Shop Sales Analysis (The latest version)

September 28, 2022

1 Shop Sales Analysis Project

Primary Questions:

```
- Q: How much was earned in 2019?
- Q: What was the best month for sales? How much was earned that month?
- Q: What City had the highest number of sales?
- Q: What time should we display adverstisement to maximize
likelihood of customer's buying product?
- Q: What product sold the most? Why do you think it sold the most?
```

2 Data Features:

```
- `Order ID` - An Order ID is the number system that Amazon uses exclusively to keep track of
- `Product` - The product that have been sold.
- `Quantity Ordered` - Ordered Quantity is the total item quantity ordered in the initial order
- `Price Each` - The price of each products.
- `Order Date` - This is the date the customer is requesting the order be shipped.
- `Purchase Address` - The purchase order is prepared by the buyer, often through a purchasing
- `shipping date`; billing address; shipping address; and the request items, quantities and pri
```

2.1 Data Importing

[1]:
```
#import the required libraries

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

[2]:
```
#Import the raw datasets

jan_data = pd.read_csv("Sales_January_2019.csv")
feb_data = pd.read_csv("Sales_February_2019.csv")
march_data = pd.read_csv("Sales_March_2019.csv")
april_data = pd.read_csv("Sales_April_2019.csv")
may_data = pd.read_csv("Sales_May_2019.csv")
```

```
june_data = pd.read_csv("Sales_June_2019.csv")
july_data = pd.read_csv("Sales_July_2019.csv")
aug_data = pd.read_csv("Sales_August_2019.csv")
sep_data = pd.read_csv("Sales_September_2019.csv")
oct_data = pd.read_csv("Sales_October_2019.csv")
nov_data = pd.read_csv("Sales_November_2019.csv")
dec_data = pd.read_csv("Sales_December_2019.csv")
```

2.2 Data Wrangling

[3]:
```
#Using Concatenate() function to merge all these datasets horizontally

df = pd.concat([jan_data, feb_data, march_data, april_data,␣
 ↪may_data,june_data,july_data,aug_data,
               sep_data, oct_data, nov_data, dec_data])
```

[4]:
```
#Making sure to convert the new large dataset into DataFrame to start my␣
 ↪analysis

df = pd.DataFrame(df)
df
```

[4]:

	Order ID	Product	Quantity Ordered	Price Each	\
0	141234	iPhone	1	700	
1	141235	Lightning Charging Cable	1	14.95	
2	141236	Wired Headphones	2	11.99	
3	141237	27in FHD Monitor	1	149.99	
4	141238	Wired Headphones	1	11.99	
…	…	…	…	…	
25112	319666	Lightning Charging Cable	1	14.95	
25113	319667	AA Batteries (4-pack)	2	3.84	
25114	319668	Vareebadd Phone	1	400	
25115	319669	Wired Headphones	1	11.99	
25116	319670	Bose SoundSport Headphones	1	99.99	

	Order Date	Purchase Address
0	01/22/19 21:25	944 Walnut St, Boston, MA 02215
1	01/28/19 14:15	185 Maple St, Portland, OR 97035
2	01/17/19 13:33	538 Adams St, San Francisco, CA 94016
3	01/05/19 20:33	738 10th St, Los Angeles, CA 90001
4	01/25/19 11:59	387 10th St, Austin, TX 73301
…	…	…
25112	12/11/19 20:58	14 Madison St, San Francisco, CA 94016
25113	12/01/19 12:01	549 Willow St, Los Angeles, CA 90001
25114	12/09/19 06:43	273 Wilson St, Seattle, WA 98101
25115	12/03/19 10:39	778 River St, Dallas, TX 75001

```
25116  12/21/19 21:45  747 Chestnut St, Los Angeles, CA 90001

[186850 rows x 6 columns]
```

[5]:
```
#Since the NA values are 545 so the ratio is 545/186850 "We can eliminate␣
 ↪them", as they don't have much weights on
#the model we build

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

[5]:
```
Order ID            545
Product             545
Quantity Ordered    545
Price Each          545
Order Date          545
Purchase Address    545
dtype: int64
```

[6]:
```
# Drop NA values, and modify the Order ID column

df = df.dropna(how='all', inplace=False)
df.drop(df.loc[df['Order ID'] =='Order ID'].index.tolist(), axis=0,inplace=True)
df.info()
df
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 182735 entries, 0 to 25116
Data columns (total 6 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   Order ID          182735 non-null  object
 1   Product           182735 non-null  object
 2   Quantity Ordered  182735 non-null  object
 3   Price Each        182735 non-null  object
 4   Order Date        182735 non-null  object
 5   Purchase Address  182735 non-null  object
dtypes: object(6)
memory usage: 9.8+ MB

/tmp/ipykernel_62538/1934129921.py:4: SettingWithCopyWarning:
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_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(df.loc[df['Order ID'] =='Order ID'].index.tolist(),
axis=0,inplace=True)
```

