', fontweight='bold')

plt.xticks(rotation=45)
sns.set(style='whitegrid')
plt.show()
```



In [47]:

```
sns.barplot(x=df['TypeName'], y=df['Price'], color='#0C4DF8')

plt.title('Type Name vs. Price', fontweight='bold', fontsize=16)
plt.xlabel('Type Name', fontweight='bold')
plt.ylabel('Price', fontweight='bold')

plt.xticks(rotation=45)
sns.set(style='whitegrid')
plt.show()
```



In [14]:

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

Out[14]:

```
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
Touchscreen 2560x1440                              7
IPS Panel 1366x768                                 7
IPS Panel Quad HD+ / Touchscreen 3200x1800         6
IPS Panel Retina Display 2560x1600                 6
IPS Panel Retina Display 2304x1440                 6
Touchscreen 2256x1504                              6
IPS Panel Touchscreen 2560x1440                    5
IPS Panel Retina Display 2880x1800                 4
IPS Panel Touchscreen 1920x1200                    4
1440x900                                           4
IPS Panel 2560x1440                                4
IPS Panel Quad HD+ 2560x1440                       3
Quad HD+ 3200x1800                                 3
1920x1080                                          3
Touchscreen 2400x1600                              3
2560x1440                                          3
IPS Panel Touchscreen 1366x768                     3
IPS Panel Touchscreen / 4K Ultra HD 3840x2160      2
IPS Panel Full HD 2160x1440                        2
IPS Panel Quad HD+ 3200x1800                       2
IPS Panel Retina Display 2736x1824                 1
IPS Panel Full HD 1920x1200                        1
IPS Panel Full HD 2560x1440                        1
IPS Panel Full HD 1366x768                         1
Touchscreen / Full HD 1920x1080                    1
Touchscreen / Quad HD+ 3200x1800                   1
Touchscreen / 4K Ultra HD 3840x2160                1
IPS Panel Touchscreen 2400x1600                    1
Name: ScreenResolution, dtype: int64
```

In [15]:

```
df['Touchscreen'] = df['ScreenResolution'].str.contains('Touchscreen').astype(int)
```

In [16]:

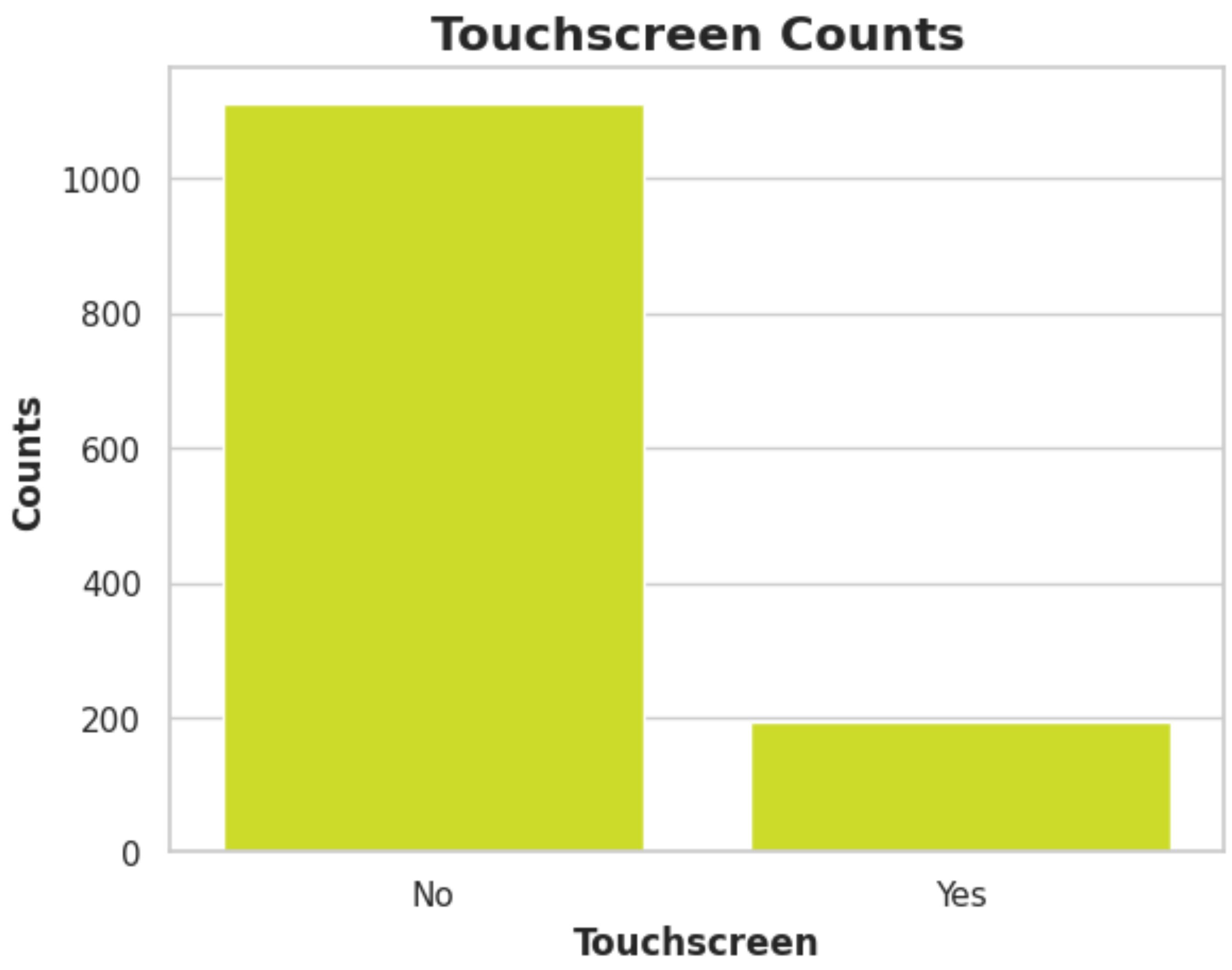
```
df.sample(3)
```

Out[16]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen
395	HP	Ultrabook	15.6	Full HD 1920x1080	AMD A9-Series 9420 3GHz	4	256GB SSD	AMD Radeon 520	Windows 10	1.91	26586.7200	0
558	HP	Notebook	15.6	IPS Panel Full HD 1920x1080	AMD A10-Series A10-9620P 2.5GHz	6	128GB SSD	AMD Radeon 530	Windows 10	1.91	30310.9920	0
1039	HP	Notebook	14.0	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	Windows 10	1.64	53839.9728	0

In [51]:

```
sns.countplot(x=df['Touchscreen'], color='#E4F80C')

plt.title('Touchscreen Counts', fontweight='bold', fontsize=16)
plt.xlabel('Touchscreen', fontweight='bold')
plt.ylabel('Counts', fontweight='bold')
sns.set(style='whitegrid')
plt.xticks([0, 1], ['No', 'Yes'])

