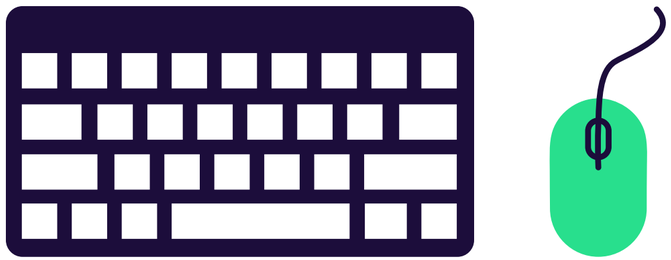
(base) C:\Users\ITMGT-A>cd superstore_dataset

Group6 =
["Buenaventura","Sta. Maria","Verches"]



Importing Necessary Libraries

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

import geopandas as gpd
```

Sourced Superstore Dataset \SuperstoreDataset.csv

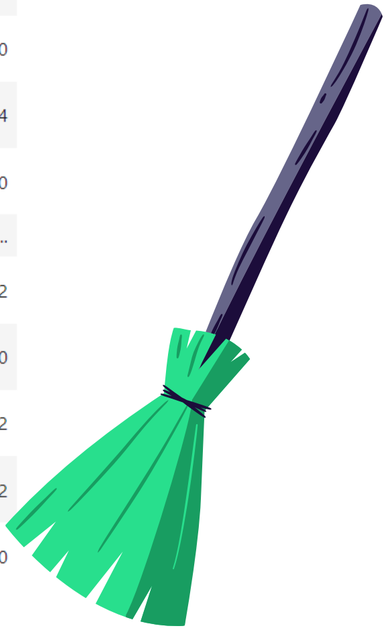
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Ship Mode	Customer ID	Customer Name	Segment	Country	City	State	Postal Code	Region	Product ID	Category	Sub-Category	Product Name	Sales	Quantity	Discount	Profit
2	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	Kentucky	42420	South	FUR-BO-10001798	Furniture	Bookcases	Bush Somerset Colle	261.96	2	0	41.9136
3	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	Kentucky	42420	South	FUR-CH-10000454	Furniture	Chairs	Hon Deluxe Fabric U	731.94	3	0	219.582
4	Second Class	DV-13045	Darrin Van Huff	Corporate	United States	Los Angeles	California	90036	West	OFF-LA-10000240	Office Supplies	Labels	Self-Adhesive Addre	14.62	2	0	6.8714
5	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	Florida	33311	South	FUR-TA-10000577	Furniture	Tables	Bretford CR4500 Ser	957.5775	5	0.45	-383.031
6	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	Florida	33311	South	OFF-ST-10000760	Office Supplies	Storage	Eldon Fold 'N Roll C	22.368	2	0.2	2.5164
7	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	FUR-FU-10001487	Furniture	Furnishings	Eldon Expressions W	48.86	7	0	14.1694
8	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-AR-10002833	Office Supplies	Art	Newell 322	7.28	4	0	1.9656
9	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	TEC-PH-10002275	Technology	Phones	Mitel 5320 IP Phone	907.152	6	0.2	90.7152
10	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-BI-10003910	Office Supplies	Binders	DXL Angle-View Bin	18.504	3	0.2	5.7825
11	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	OFF-AP-10002892	Office Supplies	Appliances	Belkin F5C206VTEL	114.9	5	0	34.47
12	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	FUR-TA-10001539	Furniture	Tables	Chromcraft Rectangu	1706.184	9	0.2	85.3092
13	Standard Class	BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	West	TEC-PH-10002033	Technology	Phones	Konftel 250 Conferer	911.424	4	0.2	68.3568
14	Standard Class	AA-10480	Andrew Allen	Consumer	United States	Concord	North Carolina	28027	South	OFF-PA-10002365	Office Supplies	Paper	Xerox 1967	15.552	3	0.2	5.4432
15	Standard Class	IM-15070	Irene Maddox	Consumer	United States	Seattle	Washington	98103	West	OFF-BI-10003656	Office Supplies	Binders	Fellowes PB200 Plas	407.976	3	0.2	132.5922
16	Standard Class	HP-14815	Harold Pawlan	Home Office	United States	Fort Worth	Texas	76106	Central	OFF-AP-10002311	Office Supplies	Appliances	Holmes Replacemer	68.81	5	0.8	-123.858
17	Standard Class	HP-14815	Harold Pawlan	Home Office	United States	Fort Worth	Texas	76106	Central	OFF-BI-10000756	Office Supplies	Binders	Storex DuraTech Re	2.544	3	0.8	-3.816
18	Standard Class	PK-19075	Pete Kriz	Consumer	United States	Madison	Wisconsin	53711	Central	OFF-ST-10004186	Office Supplies	Storage	Stur-D-Stor Shelving	665.88	6	0	13.3176
19	Second Class	AG-10270	Alejandro Grove	Consumer	United States	West Jordan	Utah	84084	West	OFF-ST-10000107	Office Supplies	Storage	Fellowes Super Stor/	55.5	2	0	9.99
20	Second Class	ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	West	OFF-AR-10003056	Office Supplies	Art	Newell 341	8.56	2	0	2.4824
21	Second Class	ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	West	TEC-PH-10001949	Technology	Phones	Cisco SPA 501G IP I	213.48	3	0.2	16.011
22	Second Class	ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	West	OFF-BI-10002215	Office Supplies	Binders	Wilson Jones Hangin	22.72	4	0.2	7.384
23	Standard Class	KB-16585	Ken Black	Corporate	United States	Fremont	Nebraska	68025	Central	OFF-AR-10000246	Office Supplies	Art	Newell 318	19.46	7	0	5.0596
24	Standard Class	KB-16585	Ken Black	Corporate	United States	Fremont	Nebraska	68025	Central	OFF-AP-10001492	Office Supplies	Appliances	Acco Six-Outlet Pow	60.34	7	0	15.6884
25	Second Class	SF-20065	Sandra Flanagan	Consumer	United States	Philadelphia	Pennsylvania	19140	East	FUR-CH-10002774	Furniture	Chairs	Global Deluxe Stack	71.372	2	0.3	-1.0196
26	Standard Class	EB-13870	Emily Burns	Consumer	United States	Orem	Utah	84057	West	FUR-TA-10000577	Furniture	Tables	Bretford CR4500 Ser	1044.63	3	0	240.2649
27	Second Class	EH-13945	Eric Hoffmann	Consumer	United States	Los Angeles	California	90049	West	OFF-BI-10001634	Office Supplies	Binders	Wilson Jones Active	11.648	2	0.2	4.2224
28	Second Class	EH-13945	Eric Hoffmann	Consumer	United States	Los Angeles	California	90049	West	TEC-AC-10003027	Technology	Accessories	Imation 8GB Mini Tr	90.57	3	0	11.7741
29	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	FUR-BO-10004834	Furniture	Bookcases	Riverside Palais Roy	3083.43	7	0.5	-1665.0522
30	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	OFF-BI-10000474	Office Supplies	Binders	Avery Recycled Flex	9.618	2	0.7	-7.0532
31	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	FUR-FU-10004848	Furniture	Furnishings	Howard Miller 13-3/4	124.2	3	0.2	15.525
32	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	OFF-EN-10001509	Office Supplies	Envelopes	Poly String Tie Enve	3.264	2	0.2	1.1016
33	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	OFF-AR-10004042	Office Supplies	Art	BOSTON Model 180	86.304	6	0.2	9.7092
34	Standard Class	TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	East	OFF-BI-10001525	Office Supplies	Binders	Acco Pressboard Co	6.858	6	0.7	-5.715

Reading and Cleaning Data

```
dataset = pd.read_csv("SuperstoreDataset.csv")
dataset = dataset.drop(columns=["Customer Name","Country","Postal Code","Unnamed: 17"]).sort_values(["Region","State","City"],ascending=[True,True,True])[["Region","State","City"
dataset
```

	Region	State	City	Customer ID	Segment	Product ID	Product Name	Ship Mode	Category	Sub-Category	Sales	Quantity	Discount	Profit
0	Central	Illinois	Arlington Heights	SC-20845	Consumer	OFF-AR-10003394	Newell 332	Standard Class	Office Supplies	Art	14.112	6	0.2	1.2348
1	Central	Illinois	Aurora	EH-14125	Home Office	FUR-CH-10001215	Global Troy Executive Leather Low-Back Tilter	Same Day	Furniture	Chairs	701.372	2	0.3	-50.0980
2	Central	Illinois	Aurora	EH-14125	Home Office	OFF-BI-10004654	Avery Binding System Hidden Tab Executive Styl...	Same Day	Office Supplies	Binders	2.308	2	0.8	-3.4620
3	Central	Illinois	Aurora	JK-16120	Home Office	FUR-FU-10003394	Tenex "The Solids" Textured Chair Mats	Standard Class	Furniture	Furnishings	83.952	3	0.6	-90.2484
4	Central	Illinois	Aurora	CK-12760	Corporate	FUR-TA-10002958	Bevis Oval Conference Table, Walnut	Standard Class	Furniture	Tables	652.450	5	0.5	-430.6170
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9989	West	Washington	Vancouver	AR-10825	Corporate	TEC-PH-10003273	AT&T TR1909W	Second Class	Technology	Phones	302.376	3	0.2	22.6782
9990	West	Washington	Vancouver	AR-10825	Corporate	TEC-AC-10001142	First Data FD10 PIN Pad	Second Class	Technology	Accessories	316.000	4	0.0	31.6000
9991	West	Washington	Vancouver	FM-14290	Home Office	OFF-AR-10002956	Boston 16801 Nautilus Battery Pencil Sharpener	Standard Class	Office Supplies	Art	44.020	2	0.0	11.4452
9992	West	Washington	Vancouver	JW-15220	Corporate	FUR-FU-10002885	Magna Visual Magnetic Picture Hangers	Standard Class	Furniture	Furnishings	9.640	2	0.0	3.6632
9993	West	Wyoming	Cheyenne	MA-17995	Home Office	FUR-CH-10001215	Global Troy Executive Leather Low-Back Tilter	Standard Class	Furniture	Chairs	1603.136	4	0.2	100.1960

9994 rows × 14 columns



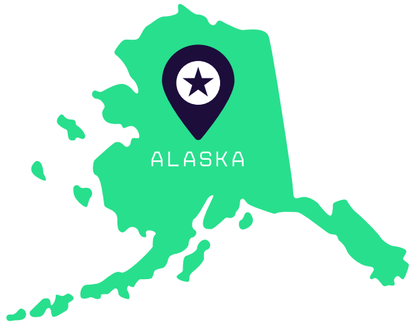
\data_by_profit.ipnyb

Separating States by Regions and Creating a Spatial File for Map Visualization

```
regions = ["Central","West","East","South"]
region_data = {}

gdf = gpd.read_file("us_states")
gdf = gdf.rename(columns={"NAME":"state"})
gdf_dict = {}

for region in regions:
    region_data[region] = dataset[dataset["Region"] == region]
    region_data[region].sort_values(by="State")
    set_region = set(region_data[region]["State"].unique())
    gdf_dict[region] = gdf.loc[gdf["state"].isin(set_region)].reset_index().drop(columns=["GEO_ID","STATE","index","CENSUSAREA","LSAD"])
    region_data[region] = pd.DataFrame(region_data[region].groupby("State").sum()).reset_index()
    region_data[region] = pd.concat([region_data[region],gdf_dict[region]],axis = 1)
    region_data[region] = region_data[region].sort_values(by="Profit",ascending=False).reset_index().drop(columns = ["Quantity","Discount","index","state"])

region_gdf = pd.concat([region_data["Central"],region_data["East"],region_data["West"],region_data["South"]])
region_gdf = gpd.GeoDataFrame(region_gdf, geometry='geometry')
region_gdf.to_file("states.geojson", driver="GeoJSON")

for region in regions:
    region_data[region].drop(columns=["geometry"],inplace = True)
    region_data[region].to_csv("region_data/{}_region_data.csv".format(region.lower()),index=False)
```

Sourced data for State geometry from https://eric.clst.org/tech/usgeojson/

	GEO_ID	STATE	state	LSAD	CENSUSAREA	geometry
0	0400000US01	01	Alabama	None	50645.326	MULTIPOLYGON (((-88.12466 30.28364, -88.08681 ...
1	0400000US02	02	Alaska	None	570640.950	MULTIPOLYGON (((-166.10574 53.98861, -166.0752...
2	0400000US04	04	Arizona	None	113594.084	POLYGON ((-112.53859 37.00067, -112.53454 37.0...
3	0400000US05	05	Arkansas	None	52035.477	POLYGON ((-94.04296 33.01922, -94.04304 33.079...
4	0400000US06	06	California	None	155779.220	MULTIPOLYGON (((-122.42144 37.86997, -122.4213...
5	0400000US08	08	Colorado	None	103641.888	POLYGON ((-106.19055 40.99761, -106.06118 40.9...
6	0400000US09	09	Connecticut	None	4842.355	POLYGON ((-71.79924 42.00806, -71.79792 41.935...
7	0400000US10	10	Delaware	None	1948.543	MULTIPOLYGON (((-75.56493 39.58325, -75.57627 ...
8	0400000US11	11	District of Columbia	None	61.048	POLYGON ((-77.03860 38.79151, -77.03890 38.800...
9	0400000US12	12	Florida	None	53624.759	MULTIPOLYGON (((-82.82158 27.96444, -82.82980 ...
10	0400000US13	13	Georgia	None	57513.485	POLYGON ((-84.81048 34.98761, -84.80918 34.987...
11	0400000US15	15	Hawaii	None	6422.628	MULTIPOLYGON (((-155.77823 20.24574, -155.7727...
12	0400000US16	16	Idaho	None	82643.117	POLYGON ((-111.04416 43.02005, -111.04413 43.0...
13	0400000US17	17	Illinois	None	55518.930	POLYGON ((-89.36603 42.50027, -89.36156 42.500...
14	0400000US18	18	Indiana	None	35826.109	POLYGON ((-84.80248 40.52805, -84.80255 40.501...
15	0400000US19	19	Iowa	None	55857.130	POLYGON ((-91.21771 43.50055, -91.21827 43.497...
16	0400000US20	20	Kansas	None	81758.717	POLYGON ((-99.54112 36.99957, -99.55807 36.999...
17	0400000US21	21	Kentucky	None	39486.338	MULTIPOLYGON (((-89.48511 36.49769, -89.49254 ...
18	0400000US22	22	Louisiana	None	43203.905	MULTIPOLYGON (((-88.86507 29.75271, -88.88976 ...



Alaska, Hawaii, and Puerto Rico were filtered from this

New Dataframes for each Region