[6]:
```
       Order ID                    Product Quantity Ordered Price Each  \
0        141234                     iPhone                1        700
1        141235  Lightning Charging Cable                1      14.95
2        141236          Wired Headphones                2      11.99
3        141237          27in FHD Monitor                1     149.99
4        141238          Wired Headphones                1      11.99
…           …                          …              …         …
25112    319666  Lightning Charging Cable                1      14.95
25113    319667     AA Batteries (4-pack)                2       3.84
25114    319668           Vareebadd Phone                1        400
25115    319669          Wired Headphones                1      11.99
25116    319670  Bose SoundSport Headphones              1      99.99

           Order Date                      Purchase Address
0      01/22/19 21:25         944 Walnut St, Boston, MA 02215
1      01/28/19 14:15        185 Maple St, Portland, OR 97035
2      01/17/19 13:33   538 Adams St, San Francisco, CA 94016
3      01/05/19 20:33      738 10th St, Los Angeles, CA 90001
4      01/25/19 11:59           387 10th St, Austin, TX 73301
…                 …                                       …
25112  12/11/19 20:58  14 Madison St, San Francisco, CA 94016
25113  12/01/19 12:01    549 Willow St, Los Angeles, CA 90001
25114  12/09/19 06:43        273 Wilson St, Seattle, WA 98101
25115  12/03/19 10:39          778 River St, Dallas, TX 75001
25116  12/21/19 21:45  747 Chestnut St, Los Angeles, CA 90001

[182735 rows x 6 columns]
```

[7]:
```
#Convert these columns into their correct dtype

df['Quantity Ordered'] = pd.to_numeric(df['Quantity Ordered']).astype(int)
df['Price Each'] = pd.to_numeric(df['Price Each']).astype(float)
df['Order Date'] = pd.to_datetime(df['Order Date'])
```

```
/tmp/ipykernel_62538/2503558553.py:3: 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_guide/indexing.html#returning-a-view-versus-a-copy
  df['Quantity Ordered'] = pd.to_numeric(df['Quantity Ordered']).astype(int)
/tmp/ipykernel_62538/2503558553.py:4: 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_guide/indexing.html#returning-a-view-versus-a-copy
```

```
  df['Price Each'] = pd.to_numeric(df['Price Each']).astype(float)
/tmp/ipykernel_62538/2503558553.py:5: 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_guide/indexing.html#returning-a-view-versus-a-copy
  df['Order Date'] = pd.to_datetime(df['Order Date'])
```

[8]:
```
#Confirm everything works smoothly

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 182735 entries, 0 to 25116
Data columns (total 6 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   Order ID          182735 non-null  object
 1   Product           182735 non-null  object
 2   Quantity Ordered  182735 non-null  int64
 3   Price Each        182735 non-null  float64
 4   Order Date        182735 non-null  datetime64[ns]
 5   Purchase Address  182735 non-null  object
dtypes: datetime64[ns](1), float64(1), int64(1), object(3)
memory usage: 9.8+ MB
```

[9]:
```
# Splitting the location primar location then the state and month

df["Consumer_Primary_Location"] = df['Purchase Address'].apply(lambda x: x.
 ↪split(',')[0])
df["Consumer_State"] =  df['Purchase Address'].apply(lambda x: x.split(',')[1])
df['Month'] = df['Order Date'].dt.month
```

```
/tmp/ipykernel_62538/95539656.py:3: 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_guide/indexing.html#returning-a-view-versus-a-copy
  df["Consumer_Primary_Location"] = df['Purchase Address'].apply(lambda x:
x.split(',')[0])
/tmp/ipykernel_62538/95539656.py:4: 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_guide/indexing.html#returning-a-view-versus-a-copy
```

```
  df["Consumer_State"] =  df['Purchase Address'].apply(lambda x:
x.split(',')[1])
/tmp/ipykernel_62538/95539656.py:5: 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_guide/indexing.html#returning-a-view-versus-a-copy
  df['Month'] = df['Order Date'].dt.month
```

3 Q1: How much was earned in 2019?

[11]:
```
#Calculating the revenue "the earnings of 2019"

df['Revenue'] = df['Quantity Ordered'] * df['Price Each']
```

```
/tmp/ipykernel_62538/4220595851.py: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_guide/indexing.html#returning-a-view-versus-a-copy
  df['Revenue'] = df['Quantity Ordered'] * df['Price Each']
```

[28]:
```
round(df['Revenue'].sum(), 2)
```

[28]:
```
33879779.77
```

[12]:
```
#Checking the latest corrected Dataset

df
```

[12]:

	Order ID	Product	Quantity Ordered	Price Each	\
0	141234	iPhone	1	700.00	
1	141235	Lightning Charging Cable	1	14.95	
2	141236	Wired Headphones	2	11.99	
3	141237	27in FHD Monitor	1	149.99	
4	141238	Wired Headphones	1	11.99	
…	…	…	…	…	
25112	319666	Lightning Charging Cable	1	14.95	
25113	319667	AA Batteries (4-pack)	2	3.84	
25114	319668	Vareebadd Phone	1	400.00	
25115	319669	Wired Headphones	1	11.99	
25116	319670	Bose SoundSport Headphones	1	99.99	

	Order Date	Purchase Address	\
0	2019-01-22 21:25:00	944 Walnut St, Boston, MA 02215	

```
1     2019-01-28 14:15:00        185 Maple St, Portland, OR 97035
2     2019-01-17 13:33:00   538 Adams St, San Francisco, CA 94016
3     2019-01-05 20:33:00      738 10th St, Los Angeles, CA 90001
4     2019-01-25 11:59:00           387 10th St, Austin, TX 73301
…                     …                                      …
25112 2019-12-11 20:58:00  14 Madison St, San Francisco, CA 94016
25113 2019-12-01 12:01:00    549 Willow St, Los Angeles, CA 90001
25114 2019-12-09 06:43:00        273 Wilson St, Seattle, WA 98101
25115 2019-12-03 10:39:00          778 River St, Dallas, TX 75001
25116 2019-12-21 21:45:00  747 Chestnut St, Los Angeles, CA 90001

      Consumer_Primary_Location  Consumer_State  Month  Revenue
0                  944 Walnut St          Boston      1   700.00
1                   185 Maple St        Portland      1    14.95
2                   538 Adams St   San Francisco      1    23.98
3                    738 10th St     Los Angeles      1   149.99
4                    387 10th St          Austin      1    11.99
…                            …             …    …      …
25112              14 Madison St   San Francisco     12    14.95
25113              549 Willow St     Los Angeles     12     7.68
25114              273 Wilson St         Seattle     12   400.00
25115               778 River St          Dallas     12    11.99
25116            747 Chestnut St     Los Angeles     12    99.99

[182735 rows x 10 columns]
```

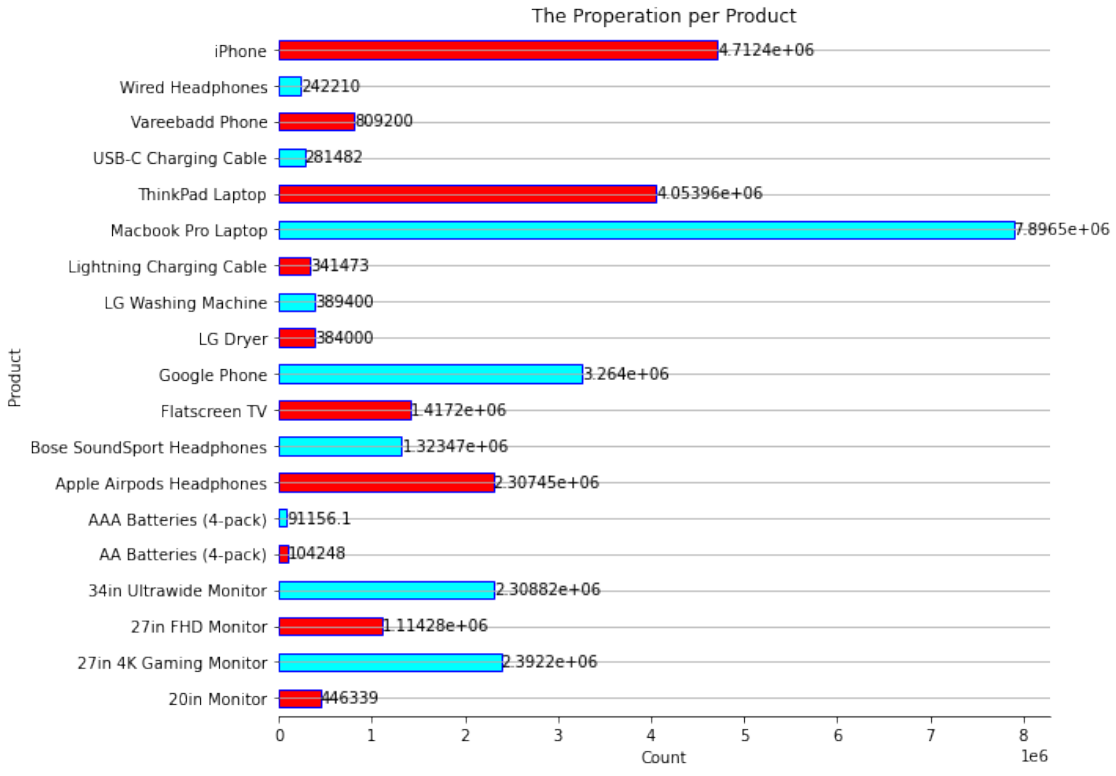
[13]:
```
#Creating sub-dataset from the original df to bring more analysis

Consumer_Usage = df.groupby("Product")[ "Revenue"].sum().sort_values(ascending
 ↪= False).to_frame(name = 'Total Profits').reset_index()
```