plt.show()
```



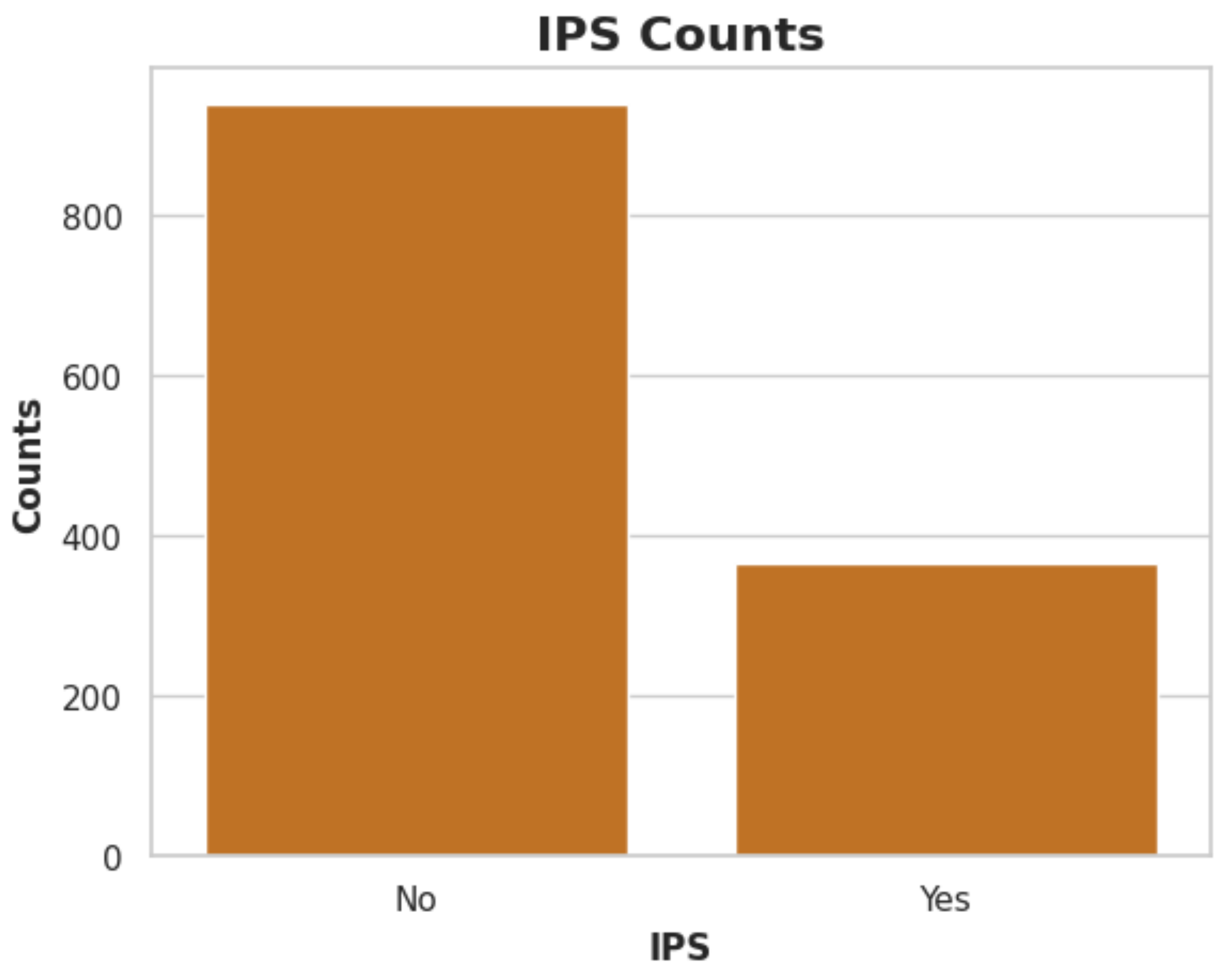
In [18]:
```
df['Ips'] = df['ScreenResolution'].str.contains('IPS').astype(int)
```

In [19]:
```
df.sample(5)
```

Out[19]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ip
424	Dell	Gaming	17.3	IPS Panel 2560x1440	Intel Core i7 7820HK 2.9GHz	16	256GB SSD + 1TB HDD	Nvidia GeForce GTX 1070	Windows 10	4.42	149130.7200	0	
279	Lenovo	Notebook	17.3	Full HD 1920x1080	Intel Core i7 8550U 1.8GHz	8	2TB HDD	Nvidia GeForce MX150	No OS	2.80	45234.7200	0	(
8	Asus	Ultrabook	14.0	Full HD 1920x1080	Intel Core i7 8550U 1.8GHz	16	512GB SSD	Nvidia GeForce MX150	Windows 10	1.30	79653.6000	0	(
545	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i3 7100U 2.4GHz	4	128GB SSD	Intel HD Graphics 620	Windows 10	2.10	37589.0400	0	(
635	Asus	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7300HQ 2.5GHz	8	1TB HDD	Nvidia GeForce GTX 1050	Windows 10	1.99	48304.7136	0	(

In [52]:
```
sns.countplot(x=df['Ips'], color='#D9720B')

plt.title('IPS Counts', fontweight='bold', fontsize=16)
plt.xlabel('IPS', fontweight='bold')
plt.ylabel('Counts', fontweight='bold')
sns.set(style='whitegrid')
plt.xticks([0, 1], ['No', 'Yes'])

plt.show()
```



In [21]:
```
df[['X_res', 'Y_res']] = df['ScreenResolution'].str.split('x', n=1, expand=True)
```

In [22]:
```
df.sample(5)
```

Out[22]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	I
1101	Dell	Ultrabook	12.5	1366x768	Intel Core i3 6100U 2.3GHz	4	128GB SSD	Intel HD Graphics 520	Windows 7	1.50	62176.1616	0	
420	Lenovo	2 in 1 Convertible	15.6	IPS Panel 4K Ultra HD / Touchscreen 3840x2160	Intel Core i7 7700HQ 2.8GHz	16	512GB SSD	Nvidia GeForce GTX 1050	Windows 10	2.00	101178.7200	1	
1175	Asus	Notebook	14.0	Full HD 1920x1080	Intel Core i3 7100U 2.4GHz	4	256GB SSD	Intel HD Graphics 620	Windows 10	2.00	40972.3200	0	
803	Dell	Notebook	15.6	4K Ultra HD / Touchscreen 3840x2160	Intel Core i5 7300HQ 2.5GHz	8	256GB SSD	Nvidia GeForce GTX 1050	Windows 10	2.06	93186.7200	1	
642	Lenovo	Ultrabook	14.0	IPS Panel Full HD 1920x1080	Intel Core i7 7500U 2.7GHz	16	512GB SSD	Intel HD Graphics 620	Windows 10	1.14	130536.0000	0	

In [23]:
```
df['X_res'] = df['X_res'].str.extract(r'(\d+\.?\d+)')
```

In [24]:
```
df['X_res'] = df['X_res'].astype('int')
df['Y_res'] = df['Y_res'].astype('int')
```

In [25]:
```
diagonal_resolution = (df['X_res']**2 + df['Y_res']**2)**0.5
df['ppi'] = (diagonal_resolution / df['Inches']).astype(float)
```

In [26]:
```
df.sample(5)
```

Out[26]:

	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ip
1132	Asus	Notebook	14.0	1366x768	Intel Celeron Dual Core N3350 1.1GHz	4	32GB Flash Storage	Intel HD Graphics 500	Windows 10	1.50	14811.840	0	
324	Acer	Notebook	15.6	1366x768	AMD A12-Series 9720P 2.7GHz	8	256GB SSD	AMD Radeon RX 540	Windows 10	2.20	35111.520	0	
1000	Acer	Gaming	15.6	IPS Panel Full HD 1920x1080	Intel Core i7 7700HQ 2.8GHz	8	128GB SSD + 1TB HDD	Nvidia GeForce GTX 1050	Windows 10	2.70	67132.800	0	
800	HP	Workstation	15.6	Full HD 1920x1080	Intel Core i7 7700HQ 2.8GHz	8	256GB SSD	Nvidia Quadro M2200	Windows 10	3.14	110017.872	0	
196	Razer	Gaming	17.3	4K Ultra HD / Touchscreen 3840x2160	Intel Core i7 7820HK 2.9GHz	32	1TB SSD	Nvidia GeForce GTX 1080	Windows 10	3.49	324954.720	1	

In [27]:

```python
# Dropping Screen resolution column

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

In [28]:

```python
# Dropping both X_res and Y_res columns

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

In [29]:

```python
df.head(3)
```

Out[29]:

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi
0	Apple	Ultrabook	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005
1	Apple	Ultrabook	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940
2	HP	Notebook	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998

In [30]:

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

Out[30]:

```
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 M M3-6Y30 0.9GHz        1
AMD A9-Series 9420 2.9GHz          1
Intel Core i3 6006U 2.2GHz         1
AMD A6-Series 7310 2GHz            1
Intel Xeon E3-1535M v6 3.1GHz      1
Name: Cpu, Length: 118, dtype: int64
```

In [31]:

```python
def get_cpu_name(cpu_value):
    cpu_words = cpu_value.split()
    first_three_words = cpu_words[:3]
    cpu_name = " ".join(first_three_words)
    return cpu_name
```

In [32]:

```python
df['Cpu Name'] = df['Cpu'].apply(get_cpu_name)
```

In [33]:

```python
df.head(3)
```

Out[33]:

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu Name
0	Apple	Ultrabook	Intel Core i5 2.3GHz	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5
1	Apple	Ultrabook	Intel Core i5 1.8GHz	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5
2	HP	Notebook	Intel Core i5 7200U 2.5GHz	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5

In [34]:

```python
def fetch_processor(text):
    if text in ['Intel Core i7', 'Intel Core i5', 'Intel Core i3']:
        return text
    elif text.split()[0] == 'Intel':
        return 'Other Intel Processor'
    else:
        return 'AMD Processor'
```

In [35]:

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

In [36]:

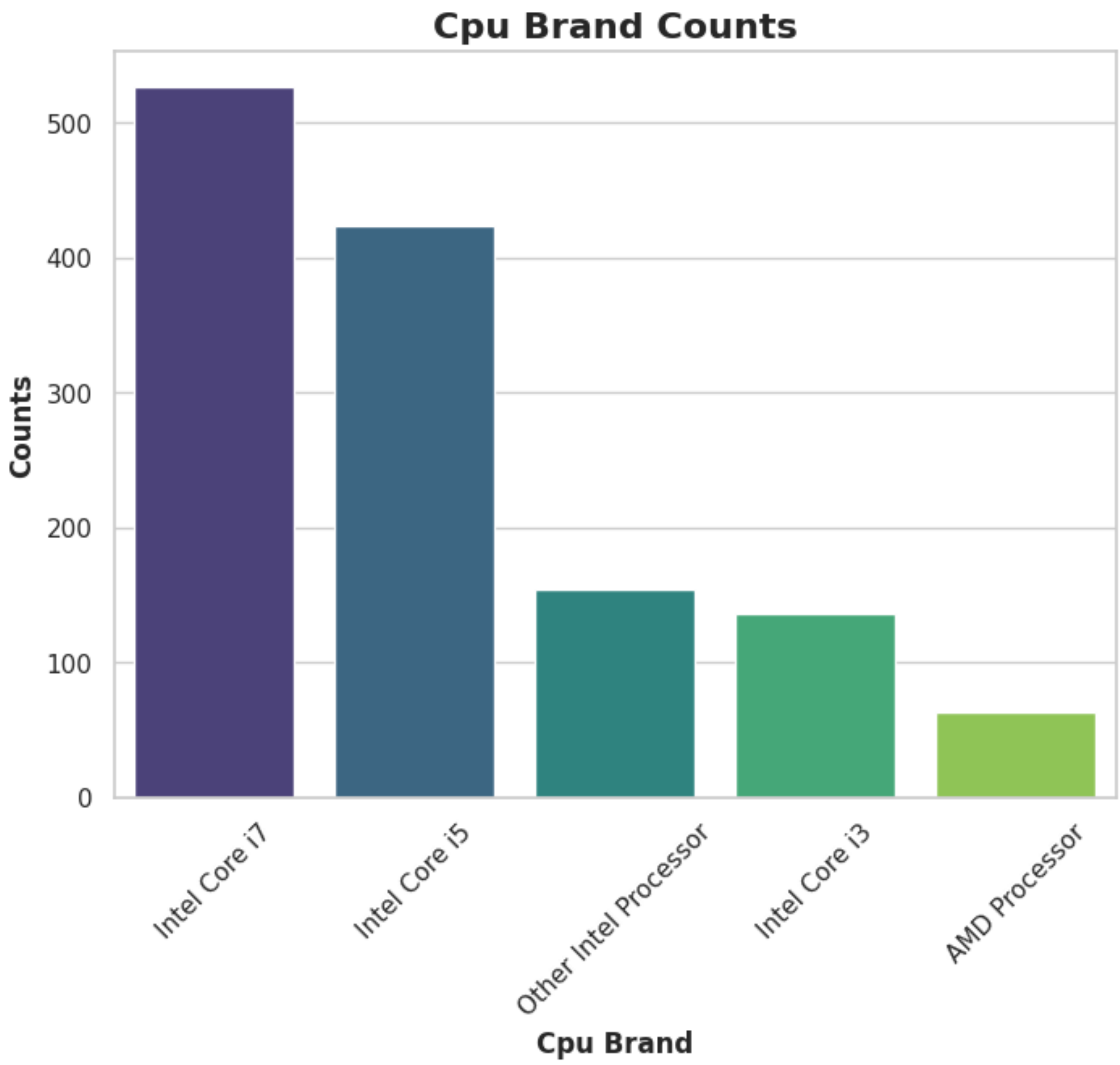
```python
df.sample(3)
```

Out[36]:

	Company	TypeName	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu Name	Cpu branc
210	Acer	Notebook	Intel Core i7 7700HQ 2.8GHz	8	1TB HDD	Nvidia GeForce GTX 1050	Linux	2.40	41505.1200	0	0	141.211998	Intel Core i7	Inte Core i7
394	Dell	Notebook	Intel Core i7 7500U 2.7GHz	8	256GB SSD	AMD Radeon R7 M445	Linux	2.33	41498.1936	0	0	141.211998	Intel Core i7	Inte Core i7
129	HP	Notebook	Intel Core i5 8250U 1.6GHz	8	256GB SSD	Intel UHD Graphics 620	Windows 10	2.50	49443.8400	0	0	127.335675	Intel Core i5	Inte Core i5

In [46]:

```python
cpu_brand_counts = df['Cpu brand'].value_counts()
sns.set(style='whitegrid')

plt.figure(figsize=(8, 6))
ax = sns.barplot(x=cpu_brand_counts.index, y=cpu_brand_counts.values, palette='viridis')

ax.set_title('Cpu Brand Counts', fontweight='bold', fontsize=16)
ax.set_xlabel('Cpu Brand', fontweight='bold')
ax.set_ylabel('Counts', fontweight='bold')

plt.xticks(rotation=45)