```
region_data["Central"]
```

	State	Sales	Profit
0	Michigan	76269.6140	24463.1876
1	Indiana	53555.3600	18382.9363
2	Minnesota	29863.1500	10823.1874
3	Wisconsin	32114.6100	8401.8004
4	Missouri	22205.1500	6436.2105
5	Oklahoma	19683.3900	4853.9560
6	Nebraska	7464.9300	2037.0942
7	Iowa	4579.7600	1183.8119
8	Kansas	2914.3100	836.4435
9	South Dakota	1315.5600	394.8283
10	North Dakota	919.9100	230.1497
11	Illinois	80166.1010	-12607.8870
12	Texas	170188.0458	-25729.3563

```
region_data["East"]
```

	State	Sales	Profit
0	New York	310876.271	74038.5486
1	Delaware	27451.069	9977.3748
2	New Jersey	35764.312	9772.9138
3	Rhode Island	22627.956	7285.6293
4	Maryland	23705.523	7031.1788
5	Massachusetts	28634.434	6785.5016
6	Connecticut	13384.357	3511.4918
7	Vermont	8929.370	2244.9783
8	New Hampshire	7292.524	1706.5028
9	District of Columbia	2865.020	1059.5893
10	Maine	1270.530	454.4862
11	West Virginia	1209.824	185.9216
12	Pennsylvania	116511.914	-15559.9603
13	Ohio	78258.136	-16971.3766

```
region_data["West"]
```

	State	Sales	Profit
0	California	457687.6315	76381.3871
1	Washington	138641.2700	33402.6517
2	Nevada	16729.1020	3316.7659
3	Utah	11220.0560	2546.5335
4	Montana	5589.3520	1833.3285
5	New Mexico	4783.5220	1157.1161
6	Idaho	4382.4860	826.7231
7	Wyoming	1603.1360	100.1960
8	Oregon	17431.1500	-1190.4705
9	Arizona	35282.0010	-3427.9246
10	Colorado	32108.1180	-6527.8579

```
region_data["South"]
```

	State	Sales	Profit
0	Virginia	70636.720	18597.9504
1	Georgia	49095.840	16250.0433
2	Kentucky	36591.750	11199.6966
3	Alabama	19510.640	5786.8253
4	Arkansas	11678.130	4008.6871
5	Mississippi	10771.340	3172.9762
6	Louisiana	9217.030	2196.1023
7	South Carolina	8481.710	1769.0566
8	Florida	89473.708	-3399.3017
9	Tennessee	30661.873	-5341.6936
10	North Carolina	55603.164	-7490.9122

\region_data\

central_region_data

State	Sales	Profit
Michigan	76269.614	24463.1876
Indiana	53555.36	18382.9363
Minnesota	29863.15	10823.1874
Wisconsin	32114.61	8401.8004
Missouri	22205.15	6436.2105
Oklahoma	19683.39	4853.956
Nebraska	7464.93	2037.0942
Iowa	4579.76	1183.8119
Kansas	2914.31	836.4435