[14]:
```
Consumer_Usage = pd.DataFrame(Consumer_Usage)
Consumer_Usage
```

[14]:
```
                       Product  Total Profits
0           Macbook Pro Laptop     7896500.00
1                       iPhone     4712400.00
2               ThinkPad Laptop     4053959.46
3                  Google Phone     3264000.00
4       27in 4K Gaming Monitor     2392198.66
5       34in Ultrawide Monitor     2308819.24
6     Apple Airpods Headphones     2307450.00
7                 Flatscreen TV     1417200.00
8   Bose SoundSport Headphones     1323467.64
9              27in FHD Monitor     1114275.71
10             Vareebadd Phone      809200.00
11                20in Monitor      446339.42
```

```
12          LG Washing Machine      389400.00
13                  LG Dryer        384000.00
14   Lightning Charging Cable       341472.95
15       USB-C Charging Cable       281482.25
16           Wired Headphones       242209.99
17      AA Batteries (4-pack)       104248.32
18     AAA Batteries (4-pack)        91156.13
```

[15]:
```
#We plot the barh plot based on the product and the revenue for each product

plt.figure(figsize = (30,30))
l = Consumer_Usage.groupby('Product')["Total Profits"].mean().plot.
 ↪barh(figsize=(10,7),  color = ('red', 'cyan'), edgecolor='b')
plt.xlabel('Count')
plt.title('The Properation per Product')

l.bar_label(l.containers[0], label_type='edge')
plt.tight_layout()

l.spines['top'].set_visible(False)
l.spines['right'].set_visible(False)
l.spines['left'].set_visible(False)
l.grid(axis="y")

plt.show()
```



3.0.1 Interpretation:

- The first best seller is (Macbook Pro Laptop), followed by (Iphone). So both products it's n
- In the second category, (ThinkPad) then (Google Phone) are considered most popular after App

[16]:
```
#Creating the most states that have the most revenue.

Usage_per_State = df.groupby(["Consumer_State","Month"])["Revenue"].sum().
 ↪sort_values(ascending = False).to_frame(name = 'Total Revenue').reset_index()
```

[17]:
```
Usage_per_State = pd.DataFrame(Usage_per_State)
Usage_per_State
```

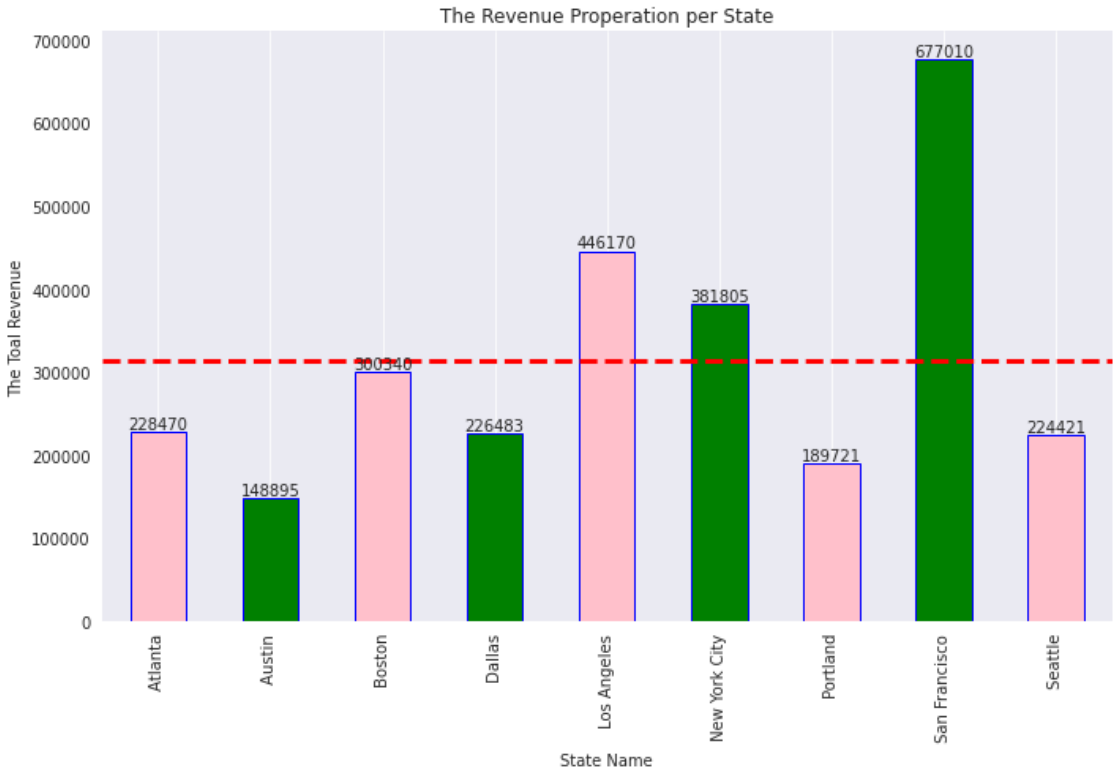
[17]:

	Consumer_State	Month	Total Revenue
0	San Francisco	12	1095074.98
1	San Francisco	10	850906.51
2	San Francisco	4	803979.43
3	San Francisco	5	766211.21
4	San Francisco	11	750491.50
..	…	…	…
103	Austin	8	124317.73
104	Portland	1	112876.66
105	Austin	2	107040.07
106	Austin	9	105836.76
107	Austin	1	85909.67

[108 rows x 3 columns]

[26]:
```
#Plotting the Revenue for each state then drawing the average revenue line.

plt.figure(figsize = (30,30))
m = Usage_per_State.groupby('Consumer_State')["Total Revenue"].mean().plot.
 ↪bar(figsize=(10,7),  color = ('pink', 'green'), edgecolor='b')
plt.xlabel('State Name')
plt.ylabel('The Toal Revenue')
plt.title('The Revenue Properation per State')

m.bar_label(m.containers[0], label_type='edge')
plt.tight_layout()

m.spines['top'].set_visible(False)
m.spines['right'].set_visible(False)
m.spines['left'].set_visible(False)
m.grid(axis="y")
```

```
plt.axhline(Usage_per_State["Total Revenue"].mean(), color='red', linewidth=3,␣
 ↪linestyle='--')

plt.show()
```



3.0.2 The Interpretation:

- The highest stated that recorded the highest revenue is San Fransico, followed by Los Angles
- Our average revenue is a little above 300k for 2019.

[20]:
```
gg = df.groupby(["Consumer_State","Month"])["Revenue"].count().
 ↪sort_values(ascending = False).to_frame(name = 'Total_Revenue').reset_index()
```

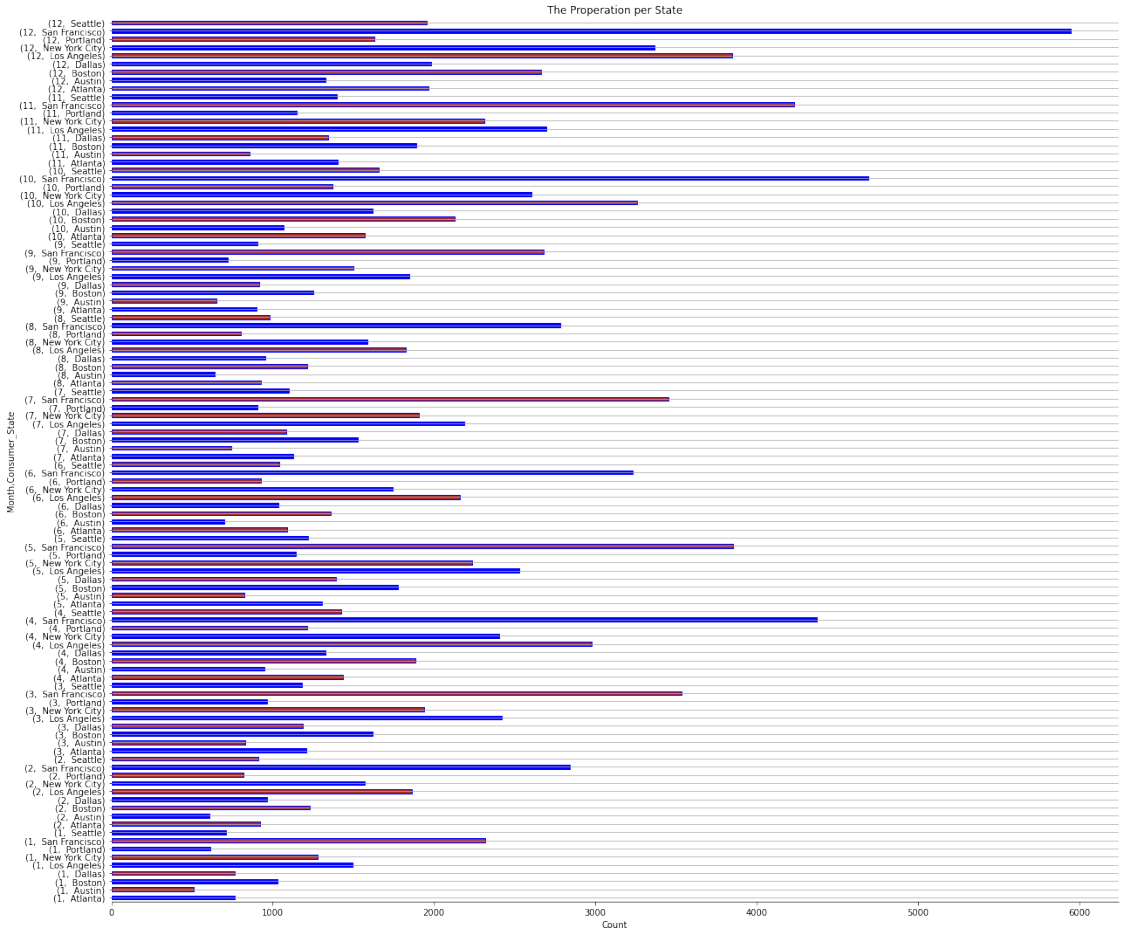
[21]:
```
dada = pd.DataFrame(gg)
dada
```