plt.show()
```



In [38]:

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

In [39]:

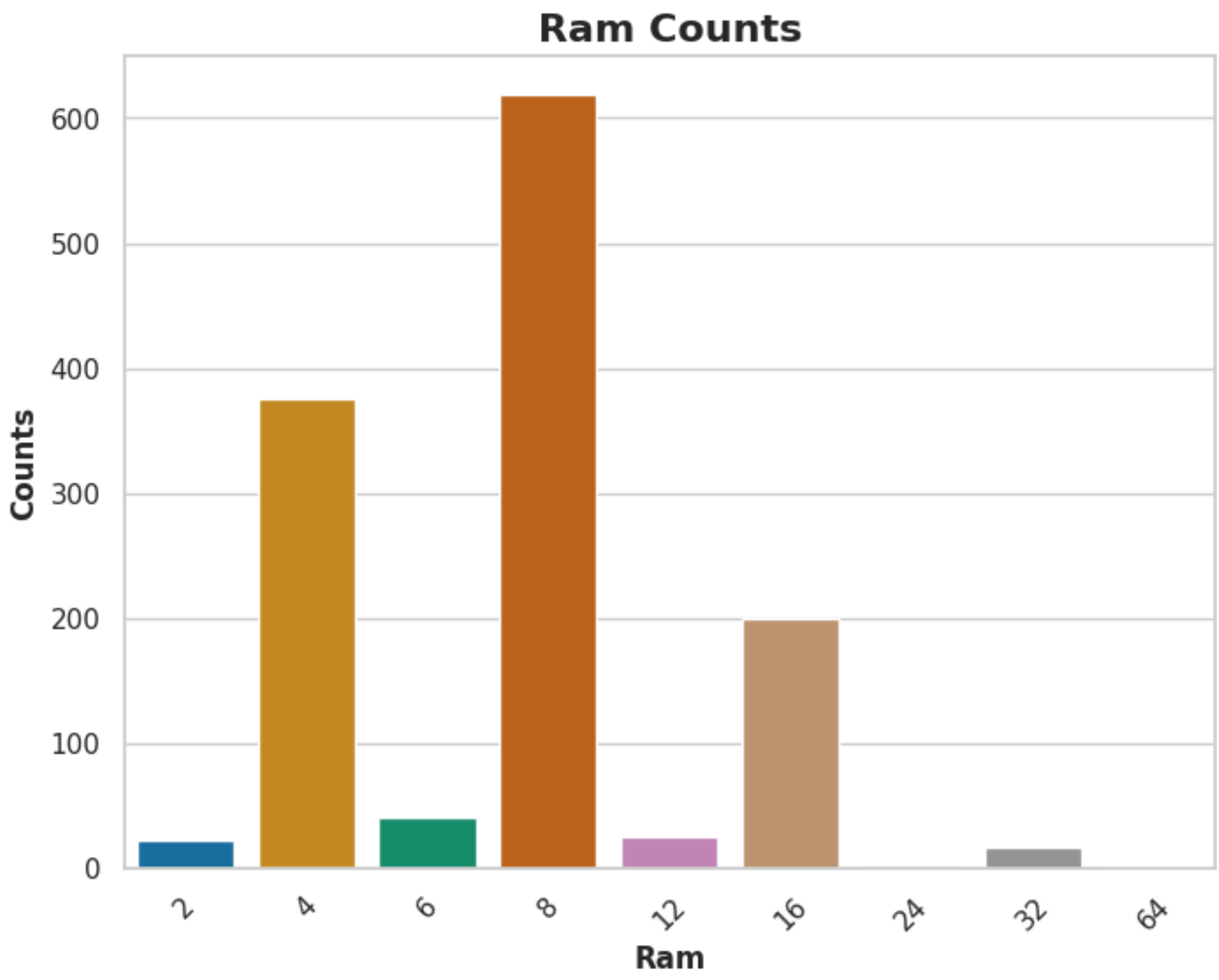
```
df.head(3)
```

Out[39]:

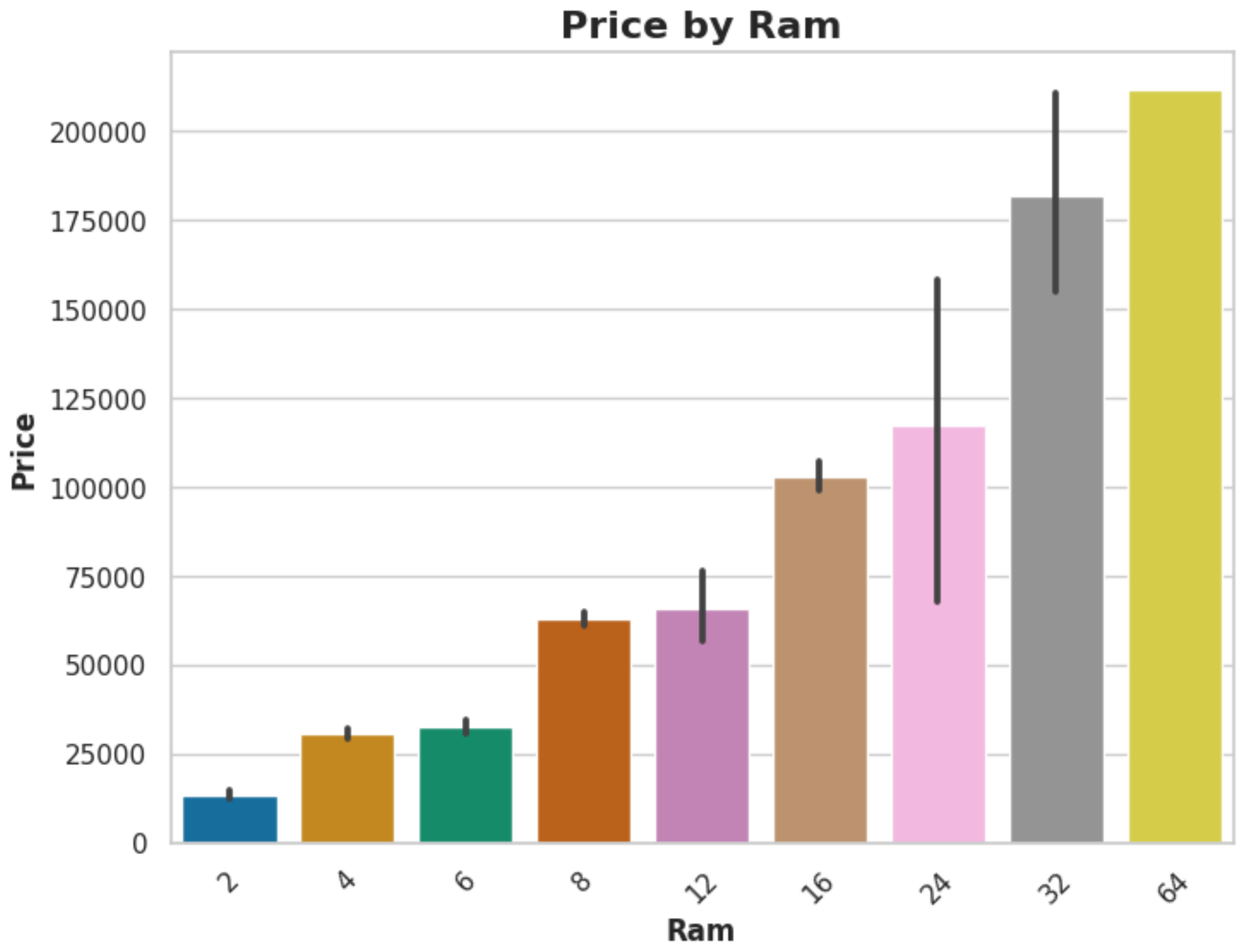
	Company	TypeName	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand
0	Apple	Ultrabook	8	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832	0	1	226.983005	Intel Core i5
1	Apple	Ultrabook	8	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232	0	0	127.677940	Intel Core i5
2	HP	Notebook	8	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000	0	0	141.211998	Intel Core i5

In [45]:

```
ram_counts = df['Ram'].value_counts()

sns.set(style='whitegrid')

plt.figure(figsize=(8, 6))
ax = sns.barplot(x=ram_counts.index, y=ram_counts.values, palette='colorblind')

ax.set_title('Ram Counts', fontweight='bold', fontsize=16)
ax.set_xlabel('Ram', fontweight='bold')
ax.set_ylabel('Counts', fontweight='bold')

plt.xticks(rotation=45)

plt.show()
```



In [43]:
```
sns.set(style='whitegrid')

plt.figure(figsize=(8, 6))
ax = sns.barplot(x=df['Ram'], y=df['Price'], palette='colorblind')

ax.set_title('Price by Ram', fontweight='bold', fontsize=16)
ax.set_xlabel('Ram', fontweight='bold')
ax.set_ylabel('Price', fontweight='bold')

plt.xticks(rotation=45)

plt.show()
```



In [53]:
```
df['Memory'].value_counts()
```

Out[53]:
```
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
512GB Flash Storage                2
1TB SSD +  1TB HDD                 2
256GB SSD +  500GB HDD             2
128GB SSD +  2TB HDD               2
256GB SSD +  256GB SSD             2
512GB SSD +  256GB SSD             1
512GB SSD +  512GB SSD             1
64GB Flash Storage +  1TB HDD      1
1TB HDD +  1TB HDD                 1
32GB HDD                           1
64GB SSD                           1
128GB HDD                          1
240GB SSD                          1
8GB SSD                            1
508GB Hybrid                       1
1.0TB HDD                          1
512GB SSD +  1.0TB Hybrid          1
256GB SSD +  1.0TB Hybrid          1
Name: Memory, dtype: int64
```

In [69]:
```python
df['Memory'] = df['Memory'].astype(str).str.replace('\.0', '').str.replace('GB', '').str.replace('TB', '000')
```

```
<ipython-input-69-e3742b54d13b>:1: FutureWarning: The default value of regex will change from True to False in a
future version.
  df['Memory'] = df['Memory'].astype(str).str.replace('\.0', '').str.replace('GB', '').str.replace('TB', '000')
```

In [70]:
```python
df[['first', 'second']] = df['Memory'].astype(str).str.split('+', n=1, expand=True)
df['first'] = df['first'].str.strip().str.replace(r'\D', '').astype(int)
df['second'] = df['second'].fillna('0').str.replace(r'\D', '').astype(int)
```

```
<ipython-input-70-7ef35f8736ed>:2: FutureWarning: The default value of regex will change from True to False in a
future version.
  df['first'] = df['first'].str.strip().str.replace(r'\D', '').astype(int)
<ipython-input-70-7ef35f8736ed>:3: FutureWarning: The default value of regex will change from True to False in a
future version.
  df['second'] = df['second'].fillna('0').str.replace(r'\D', '').astype(int)
```

In [71]:
```python
df['HDD'] = df['first'] * (df['Memory'].str.contains('HDD').astype(int)) + df['second'] * (df['Memory'].str.conta
df['SSD'] = df['first'] * (df['Memory'].str.contains('SSD').astype(int)) + df['second'] * (df['Memory'].str.conta
df['Hybrid'] = df['first'] * (df['Memory'].str.contains('Hybrid').astype(int)) + df['second'] * (df['Memory'].str
df['Flash_Storage'] = df['first'] * (df['Memory'].str.contains('Flash Storage').astype(int)) + df['second'] * (df
```

In [72]:
```python
df.drop(columns=['first', 'second'], inplace=True)
```

In [73]:
```python
df.sample(5)
```

Out[73]:

	Company	TypeName	Ram	Memory	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	H
432	Lenovo	Notebook	4	128 SSD	Intel HD Graphics 620	Windows 10	1.70	31914.7200	0	1	157.350512	Intel Core i3	0	128	
1227	Dell	Notebook	4	1000 HDD	Intel HD Graphics 520	Linux	2.18	27804.7008	0	0	100.454670	Intel Core i5	1000	0	
1257	Dell	Notebook	4	500 HDD	Intel HD Graphics 520	Windows 10	2.29	26107.2000	0	0	100.454670	Intel Core i3	500	0	
1164	HP	Notebook	4	500 HDD	Intel HD Graphics 520	No OS	2.10	25414.0272	0	0	100.454670	Intel Core i5	500	0	
386	Lenovo	Notebook	4	128 SSD	Intel HD Graphics 620	Windows 10	1.50	29250.7200	0	1	165.632118	Intel Core i3	0	128	

In [74]:
```
df.drop(columns=['Memory'],inplace=True)
```

In [76]:
```
df.corr()['Price']
```

```
<ipython-input-76-9447c1bc3d29>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future version, it will default to False. Select only valid columns or specify the value of numeric_only to silence this warning.
  df.corr()['Price']
```

Out[76]:
```
Ram            0.743007
Weight         0.210370
Price          1.000000
Touchscreen    0.191226
Ips            0.252208
ppi            0.473487
HDD           -0.024428
SSD            0.529437
Name: Price, dtype: float64
```

In [75]:
```
df.drop(columns=['Hybrid','Flash_Storage'],inplace=True)
```

In [77]:
```
df['Gpu'].value_counts()
```

Out[77]:
```
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
                          ...
AMD Radeon R5 520            1
AMD Radeon R7                1
Intel HD Graphics 540        1
AMD Radeon 540               1
ARM Mali T860 MP4            1
Name: Gpu, Length: 110, dtype: int64
```

In [78]:
```
df['Gpu brand'] = df['Gpu'].str.split().str[0]
```

In [79]:
```
df.sample(3)
```

Out[79]:

	Company	TypeName	Ram	Gpu	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand
1108	HP	Notebook	4	AMD Radeon R4	Windows 10	2.10	21205.4400	0	0	141.211998	AMD Processor	1000	0	AMD
1008	HP	Notebook	8	Nvidia GeForce 930MX	Windows 10	1.64	55904.5728	0	0	157.350512	Intel Core i5	0	256	Nvidia
367	Lenovo	Gaming	8	Nvidia GeForce GTX 1050	No OS	2.40	43103.5200	0	1	141.211998	Intel Core i5	1128	1128	Nvidia

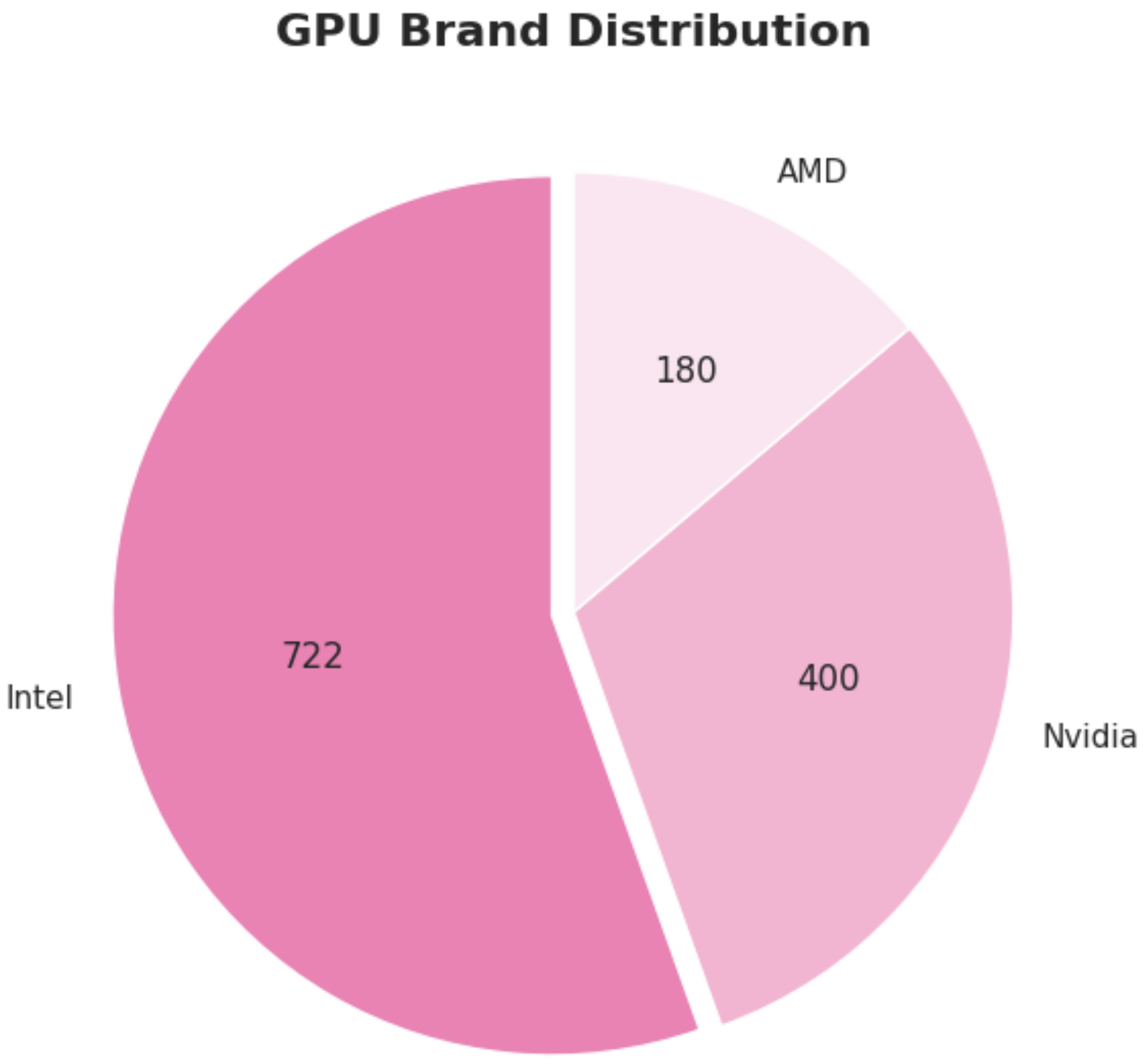
In [80]:
```
df['Gpu brand'].value_counts()
```

Out[80]:
```
Intel     722
Nvidia    400
AMD       180
ARM         1
Name: Gpu brand, dtype: int64
```

In [81]:
```
df = df[df['Gpu brand'] != 'ARM']
```

In [99]:

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

plt.figure(figsize=(9, 7))

colors = ['#E883B4', '#F1B5D2', '#FAE6F0']

patches, _ = plt.pie(gpu_counts, labels=gpu_counts.index, explode=(0.05, 0, 0), startangle=90, colors=colors)

plt.title('GPU Brand Distribution', fontweight='bold', fontsize=16)

for patch, count in zip(patches, gpu_counts):
    angle = patch.theta1 + (patch.theta2 - patch.theta1) / 2
    x = patch.r * 0.6 * np.cos(np.deg2rad(angle))
    y = patch.r * 0.6 * np.sin(np.deg2rad(angle))

    plt.text(x, y, str(count), ha='center', va='center')

plt.xticks(fontweight='bold')

plt.show()
```