South Dakota	1315.56	394.8283
North Dakota	919.91	230.1497
Illinois	80166.101	-12607.887
Texas	170188.0458	-25729.3563

east_region_data

State	Sales	Profit
New York	310876.271	74038.5486
Delaware	27451.069	9977.3748
New Jersey	35764.312	9772.9138
Rhode Island	22627.956	7285.6293
Maryland	23705.523	7031.1788
Massachusetts	28634.434	6785.5016
Connecticut	13384.357	3511.4918
Vermont	8929.37	2244.9783
New Hampshire	7292.524	1706.5028
District of Columbia	2865.02	1059.5893
Maine	1270.53	454.4862
West Virginia	1209.824	185.9216
Pennsylvania	116511.914	-15559.9603
Ohio	78258.136	-16971.3766

west_region_data

State	Sales	Profit
California	457687.6315	76381.3871
Washington	138641.27	33402.6517
Nevada	16729.102	3316.7659
Utah	11220.056	2546.5335
Montana	5589.352	1833.3285
New Mexico	4783.522	1157.1161
Idaho	4382.486	826.7231
Wyoming	1603.136	100.196
Oregon	17431.15	-1190.4705
Arizona	35282.001	-3427.9246
Colorado	32108.118	-6527.8579

south_region_data

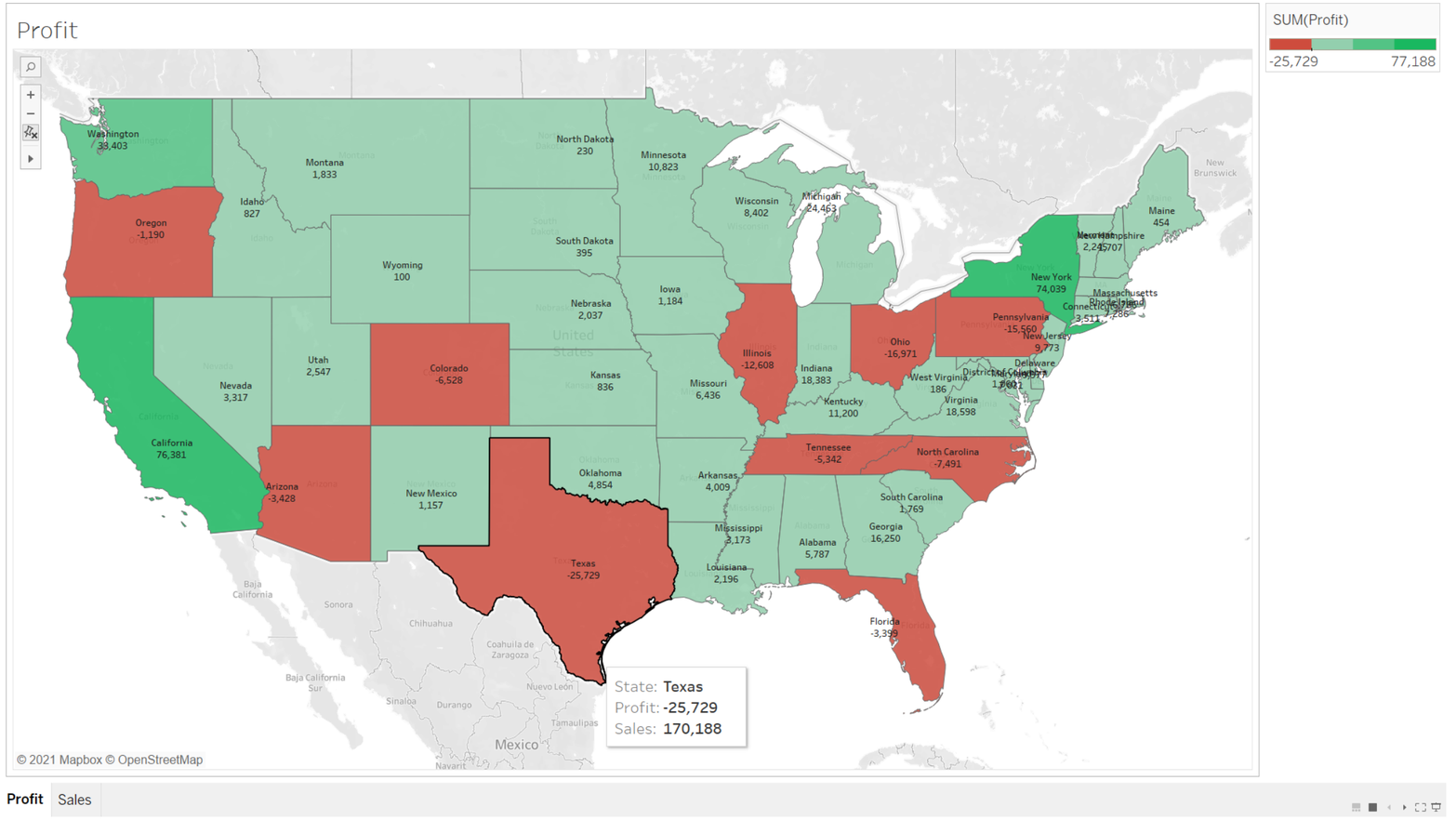
State	Sales	Profit
Virginia	70636.72	18597.9504
Georgia	49095.84	16250.0433
Kentucky	36591.75	11199.6966
Alabama	19510.64	5786.8253
Arkansas	11678.13	4008.6871
Mississippi	10771.34	3172.9762
Louisiana	9217.03	2196.1023
South Carolina	8481.71	1769.0566
Florida	89473.708	-3399.3017
Tennessee	30661.873	-5341.6936
North Carolina	55603.164	-7490.9122

 # Generated Spatial file

\states.geojson

Map Visualization Using GeoPandas + Tableau

States based on Profit

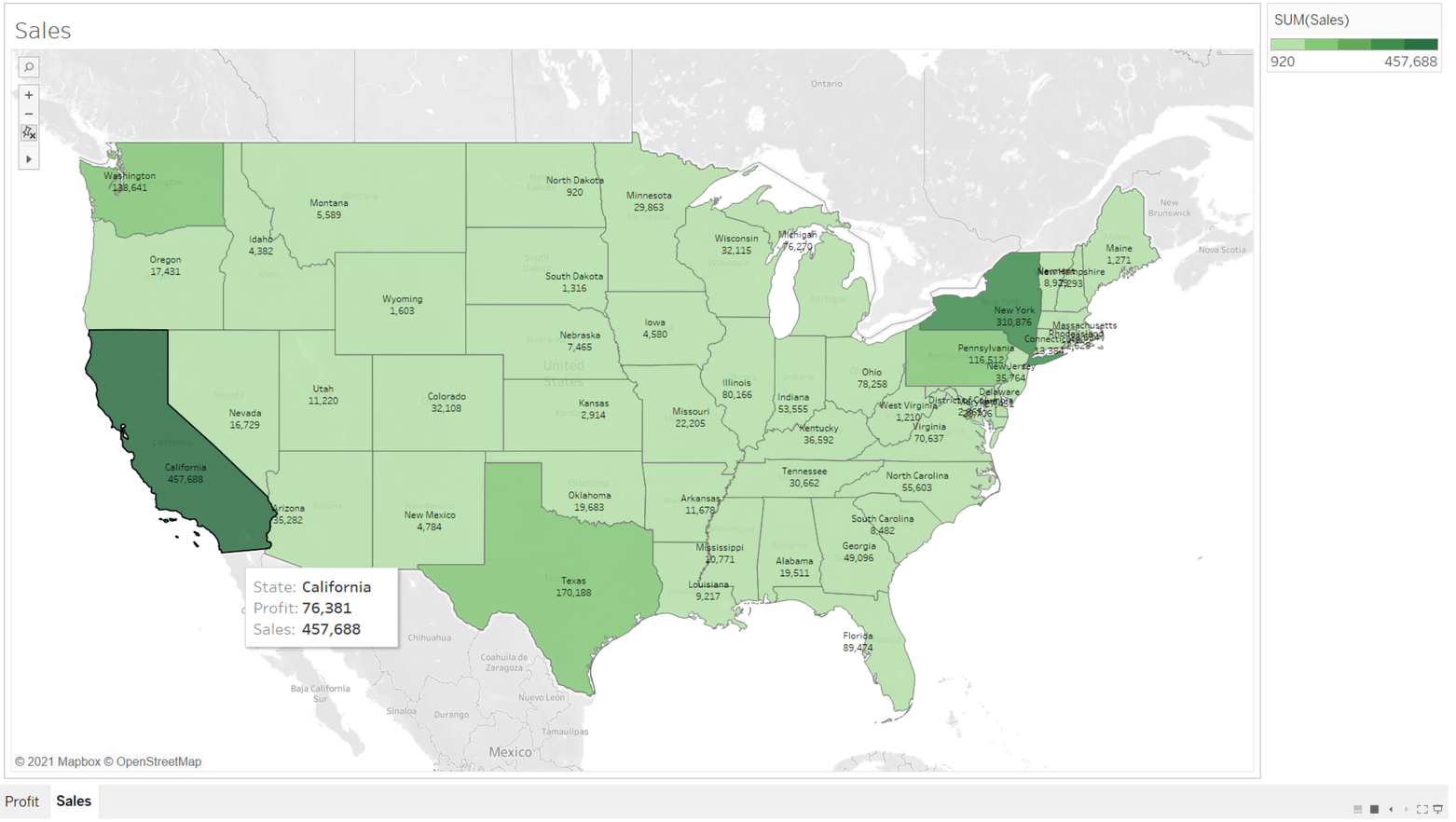


Link: https://prod-apnortheast-a.online.tableau.com/#/site/itmgtagroup6superstorevisualization/workbooks/249210?:origin=card_share_link

*Tableau Online Account is required

Map Visualization Using GeoPandas + Tableau

States based on Sales



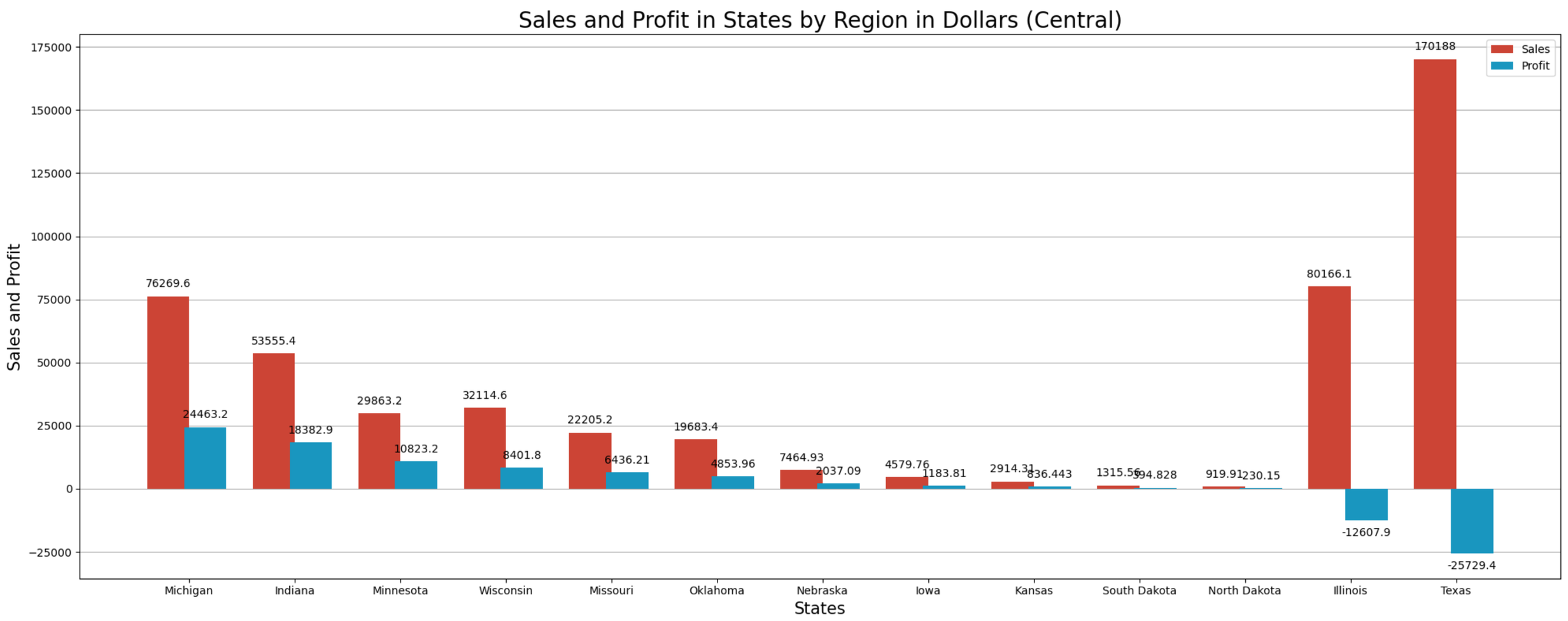
Link: https://prod-apnortheast-a.online.tableau.com/#/site/itmgtagroup6superstorevisualization/workbooks/249210?:origin=card_share_link

*Tableau Online Account is required

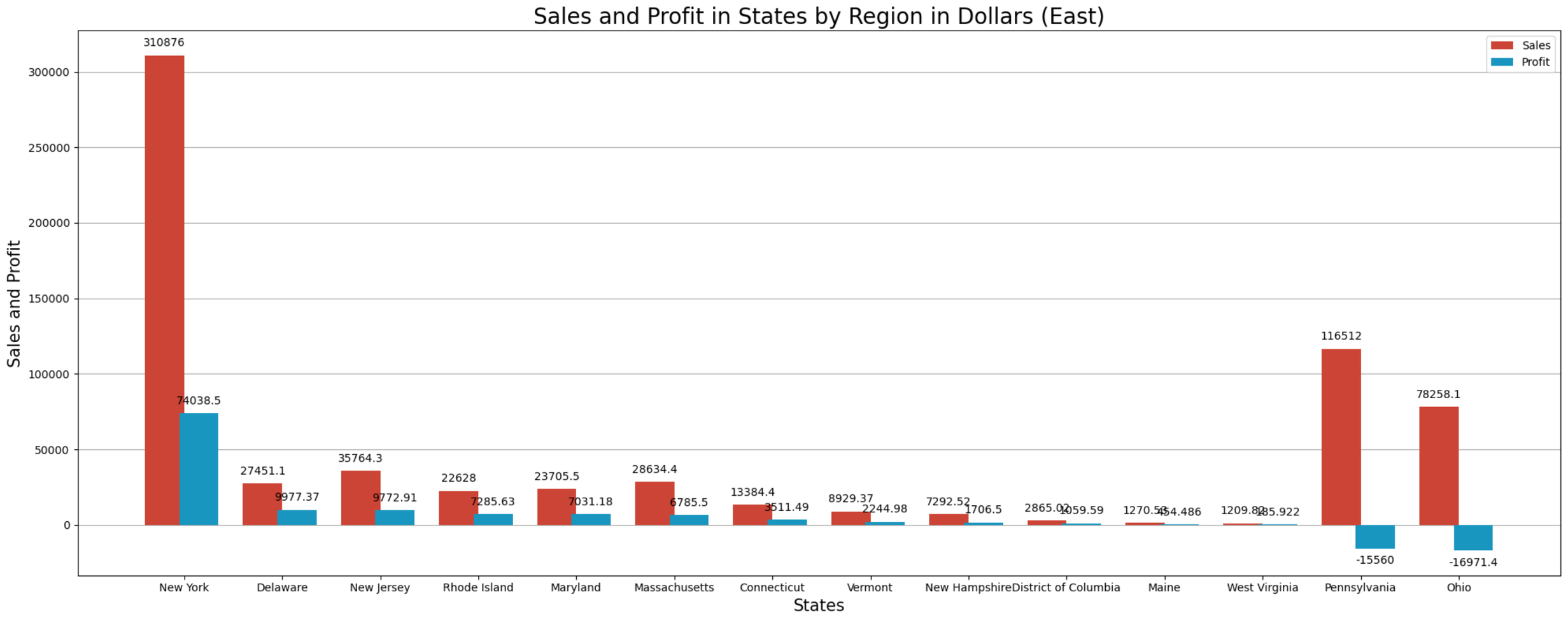
Creating Charts for Sales and Profit in each State by Region using Matplotlib