[21]:

	Consumer_State	Month	Total_Revenue
0	San Francisco	12	5946
1	San Francisco	10	4693
2	San Francisco	4	4371
3	San Francisco	11	4232
4	San Francisco	5	3856

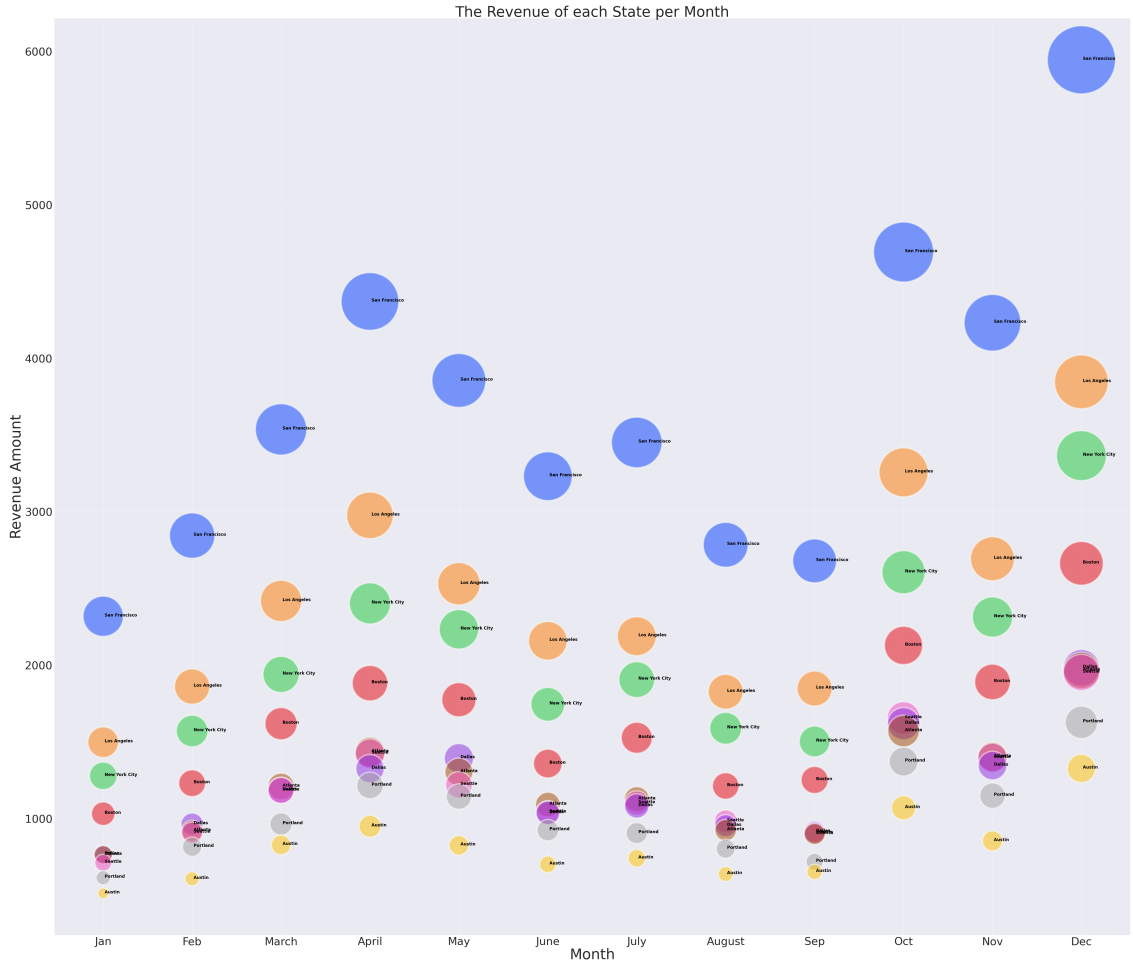
```
..              …    …             …
103          Austin      9           653
104          Austin      8           639
105        Portland      1           615
106          Austin      2           608
107          Austin      1           513

[108 rows x 3 columns]
```