In [101…

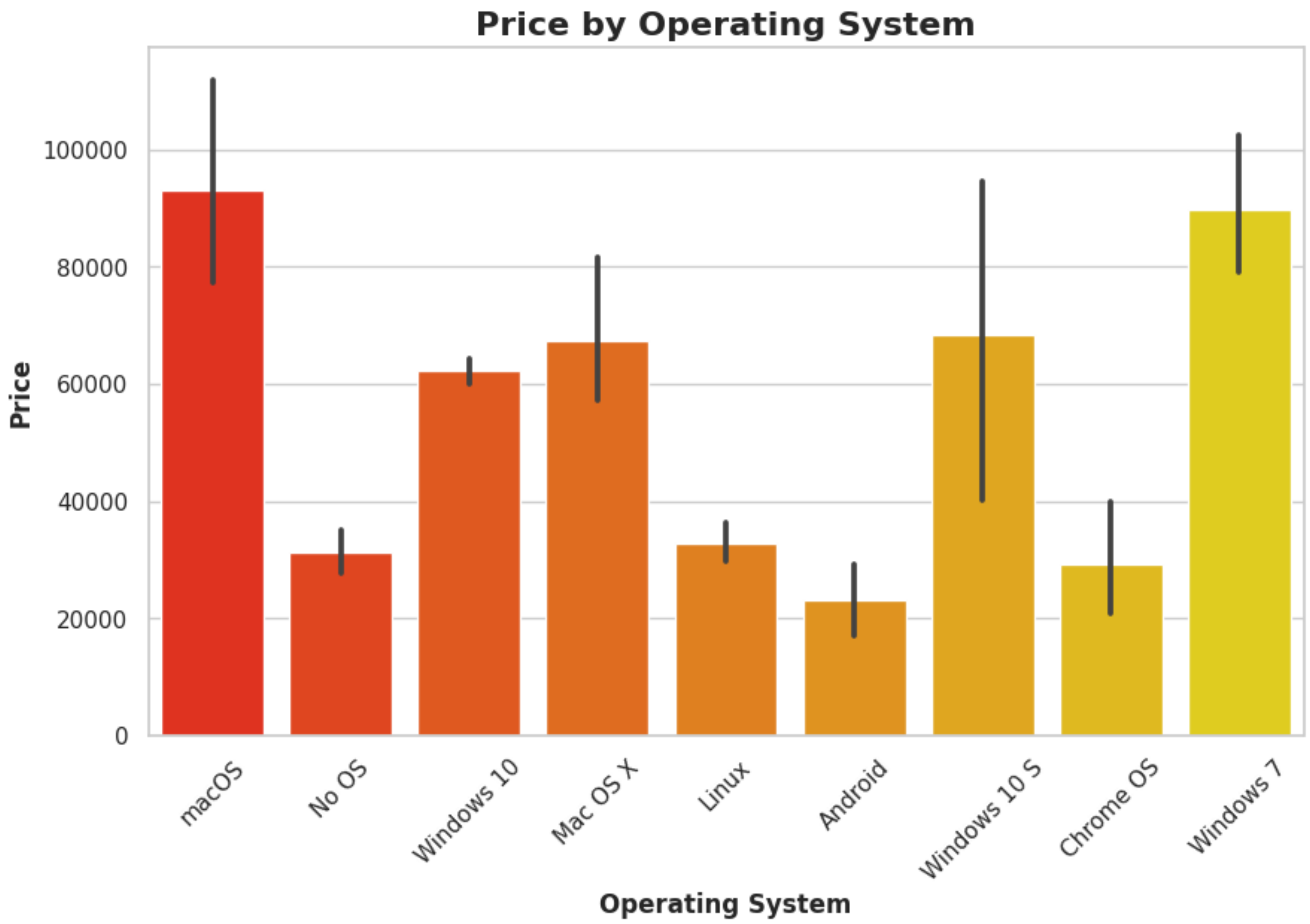
```
df['OpSys'].value_counts()
```

Out[101]:

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

In [104…

```
plt.figure(figsize=(10, 6))
sns.set(style="whitegrid")

sns.barplot(x=df['OpSys'], y=df['Price'], palette = 'autumn')

plt.title('Price by Operating System', fontweight='bold', fontsize=16)
plt.xlabel('Operating System', fontweight='bold')
plt.ylabel('Price', fontweight='bold')

plt.xticks(rotation= 45)

plt.show()
```



In [106…

```
os_mapping = {
    'Windows 10': 'Windows',
    'Windows 7': 'Windows',
    'Windows 10 S': 'Windows',
    'macOS': 'Mac',
    'Mac OS X': 'Mac'
}
```

In [107…

```
df['os'] = df['OpSys'].map(os_mapping).fillna('Others/No OS/Linux')
```

In [110…

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

Out[110]:

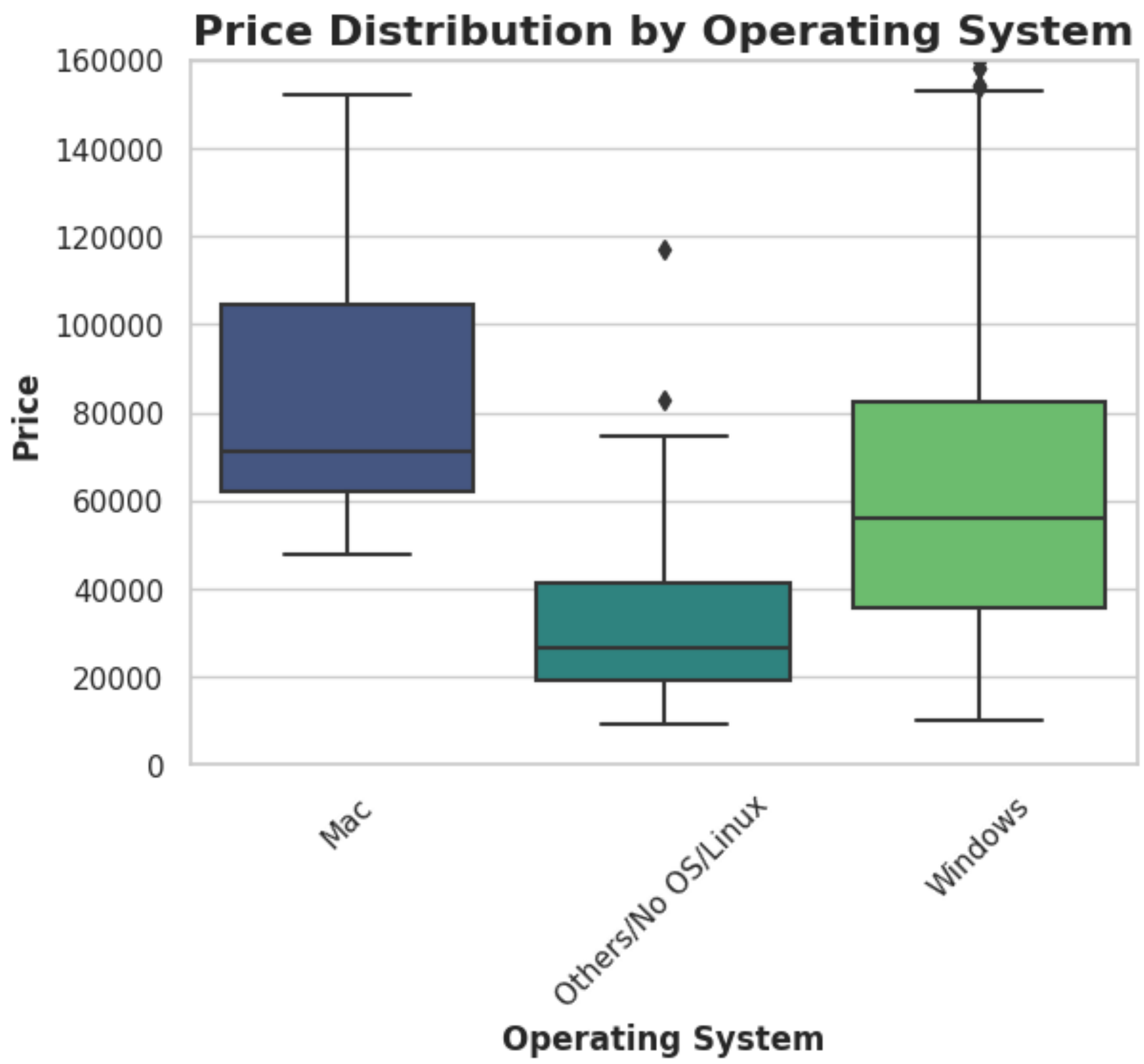
	Company	TypeName	Ram	OpSys	Weight	Price	Touchscreen	Ips	ppi	Cpu brand	HDD	SSD	Gpu brand	os
772	Toshiba	Notebook	4	Windows 10	1.75	54345.60	0	1	111.935204	Intel Core i5	0	128	Intel	Windows
188	Acer	Ultrabook	8	Windows 10	1.12	52693.92	0	1	165.632118	Intel Core i5	0	256	Intel	Windows
948	Dell	Notebook	4	Windows 10	2.36	35111.52	0	0	106.113062	Intel Core i3	1000	0	AMD	Windows
1014	HP	Notebook	4	Windows 10	1.49	42624.00	0	0	117.826530	Intel Core i3	500	0	Intel	Windows
533	Mediacom	Notebook	4	Windows 10	1.20	19660.32	0	1	165.632118	Other Intel Processor	0	32	Intel	Windows

In [111…

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

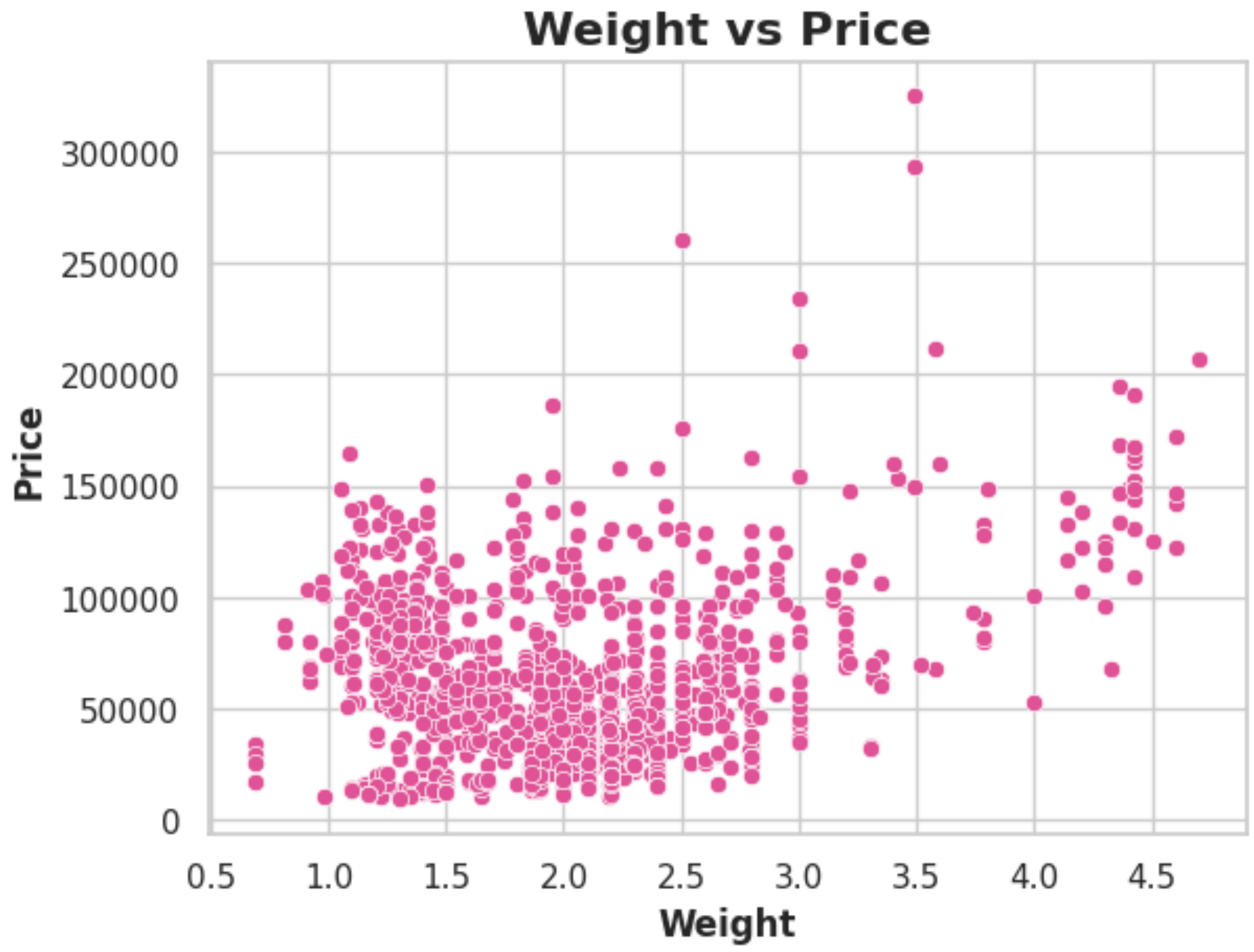
In [120…

```
sns.boxplot(x=df['os'], y=df['Price'], palette='viridis')
plt.xticks(rotation='vertical')
plt.ylim(0, 160000)
plt.title('Price Distribution by Operating System', fontweight='bold', fontsize=16)
plt.xlabel('Operating System', fontweight='bold')
plt.ylabel('Price', fontweight='bold')
plt.xticks(rotation= 45)
plt.show()
```