```
for region_df in regions:
    x = list(region_data[region_df]["State"])
    x_labels = np.arange(len(x))
    y1 = np.array(region_data[region_df]["Sales"])
    y2 = np.array(region_data[region_df]["Profit"])

    fig, ax = plt.subplots(figsize=(20,8))
    sales_bar = ax.bar(x_labels - 0.2, y1, 0.4, label = 'Sales',color = "#cc4435",zorder = 3)
    profit_bar = ax.bar(x_labels + 0.15, y2, 0.4, label = 'Profit', color = "#1996bf", zorder = 3)

    ax.set_ylabel("Sales and Profit",fontsize = 15)
    ax.set_xlabel("States",fontsize = 15)
    ax.set_title("Sales and Profit in States by Region in Dollars ({})".format(region_df),fontsize = 20)
    ax.set_xticks(x_labels)
    ax.set_xticklabels(x)
    ax.legend()
    ax.bar_label(sales_bar, padding=6)
    ax.bar_label(profit_bar, padding=6)
    ax.grid(axis = 'y',zorder = 0)
    fig.tight_layout()
    fig.savefig("sales_profit_charts/{}_sales_profit_chart.png".format(region_df.lower()))
```

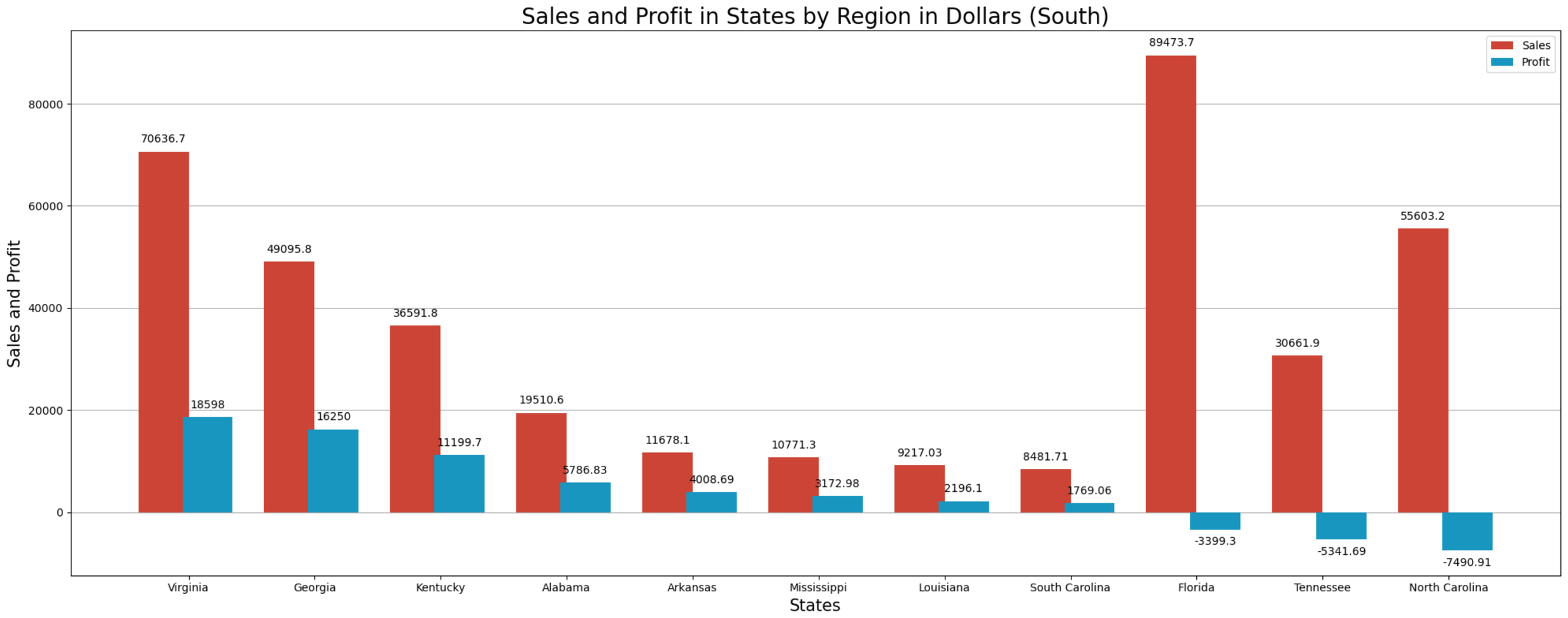
\sales_profit_charts\central_sales_profit_chart.png



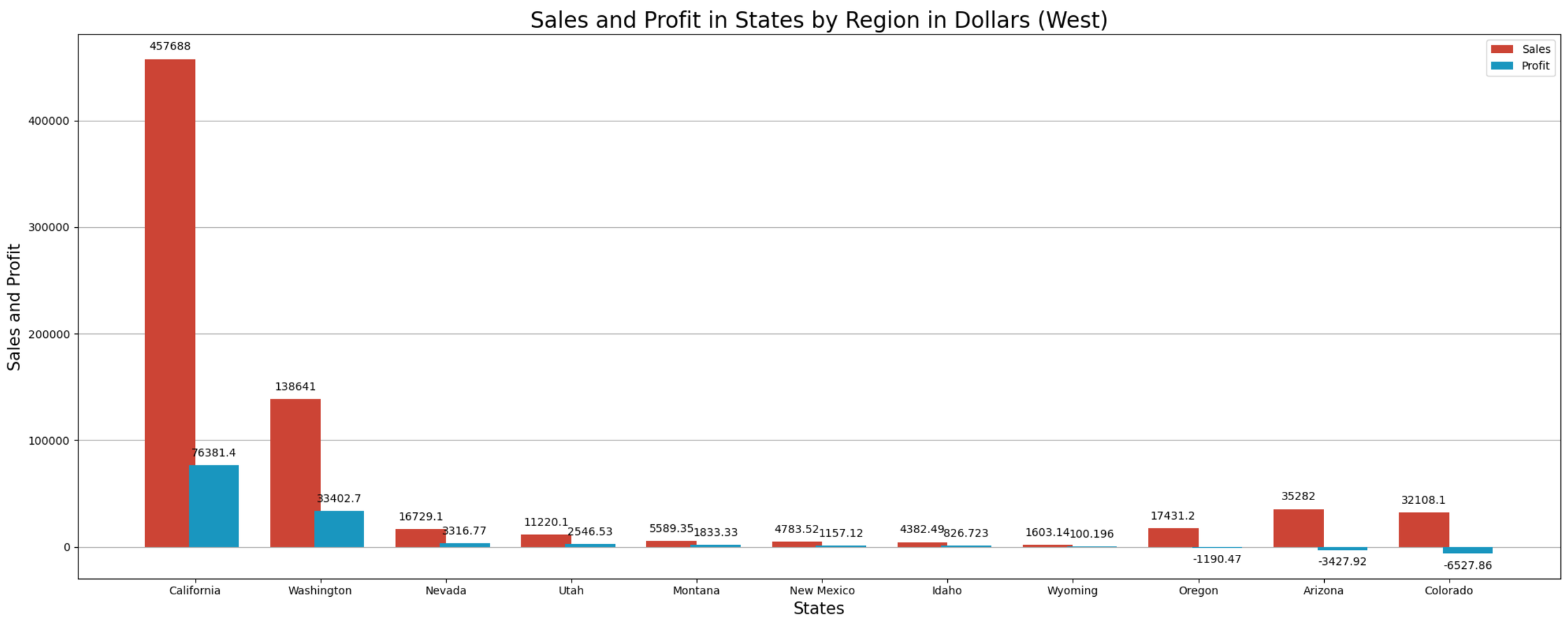
\sales_profit_charts\east_sales_profit_chart.png



\sales_profit_charts\south_sales_profit_chart.png



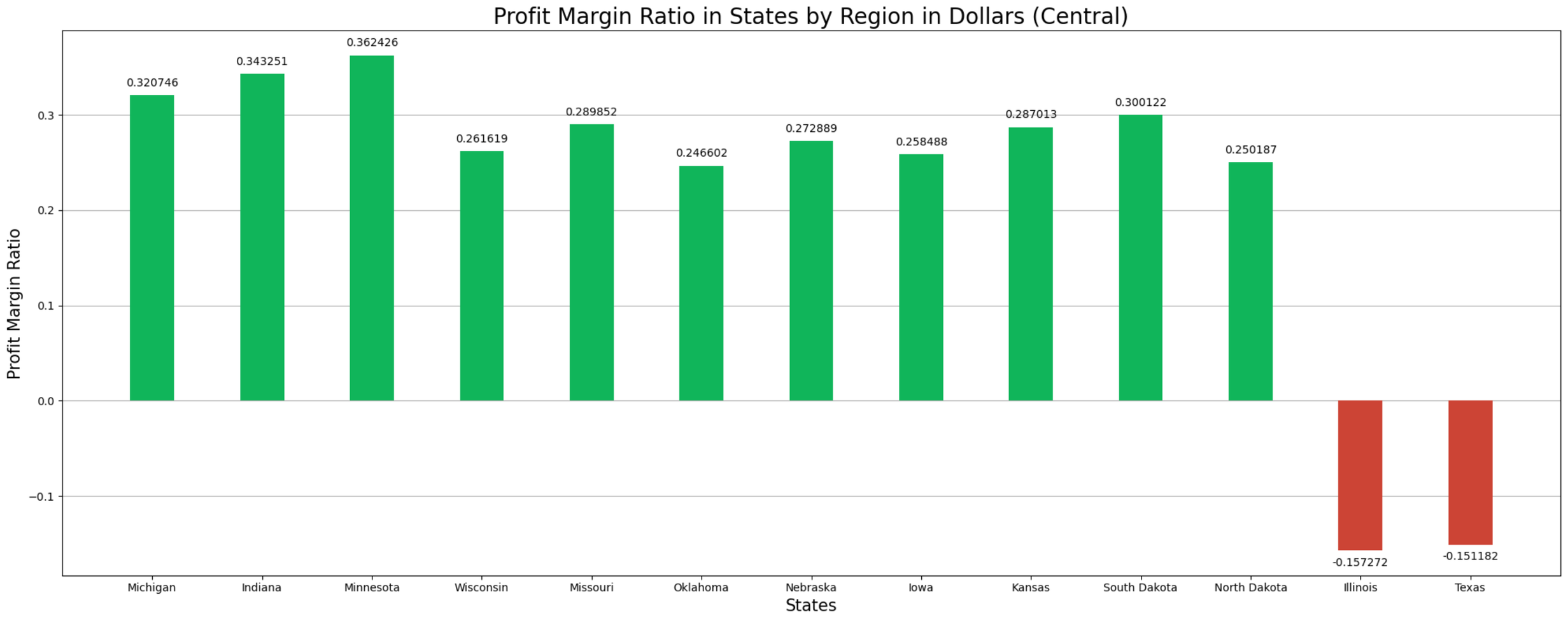
\sales_profit_charts\west_sales_profit_chart.png



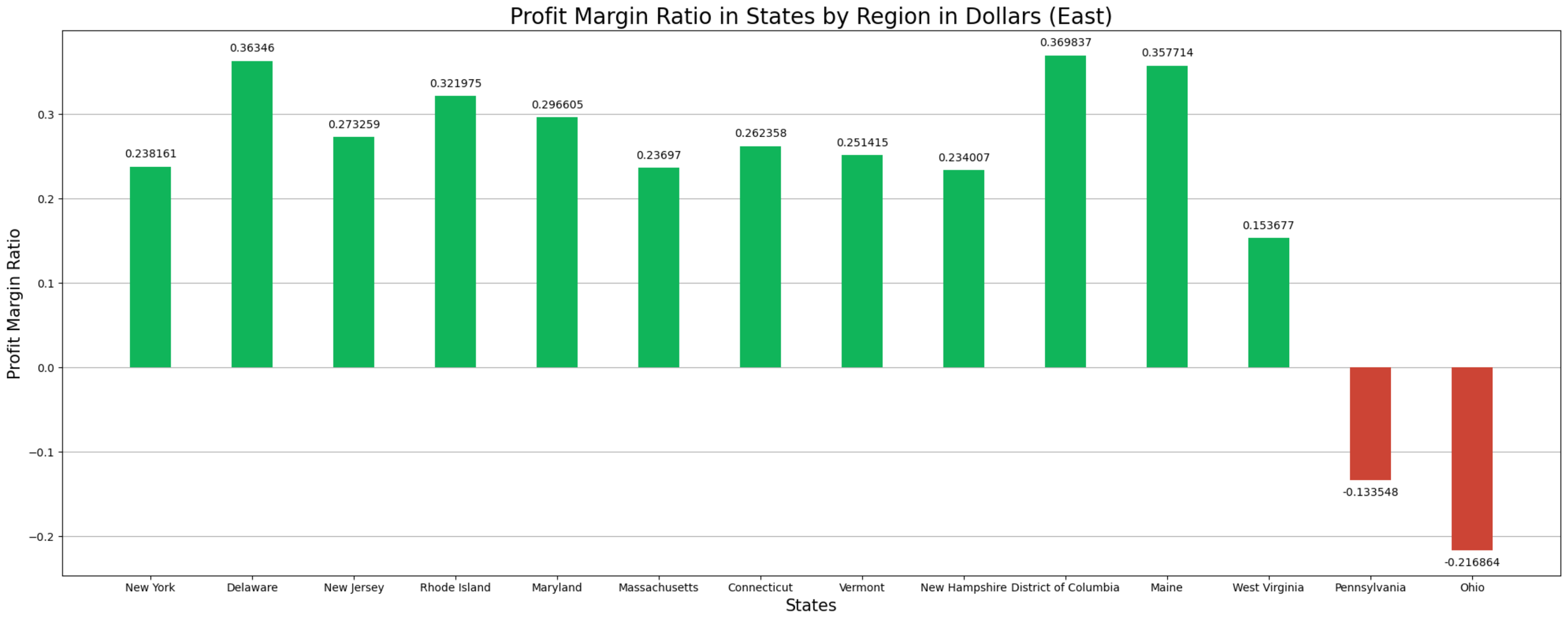
Creating Charts for Profit Margin Ratio in each State by Region

```
def get_ratio(r):
    return r["Profit"]/r["Sales"]

for region_df in regions:
    region_data[region_df]["Profit Margin Ratio"] = region_data[region_df].apply(get_ratio,axis=1)
    clrs = ["#cc4435" if (v < 0) else "#10b55a" for v in region_data[region_df]["Profit Margin Ratio"]]
    x = list(region_data[region_df]["State"])
    x_labels = np.arange(len(x))
    y = np.array(region_data[region_df]["Profit Margin Ratio"])

    fig, ax = plt.subplots(figsize=(20,8),dpi=100)
    sales_bar = ax.bar(x_labels, y, 0.4, label = 'Profit Margin Ratio',color = clrs,zorder = 3)

    ax.set_ylabel("Profit Margin Ratio",fontsize = 15)
    ax.set_xlabel("States",fontsize = 15)
    ax.set_title("Profit Margin Ratio in States by Region in Dollars ({})".format(region_df),fontsize = 20)
    ax.set_xticks(x_labels)
    ax.set_xticklabels(x)
    ax.bar_label(sales_bar, padding=6)
    ax.grid(axis = 'y',zorder = 0)
    fig.tight_layout()
    plt.show()
    fig.savefig("profit_margin_charts/{}_profit_margin_chart.png".format(region_df.lower()))