[22]:
```
plt.figure(figsize = (80,80))
#m = dada.groupby("Month")["Total Revenue"].sum().plot.bar(figsize=(18,15), ␣
 ↪color = ('pink', 'green'), edgecolor='b')
n = dada.groupby(["Month", 'Consumer_State'])["Total_Revenue"].sum().plot.
 ↪barh(figsize=(18,15),  color = ('blue', 'brown'), edgecolor='b')


plt.xlabel('Count')
plt.title('The Properation per State')

n.bar_label(m.containers[0], label_type='edge')
plt.tight_layout()

n.spines['top'].set_visible(False)
n.spines['right'].set_visible(False)
n.spines['left'].set_visible(False)
n.grid(axis="y")

#plt.axhline(dada["Total Revenue"].mean(), color='red', linewidth=3,␣
 ↪linestyle='--')

plt.show()
```



[23]:
```
# set seaborn "whitegrid" theme
sns.set_style("darkgrid")


mme = ["Jan", "Feb", "March", "April", "May", "June", "July", "August", "Sep",␣
 ↪"Oct", "Nov", "Dec"]

plt.figure(figsize=(80,70))

kiki = dada["Total_Revenue"]*1000
# use the scatterplot function
ax = sns.scatterplot(data=dada, x="Month", y="Total_Revenue",␣
 ↪size="Total_Revenue", hue='Consumer_State',
                palette="bright", edgecolors="black", alpha=0.5,␣
 ↪sizes=(2000,80000), legend = False)

# Add titles (main and on axis)
plt.xlabel("Month", fontsize = 60)
```

```
plt.ylabel("Revenue Amount", fontsize = 60)
plt.title("The Revenue of each State per Month", fontsize = 60)

#sns.set_xticklabels(mme)
plt.xticks([1,2,3,4,5,6,7,8,9,10,11,12], mme, fontsize = 45)
plt.yticks(fontsize = 45)


# Locate the legend outside of the plot

for line in range(0,dada.shape[0]):
     ax.text(dada.Month.iloc[line], dada.Total_Revenue.iloc[line], dada.
 ↪Consumer_State.iloc[line], horizontalalignment='left', size='xx-large',␣
 ↪color='black', weight='semibold')

#plt.legend(bbox_to_anchor=(1,1), loc='upper left', fontsize=40)

# show the graph
plt.show()
```



3.0.3 The Interpretation:

- I built up this chart as it has three different variables "Revenue" & "Month" & "Consumer Sta
- The best month we achieve high revenue is on December, October, and April.

[24]:
```
Product_Consumprtion = df.groupby(["Product", "Month"])[ "Revenue"].sum().
 ↪sort_values(ascending = False).to_frame(name = 'Total_Profits').reset_index()
Product_Consumprtion
```

[24]:

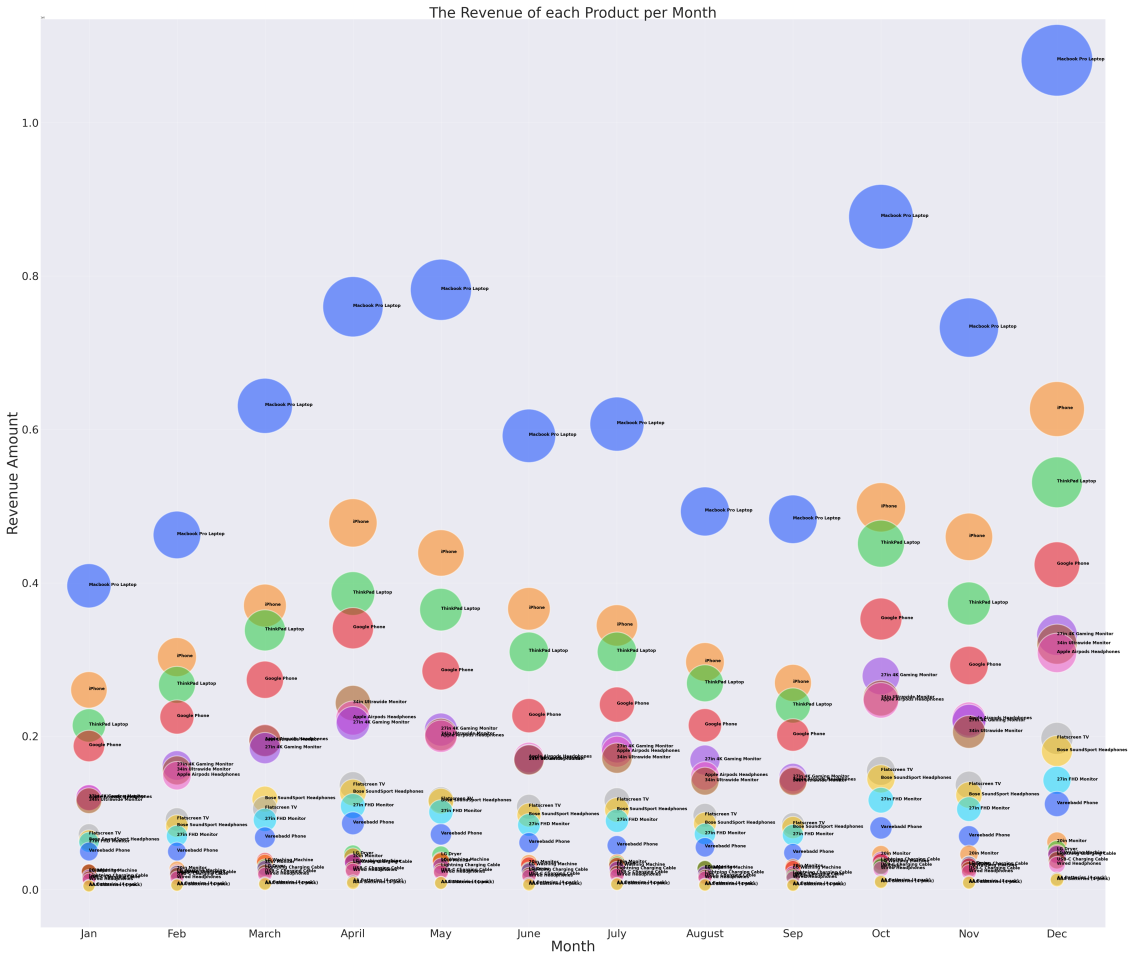
	Product	Month	Total_Profits
0	Macbook Pro Laptop	12	1081200.00
1	Macbook Pro Laptop	10	877200.00
2	Macbook Pro Laptop	5	782000.00
3	Macbook Pro Laptop	4	759900.00
4	Macbook Pro Laptop	11	732700.00
..	…	…	…
223	AAA Batteries (4-pack)	8	5947.11
224	AAA Batteries (4-pack)	2	5770.70
225	AAA Batteries (4-pack)	9	5651.10
226	AA Batteries (4-pack)	1	5368.32
227	AAA Batteries (4-pack)	1	4670.38

[228 rows x 3 columns]

[ ]:
```

```

[25]:
```
# set seaborn "whitegrid" theme
sns.set_style("darkgrid")


mme = ["Jan", "Feb", "March", "April", "May", "June", "July", "August", "Sep",␣
 ↪"Oct", "Nov", "Dec"]

plt.figure(figsize=(80,70))

# use the scatterplot function
ax = sns.scatterplot(data=Product_Consumprtion, x="Month", y="Total_Profits",␣
 ↪size="Total_Profits", hue='Product',
                palette="bright", edgecolors="black", alpha=0.5,␣
 ↪sizes=(2500,90000), legend = False)

# Add titles (main and on axis)
plt.xlabel("Month", fontsize = 60)
plt.ylabel("Revenue Amount", fontsize = 60)
plt.title("The Revenue of each Product per Month", fontsize = 60)
```

```
#sns.set_xticklabels(mme)
plt.xticks([1,2,3,4,5,6,7,8,9,10,11,12], mme, fontsize = 45)
plt.yticks(fontsize = 45)


# Locate the legend outside of the plot

for line in range(0,Product_Consumprtion.shape[0]):
     ax.text(Product_Consumprtion.Month.iloc[line], Product_Consumprtion.
  ↪Total_Profits.iloc[line], Product_Consumprtion.Product.iloc[line],␣
  ↪horizontalalignment='left', size='xx-large', color='black',␣
  ↪weight='semibold')

#plt.legend(bbox_to_anchor=(1,1), loc='upper left', fontsize=40)

# show the graph
plt.show()
```



[ ]:

4 Conclusion:

- I have covered the main questions asked, and here's the detailed answers:

  - Q: How much was earned in 2019? At the end of 2019, the shop totall sales are 33879779.

  - Q: What was the best month for sales? How much was earned that month? December is
    recorded as the best profitable month for 2019, witha total revenue equal to 677010 do

  - Q: What City had the highest number of sales? The highest number os sales is in San Fran

  - Q: What time should we display adverstisement to maximize
  likelihood of customer's buying product? The best time is December, then October, then Apr

  - Q: What product sold the most? Why do you think it sold the most? The top are Apple pro
    which are Macbook Pro Laptop, then Iphone.

4.1 Limitation:

- The raw dataset isn't complete, if there were more data-related to the consumers such as (Th

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