In [123…

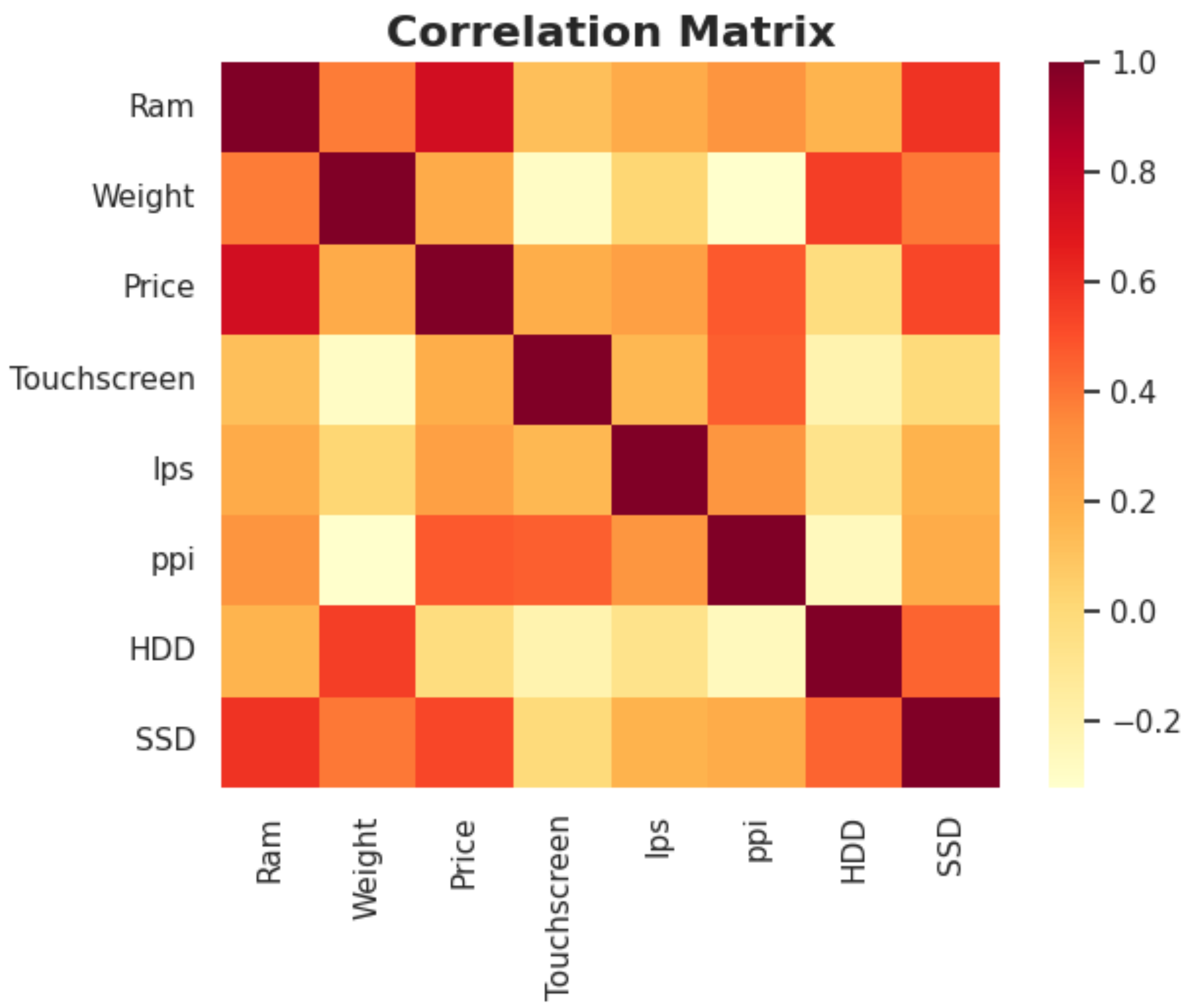
```
sns.scatterplot(x=df['Weight'], y=df['Price'], c = '#DF5296')
plt.title('Weight vs Price', fontweight='bold', fontsize=16)
plt.xlabel('Weight', fontweight='bold')
plt.ylabel('Price', fontweight='bold')
plt.show()
```



In [129…

```
sns.heatmap(df.corr(), cmap='YlOrRd')
plt.title('Correlation Matrix', fontweight='bold', fontsize=16)
plt.show()
```

```
<ipython-input-129-0aaac1ab8655>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprec
ated. In a future version, it will default to False. Select only valid columns or specify the value of numeric_o
nly to silence this warning.
  sns.heatmap(df.corr(), cmap='YlOrRd')
```



Training the model

In [130…
```
X = df.drop(columns=['Price'])
y = np.log(df['Price'])
```

In [149…
```
from sklearn.compose import ColumnTransformer
from sklearn.preprocessing import OneHotEncoder
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score, mean_absolute_error
from sklearn.pipeline import Pipeline
```

In [132…
```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.15,random_state=2)
```

In [147…
```
# Apply one-hot encoding

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

In [139…
```
X_train_encoded = ct.fit_transform(X_train)
X_test_encoded = ct.transform(X_test)
```

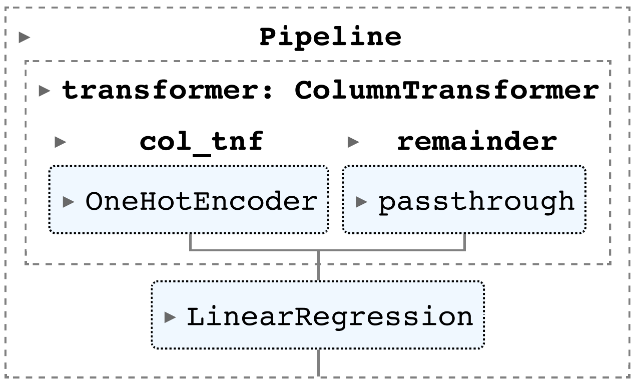
```
/usr/local/lib/python3.10/dist-packages/sklearn/preprocessing/_encoders.py:868: FutureWarning: `sparse` was rena
med to `sparse_output` in version 1.2 and will be removed in 1.4. `sparse_output` is ignored unless you leave `s
parse` to its default value.
  warnings.warn(
```

In [150…
```
pipe = Pipeline([
    ('transformer', transformer),
    ('model', LinearRegression())
])
```

In [151…
```
pipe.fit(X_train, y_train)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/preprocessing/_encoders.py:868: FutureWarning: `sparse` was rena
med to `sparse_output` in version 1.2 and will be removed in 1.4. `sparse_output` is ignored unless you leave `s
parse` to its default value.
  warnings.warn(
```

Out[151]:



In [152…

```
y_pred = pipe.predict(X_test)
```

In [154…

```
# Evaluating the model
print('R2 score:', r2_score(y_test, y_pred))
print('MAE:', mean_absolute_error(y_test, y_pred))
```

```
R2 score: 0.8090942879851168
MAE: 0.2117714518944287
```

An R2 score of 0.809 indicates that approximately 80.91% of the variance in the logarithm of the price can be explained by the features included in the model.

Exporting the model

In [155…

```
import pickle

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