    region_data[region_df].drop(columns=["Profit Margin Ratio"],inplace = True)
```

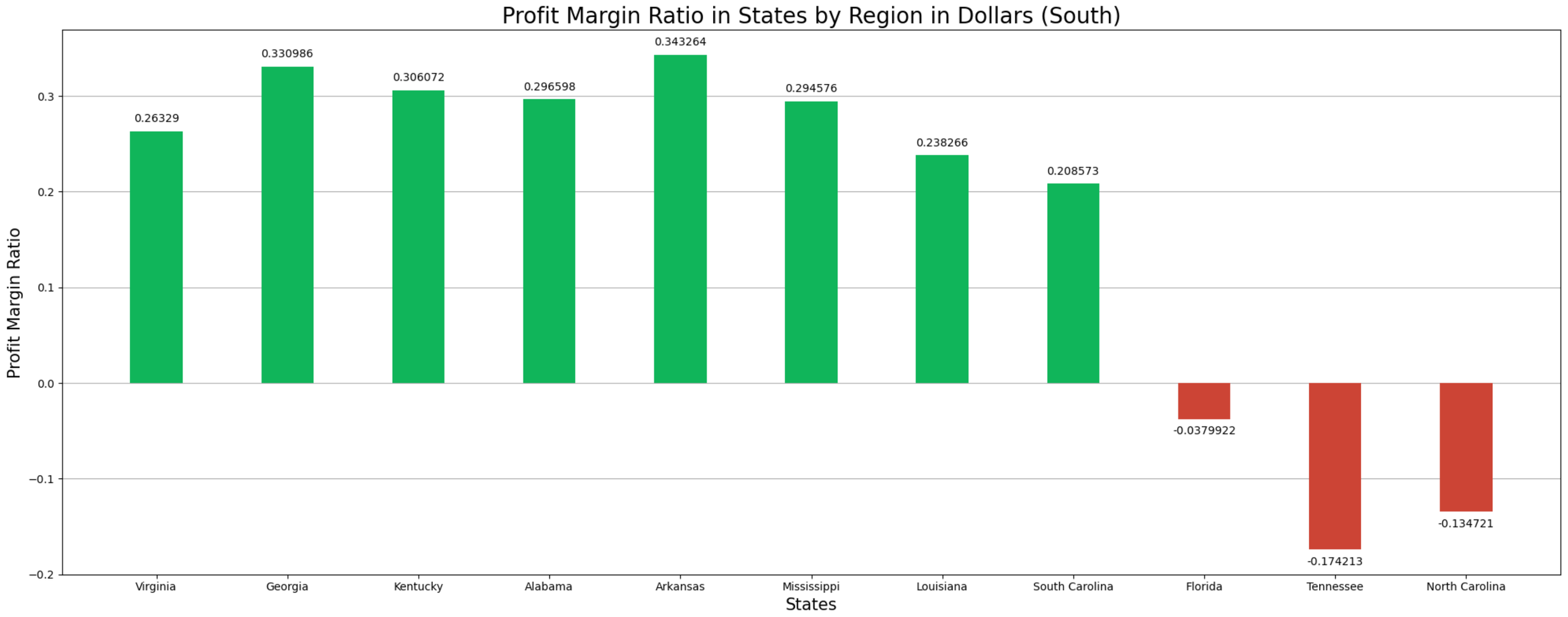
\profit_margin_charts\central_profit_margin_chart.png



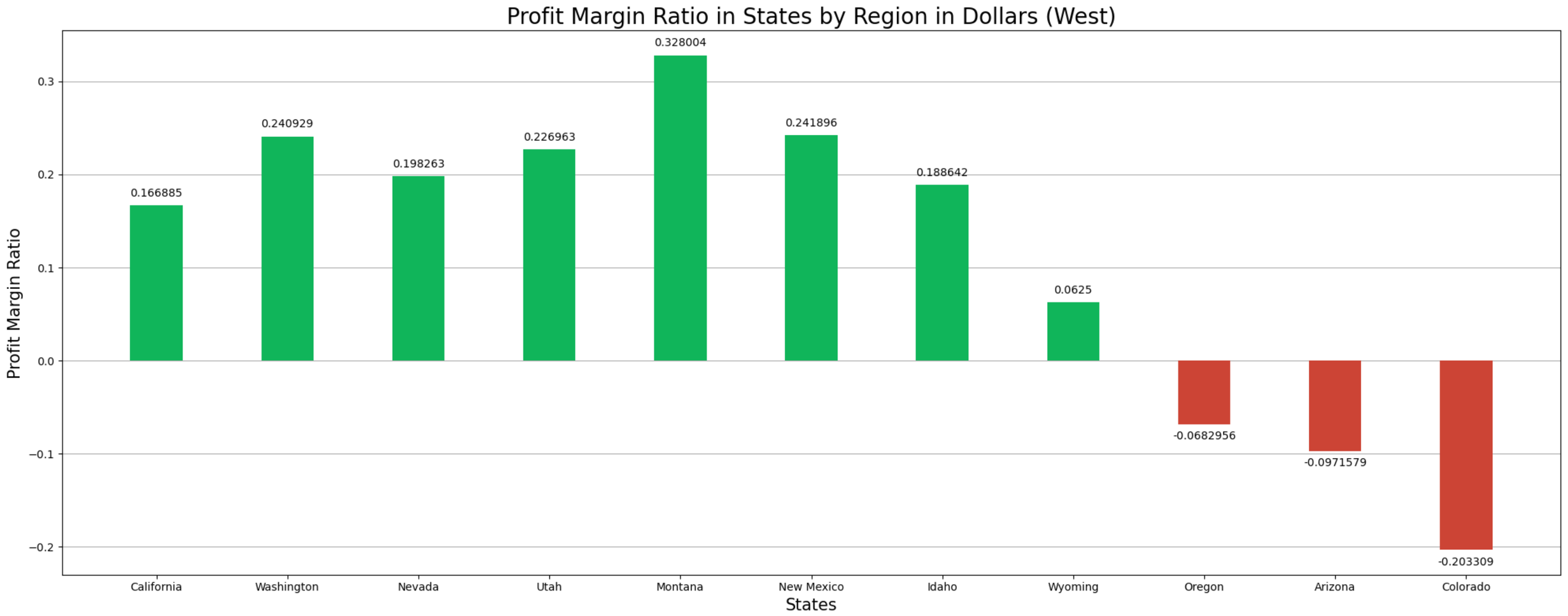
\profit_margin_charts\east_profit_margin_chart.png



\profit_margin_charts\south_profit_margin_chart.png



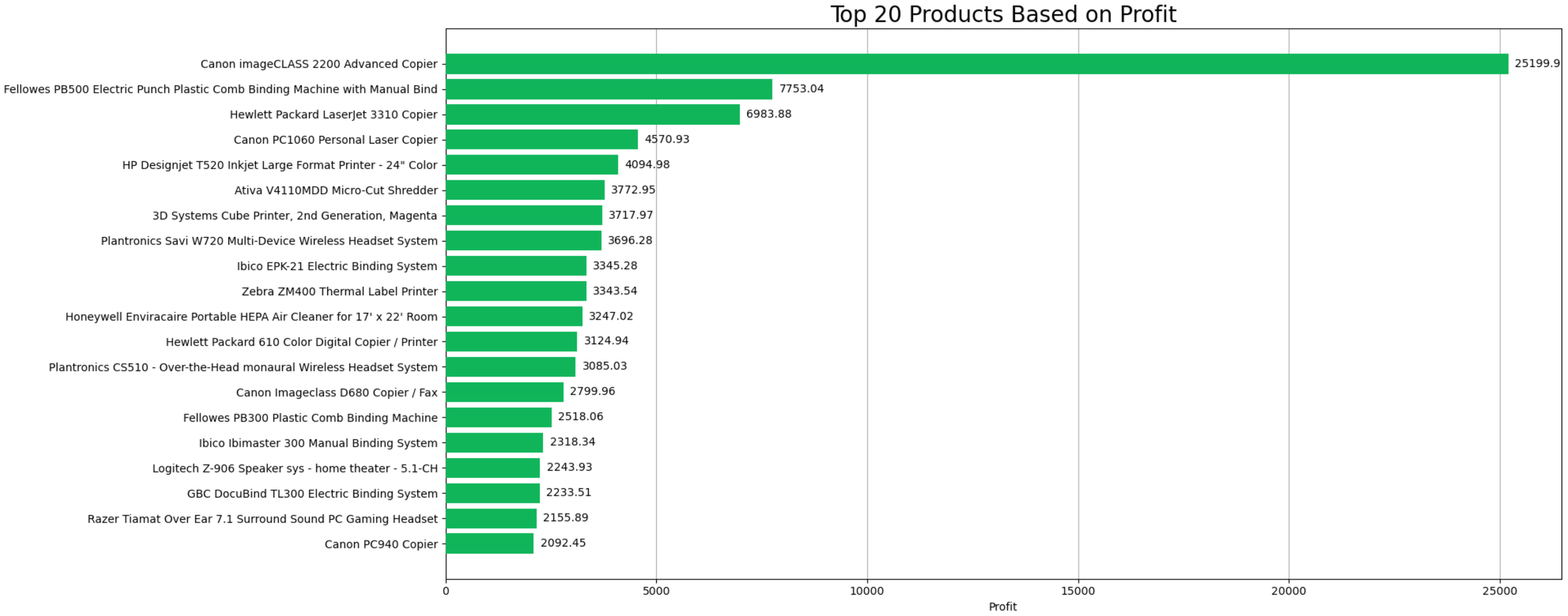
\profit_margin_charts\west_profit_margin_chart.png



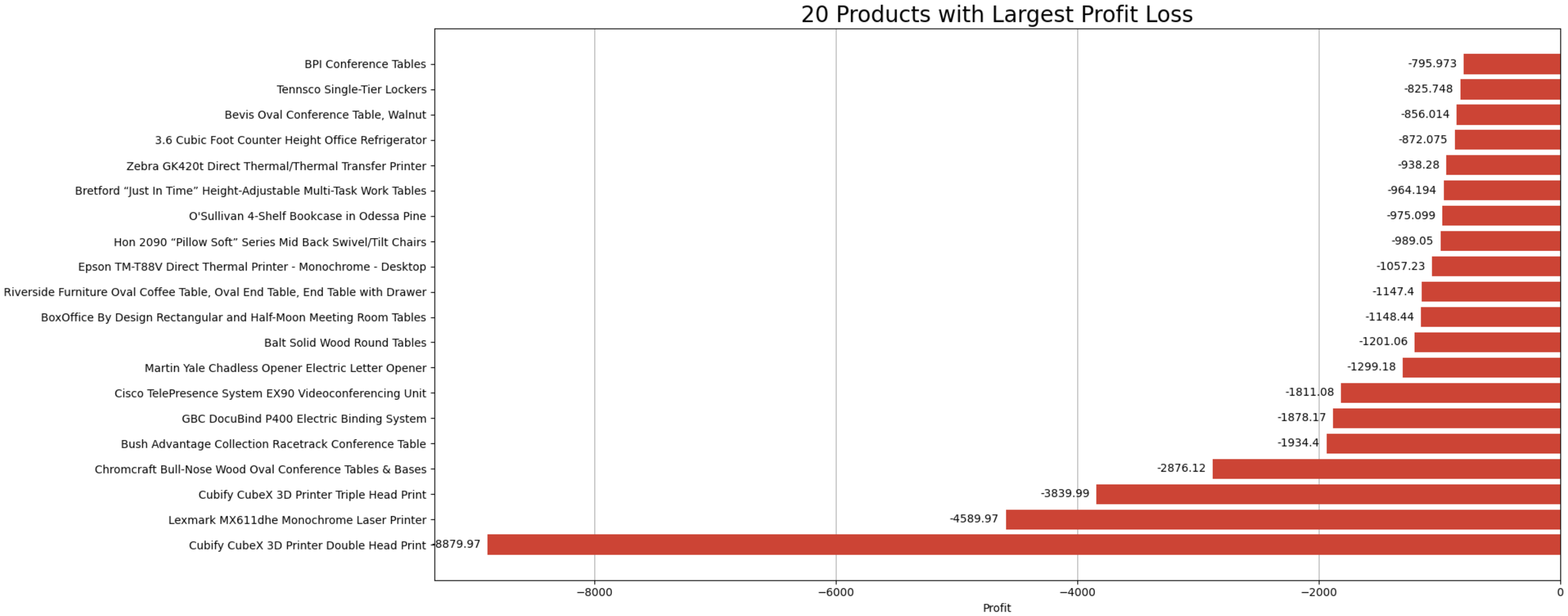
Creating Charts for Profit Based on Products

```
producttop = pd.DataFrame(dataset.groupby("Product Name").sum()).sort_values(by="Profit",ascending=False).reset_index().drop(columns = ["Quantity","Discount"]
productbottom = pd.DataFrame(dataset.groupby("Product Name").sum()).sort_values(by="Profit",ascending=False).reset_index().drop(columns = ["Quantity","Discoun

top_y_labels = list(producttop["Product Name"])
top_y = np.arange(len(top_y_labels))
top_x = np.array(producttop["Profit"])
fig, ax = plt.subplots(figsize=(20,8),dpi=100)
top_profit = ax.barh(top_y, top_x, align='center', color = "#10b55a",zorder = 3)
ax.set_yticks(top_y)
ax.set_yticklabels(top_y_labels)
ax.invert_yaxis()  # labels read top-to-bottom
ax.set_xlabel('Profit')
ax.bar_label(top_profit, padding=6)
ax.set_title('Top 20 Products Based on Profit',fontsize = 20)
ax.grid(axis = 'x',zorder = 0)
plt.tight_layout()
fig.savefig("product_profit_charts/top_products_chart.png")
plt.show()

bottom_y_labels = list(productbottom["Product Name"])
bottom_y = np.arange(len(bottom_y_labels))
bottom_x = np.array(productbottom["Profit"])
fig, ax = plt.subplots(figsize=(20,8),dpi=100)
bottom_profit = ax.barh(bottom_y, bottom_x, align='center', color = "#cc4435",zorder = 3)
ax.set_yticks(bottom_y)
ax.set_yticklabels(bottom_y_labels)
ax.invert_yaxis()  # labels read top-to-bottom
ax.set_xlabel('Profit')
ax.bar_label(bottom_profit, padding=6)
ax.set_title('20 Products with Largest Profit Loss',fontsize = 20)
ax.grid(axis = 'x',zorder = 0)
plt.tight_layout()
fig.savefig("product_profit_charts/bottom_products_chart.png")
plt.show()
```

\product_profit_charts\top_products_chart.png



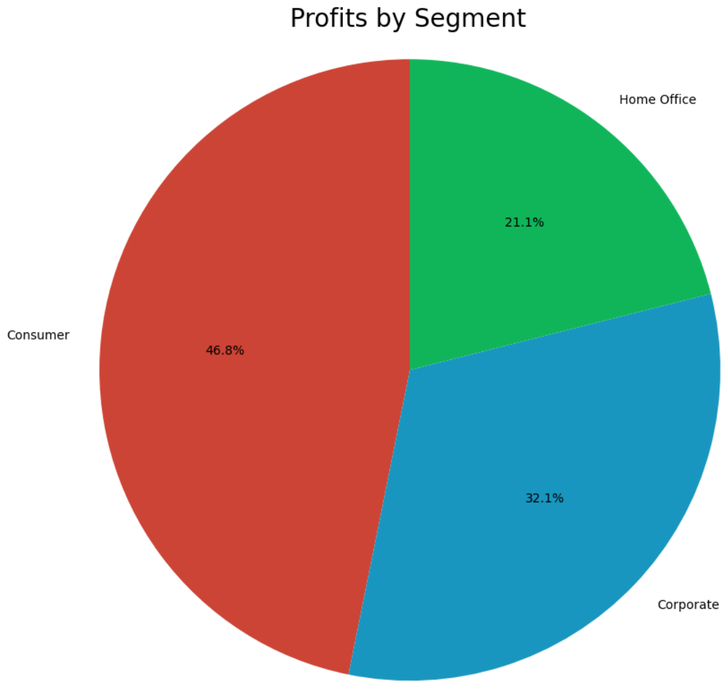
\product_profit_charts\bottom_products_chart.png

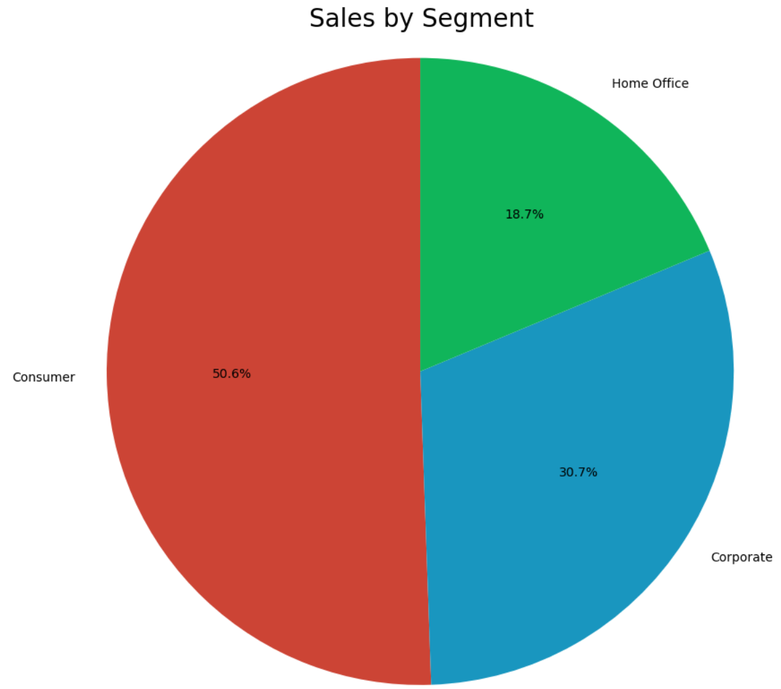


Creating Charts for Profit and Sales Based on Segments

```
segment_profits = pd.DataFrame(dataset.groupby("Segment").sum()).sort_values(by="Profit",ascending=False).reset_index().drop(columns = ["Quantity","Discount"])
segment_profits

labels = list(segment_profits["Segment"])
profits = list(segment_profits["Profit"])
sales = list(segment_profits["Sales"])
colors = ["#cc4435","#1996bf","#10b55a"]

fig, ax = plt.subplots(figsize=(10,10),dpi=100)
ax.pie(profits, labels=labels, autopct='%1.1f%%',startangle=90, colors=colors)
ax.axis('equal')
ax.set_title("Profits by Segment",fontsize = 20)
fig.savefig("segment_charts/profit_chart.png")
plt.show()

fig, ax = plt.subplots(figsize=(10,10),dpi=100)
ax.pie(sales, labels=labels, autopct='%1.1f%%',startangle=90, colors=colors)
ax.axis('equal')
ax.set_title("Sales by Segment",fontsize = 20)
fig.savefig("segment_charts/sales_chart.png")
plt.show()
```

\segment_charts\profit_chart.png
\segment_charts\sales_chart.png





\FINAL PROJECT (PRODUCTS CATEGORIES AND SUBCATEGORIES).ipnyb

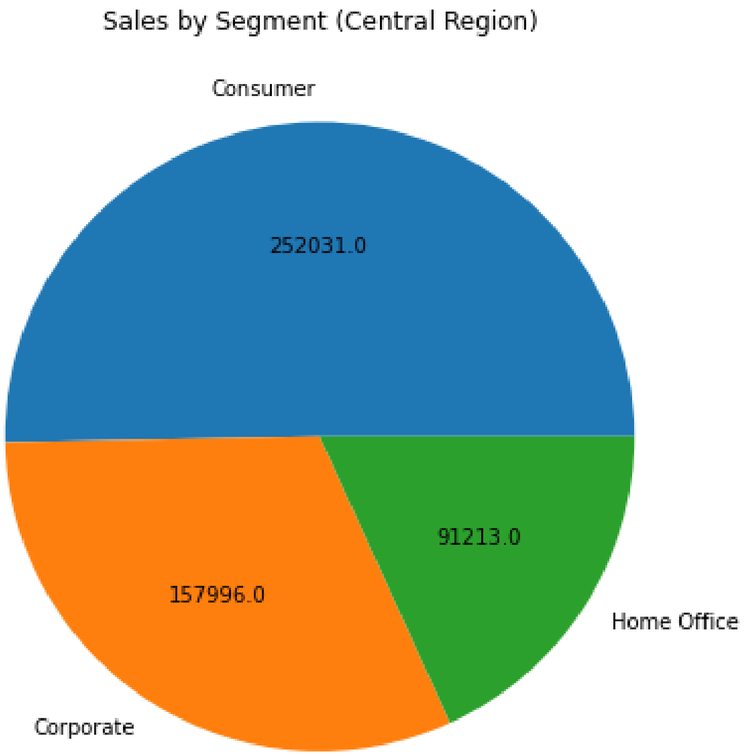
Creating Charts for Sales Based on Segments by Region

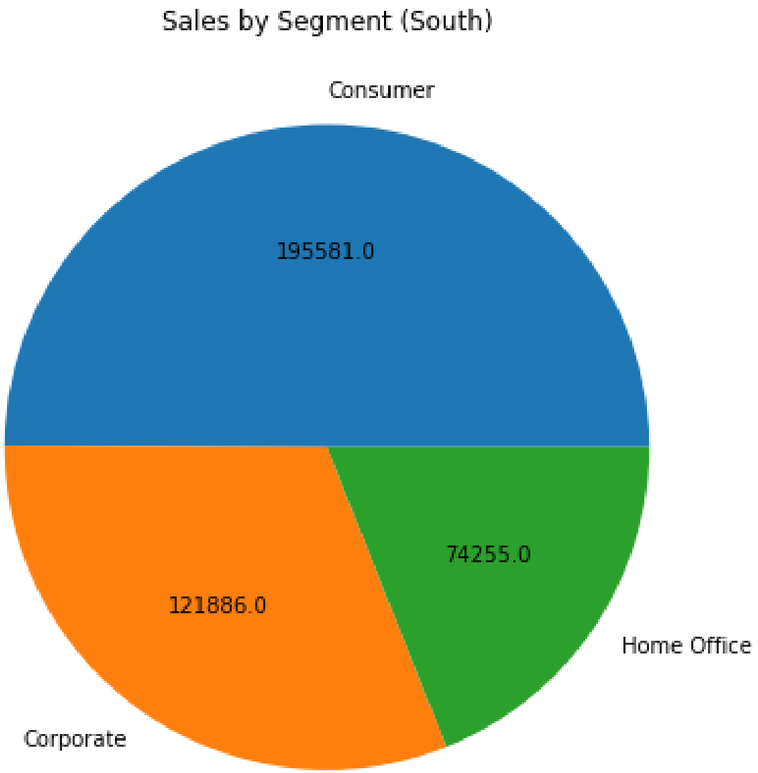
```
#Isolating necessary columns for getting sales by segment per region
df1 = dataset[['Region','Segment','Sales']]
df1 = df1.sort_values(["Region","Segment"])

#Get Unique Regions and segments
df1["Region"].unique()
df1["Segment"].unique()

#Seperate by Region
central_cond = df1["Region"] == "Central"
east_cond = df1["Region"] == "East"
south_cond = df1["Region"] == "South"
west_cond = df1["Region"] == "West"

central_df = df1.loc[central_cond,:]
east_df = df1.loc[east_cond,:]
south_df = df1.loc[south_cond,:]
west_df = df1.loc[west_cond,:]

#Getting sales and segment per region
agg_func = {'Region': 'first', 'Sales': 'sum'}
central_df = central_df.groupby(central_df['Segment']).aggregate(agg_func)
east_df = east_df.groupby(east_df['Segment']).aggregate(agg_func)
south_df = south_df.groupby(south_df['Segment']).aggregate(agg_func)
west_df = west_df.groupby(west_df['Segment']).aggregate(agg_func)

#Remove Index

central_df.reset_index(inplace=True,drop=False)
east_df.reset_index(inplace=True,drop=False)
south_df.reset_index(inplace=True,drop=False)
west_df.reset_index(inplace=True,drop=False)
```

Plotting Charts

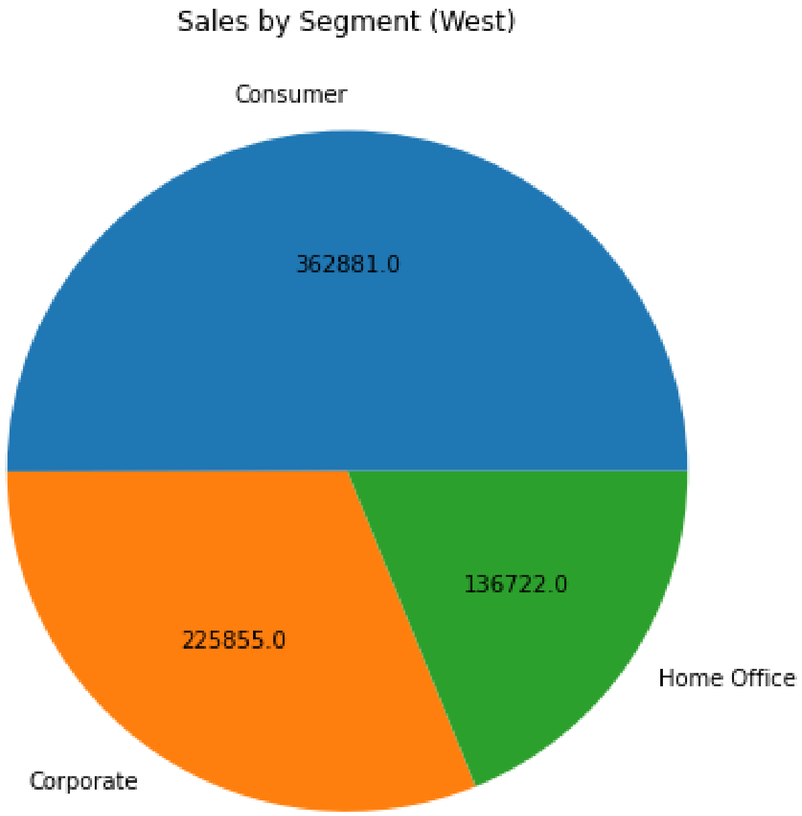
```
#Plotting Pie Chart (Sales by segments in region)
import matplotlib.pyplot as plt
import numpy as np

#https://www.geeksforgeeks.org/plot-a-pie-chart-in-python-using-matplotlib/
#http://www.learningaboutelectronics.com/Articles/How-to-create-a-pie-chart-in-matplotlib-with-Python.php

# Creating dataset
sub_cat = central_df["Segment"]
data = central_df["Sales"]

#https://stackoverflow.com/questions/41088236/how-to-have-actual-values-in-matplotlib-pie-chart-displayed-python
def absolute_value(val):
    a  = np.round(val/100.*data.sum(), 0)
    return a

# Creating plot
fig = plt.figure(figsize =(10, 7))
plt.pie(data, labels = sub_cat,autopct=absolute_value)
plt.title("Sales by Segment (Central Region)")

# show plot
fig.savefig("Sales by Segment (Central Region)")
plt.show()
```

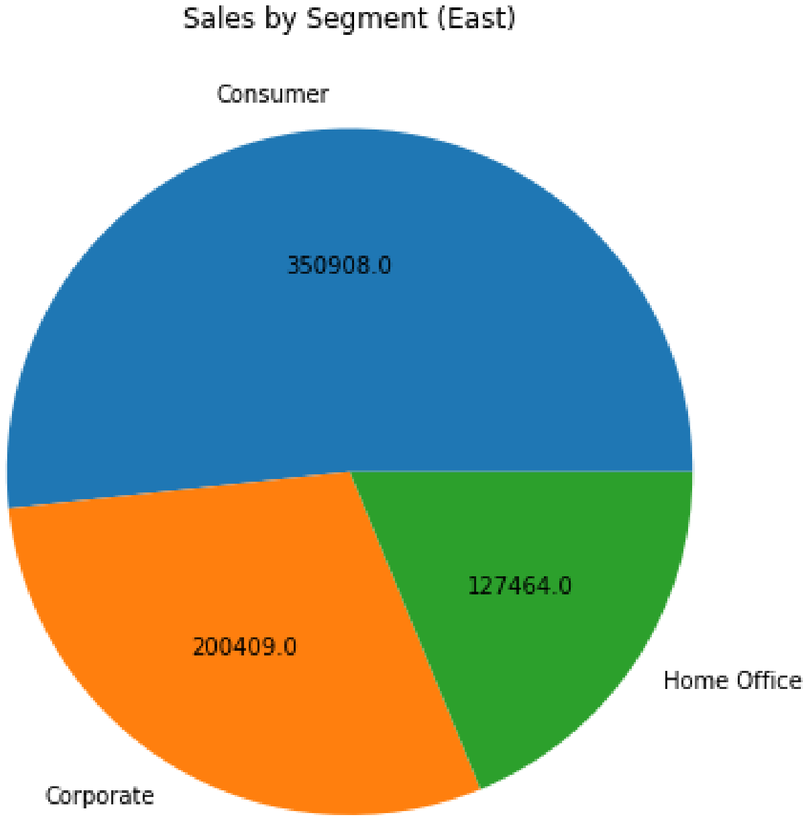
Sales based on Segment by Region





Sales based on Segment by Region





Creating Graphs for Profits and Sales based on Product Sub-Category

```
#Isolating necessary columns for product wise sales
df1 = dataset[['Category','Sub-Category','Sales','Profit']]
df1 = df1.sort_values(["Category","Sub-Category"])

#Check for unique categories
df1["Category"].unique()

#Seperate by unique category
furniture_cond = df1["Category"] == "Furniture"
office_cond = df1["Category"] == "Office Supplies"
tech_cond = df1["Category"] == "Technology"

furniture_df = df1.loc[furniture_cond,:]
office_df = df1.loc[office_cond,:]
tech_df = df1.loc[tech_cond,:]

#Getting sales and profit per subcategory
agg_func = {'Category': 'first', 'Sales': 'sum', 'Profit': 'sum'}
furniture_df = furniture_df.groupby(furniture_df['Sub-Category']).aggregate(agg_func)
office_df = office_df.groupby(office_df['Sub-Category']).aggregate(agg_func)
tech_df = tech_df.groupby(tech_df['Sub-Category']).aggregate(agg_func)
```

Creating Graphs for Profits and Sales based on Product Sub-Category

```
#Sort Sales and Profits in descending order

furniture_sales_df = furniture_df.sort_values(["Sales"],ascending=False)
furniture_profit_df = furniture_df.sort_values(["Profit"],ascending=False)
office_sales_df = office_df.sort_values(["Sales"],ascending=False)
office_profit_df = office_df.sort_values(["Profit"],ascending=False)
tech_sales_df = tech_df.sort_values(["Sales"],ascending=False)
tech_profit_df = tech_df.sort_values(["Profit"],ascending=False)

#Remove Index

furniture_sales_df.reset_index(inplace=True,drop=False)
furniture_profit_df.reset_index(inplace=True,drop=False)
office_sales_df.reset_index(inplace=True,drop=False)
office_profit_df.reset_index(inplace=True,drop=False)
tech_sales_df.reset_index(inplace=True,drop=False)
tech_profit_df.reset_index(inplace=True,drop=False)
```

Resulting DataFrames

	Sub-Category	Category	Sales	Profit
0	Paper	Office Supplies	78479.206	34053.5693
1	Binders	Office Supplies	203412.733	30221.7633
2	Storage	Office Supplies	223843.608	21278.8264
3	Appliances	Office Supplies	107532.161	18138.0054
4	Envelopes	Office Supplies	16476.402	6964.1767
5	Art	Office Supplies	27118.792	6527.7870
6	Labels	Office Supplies	12486.312	5546.2540
7	Fasteners	Office Supplies	3024.280	949.5182
8	Supplies	Office Supplies	46673.538	-1189.0995

	Sub-Category	Category	Sales	Profit
0	Storage	Office Supplies	223843.608	21278.8264
1	Binders	Office Supplies	203412.733	30221.7633
2	Appliances	Office Supplies	107532.161	18138.0054
3	Paper	Office Supplies	78479.206	34053.5693
4	Supplies	Office Supplies	46673.538	-1189.0995
5	Art	Office Supplies	27118.792	6527.7870
6	Envelopes	Office Supplies	16476.402	6964.1767
7	Labels	Office Supplies	12486.312	5546.2540
8	Fasteners	Office Supplies	3024.280	949.5182

Resulting DataFrames

	Sub-Category	Category	Sales	Profit
0	Copiers	Technology	149528.030	55617.8249
1	Phones	Technology	330007.054	44515.7306
2	Accessories	Technology	167380.318	41936.6357
3	Machines	Technology	189238.631	3384.7569

	Sub-Category	Category	Sales	Profit
0	Phones	Technology	330007.054	44515.7306
1	Machines	Technology	189238.631	3384.7569
2	Accessories	Technology	167380.318	41936.6357
3	Copiers	Technology	149528.030	55617.8249

Resulting DataFrames

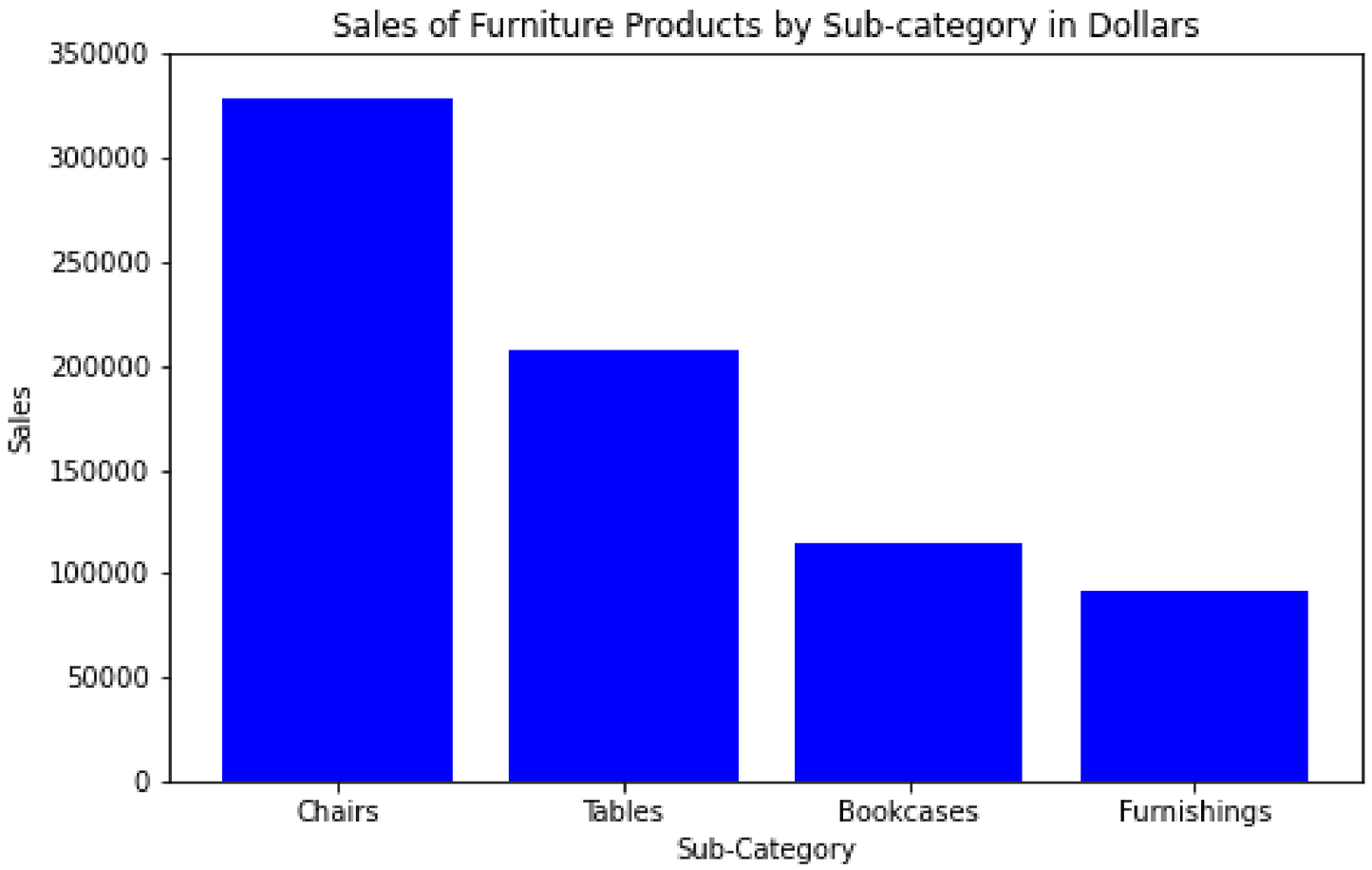
	Sub-Category	Category	Sales	Profit
0	Chairs	Furniture	328449.1030	26590.1663
1	Furnishings	Furniture	91705.1640	13059.1436
2	Bookcases	Furniture	114879.9963	-3472.5560
3	Tables	Furniture	206965.5320	-17725.4811

	Sub-Category	Category	Sales	Profit
0	Chairs	Furniture	328449.1030	26590.1663
1	Tables	Furniture	206965.5320	-17725.4811
2	Bookcases	Furniture	114879.9963	-3472.5560
3	Furnishings	Furniture	91705.1640	13059.1436

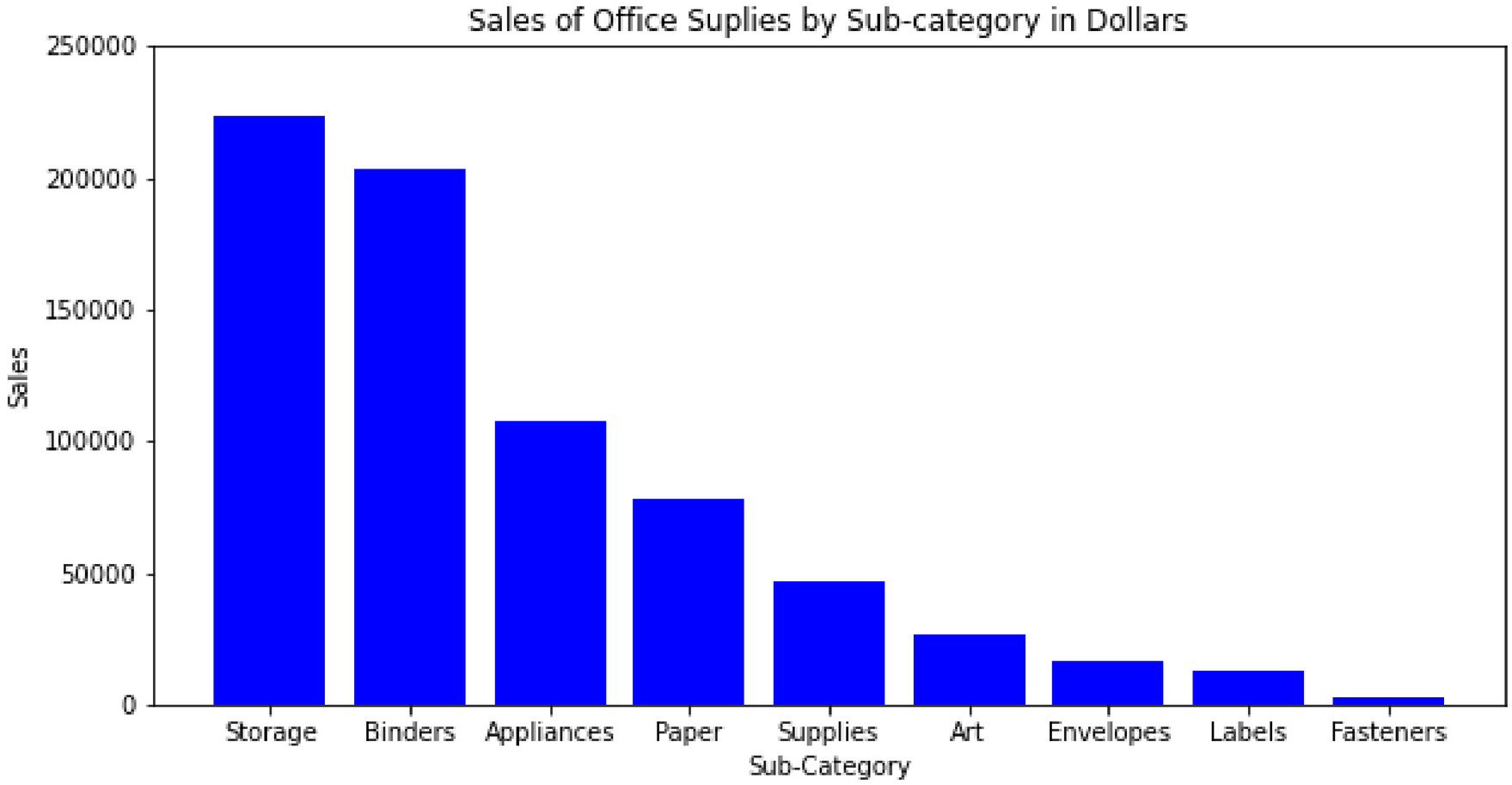
Plotting Bar Graphs

```
#Plotting Bar Graph (Furniture Sales)
import matplotlib.pyplot as plt
import numpy as np

#Getting x and y axis
X = list(furniture_sales_df["Sub-Category"])
Y = list(furniture_sales_df["Sales"])


# Plotting data
f = plt.figure(figsize=(8,5))
plt.bar(X, Y, color='b')
plt.title("Sales of Furniture Products by Sub-category in Dollars")
plt.xlabel("Sub-Category")
plt.ylabel("Sales")
y_ticks = np.arange(0,400000,50000)
plt.yticks(y_ticks)


f.savefig("Sales of Furniture Products by Sub-category in Dollars.png")
plt.show()
```

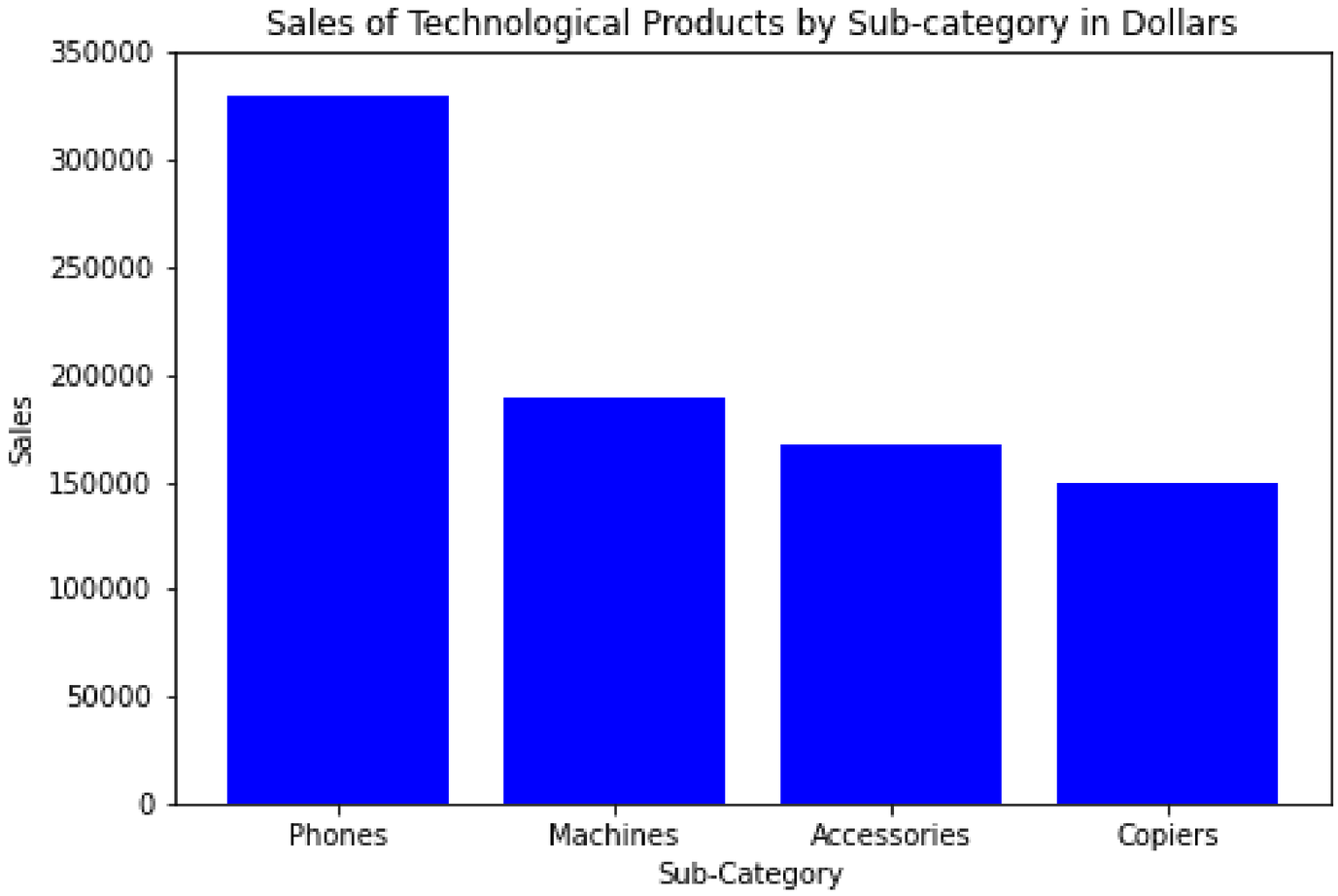
Sales based on Product Sub-Category



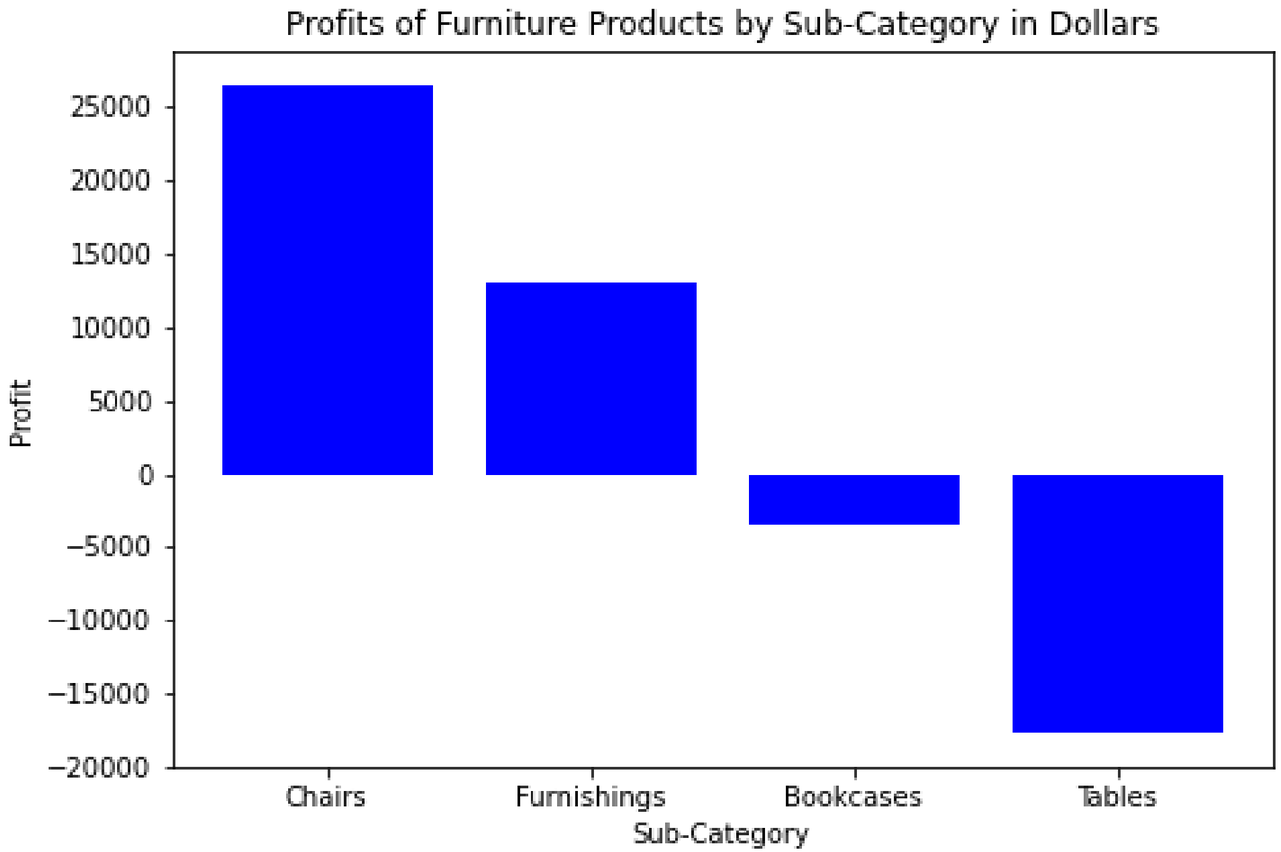
Sales based on Product Sub-Category



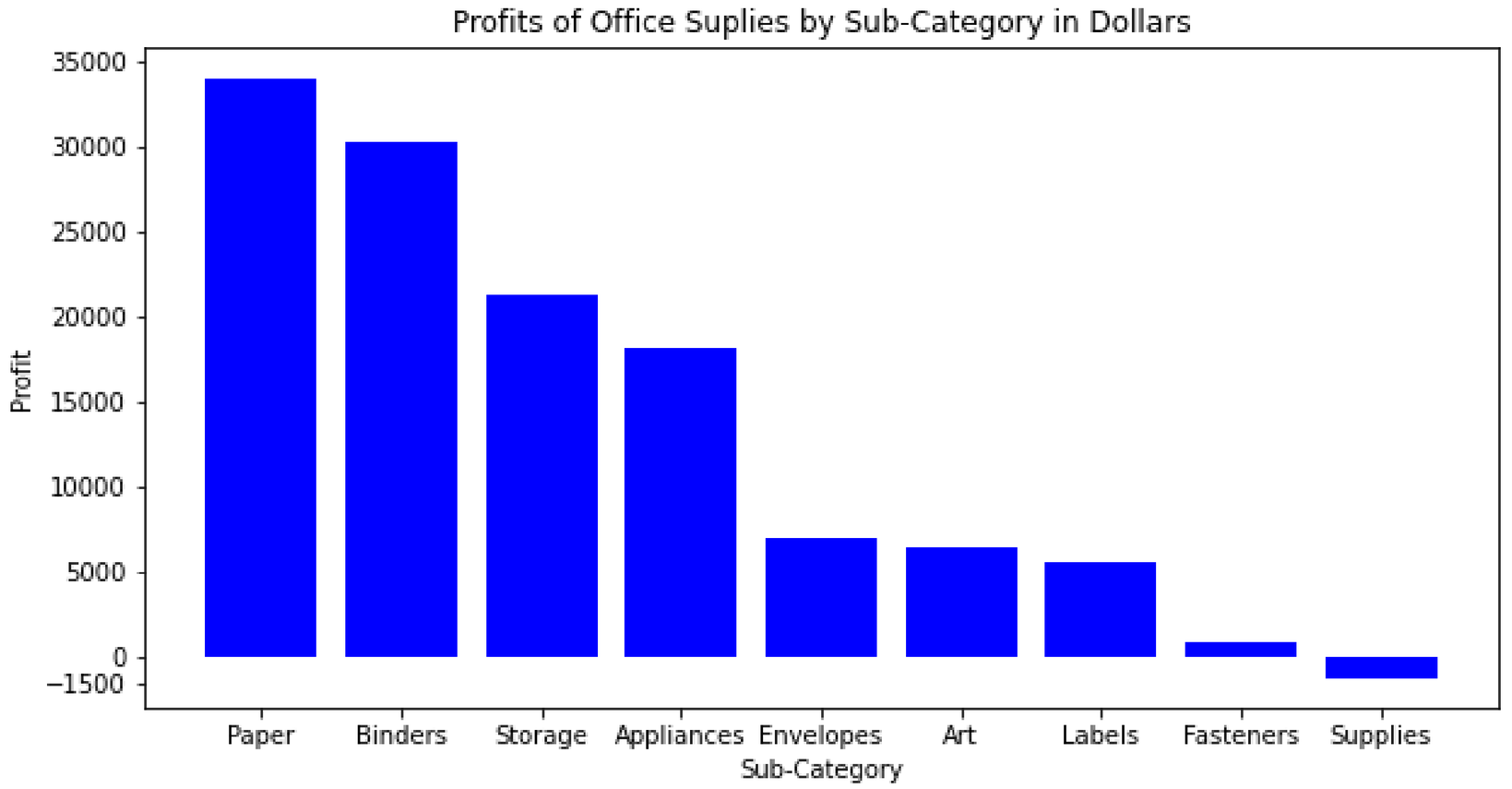
Sales based on Product Sub-Category



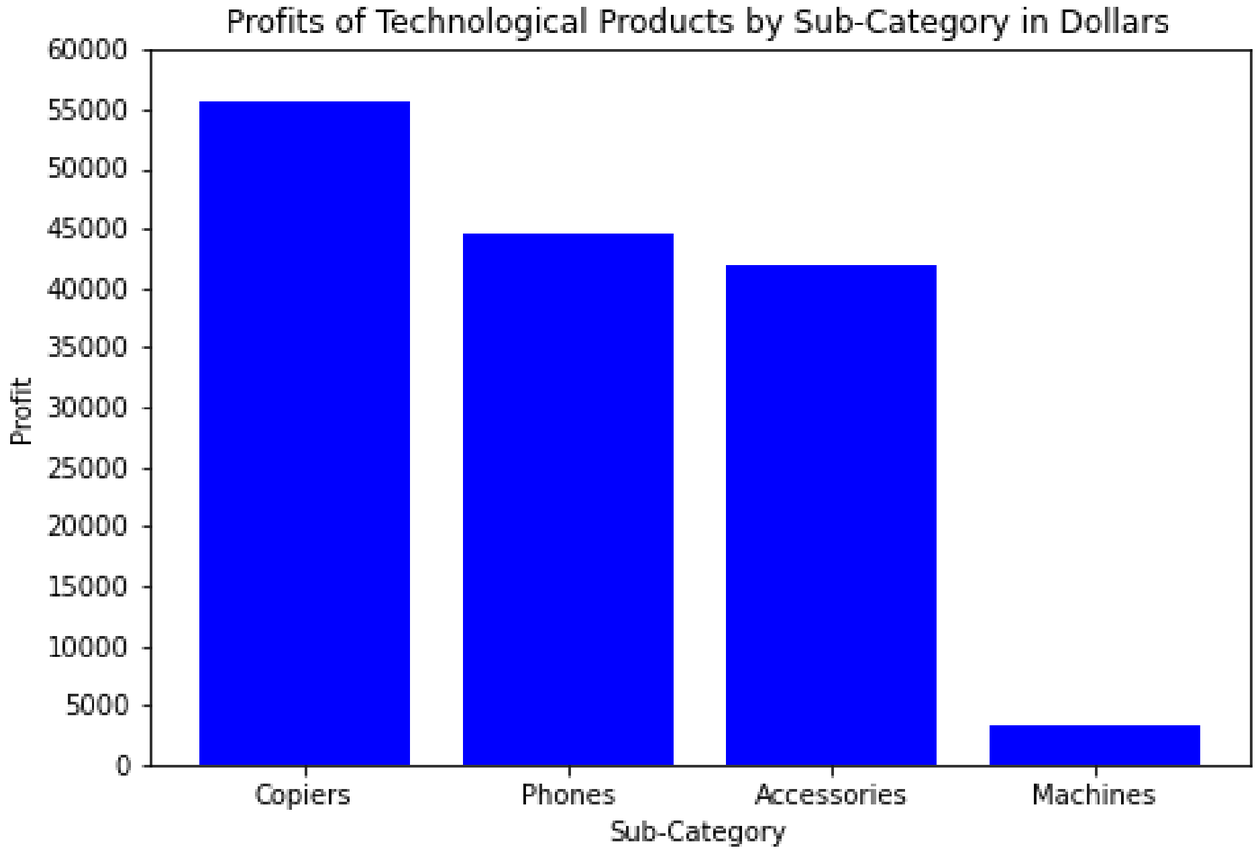
Profits based on Product Sub-Category



Profits based on Product Sub-Category



Profits based on Product Sub-Category



Creating Charts for showcasing most popular Product Sub-Categories by Quantity Sold

```
#Isolating necessary columns for getting most popular subcategory by quantity sold
df1 = dataset[['Category','Sub-Category','Quantity']]
df1 = df1.sort_values(["Category","Sub-Category"])

#Seperate by unique Category
furniture_cond = df1["Category"] == "Furniture"
office_cond = df1["Category"] == "Office Supplies"
tech_cond = df1["Category"] == "Technology"

furniture_df1 = df1.loc[furniture_cond,:]
office_df1 = df1.loc[office_cond,:]
tech_df1 = df1.loc[tech_cond,:]

#Getting Total Quantity by Sub-Category
agg_func = {'Category': 'first', 'Quantity': 'sum'}
furniture_df1 = furniture_df1.groupby(furniture_df1['Sub-Category']).aggregate(agg_func)
office_df1 = office_df1.groupby(office_df1['Sub-Category']).aggregate(agg_func)
tech_df1 = tech_df1.groupby(tech_df1['Sub-Category']).aggregate(agg_func)

#Sort by Quantity
furniture_df1 = furniture_df1.sort_values(["Quantity"],ascending=False)
office_df1 = office_df1.sort_values(["Quantity"],ascending=False)
tech_df1 = tech_df1.sort_values(["Quantity"],ascending=False)

#Reset Index
furniture_df1.reset_index(inplace=True,drop=False)
office_df1.reset_index(inplace=True,drop=False)
tech_df1.reset_index(inplace=True,drop=False)
```

Resulting DataFrames

	Sub-Category	Category	Quantity
0	Phones	Technology	3289
1	Accessories	Technology	2976
2	Machines	Technology	440
3	Copiers	Technology	234

	Sub-Category	Category	Quantity
0	Furnishings	Furniture	3563
1	Chairs	Furniture	2356
2	Tables	Furniture	1241
3	Bookcases	Furniture	868

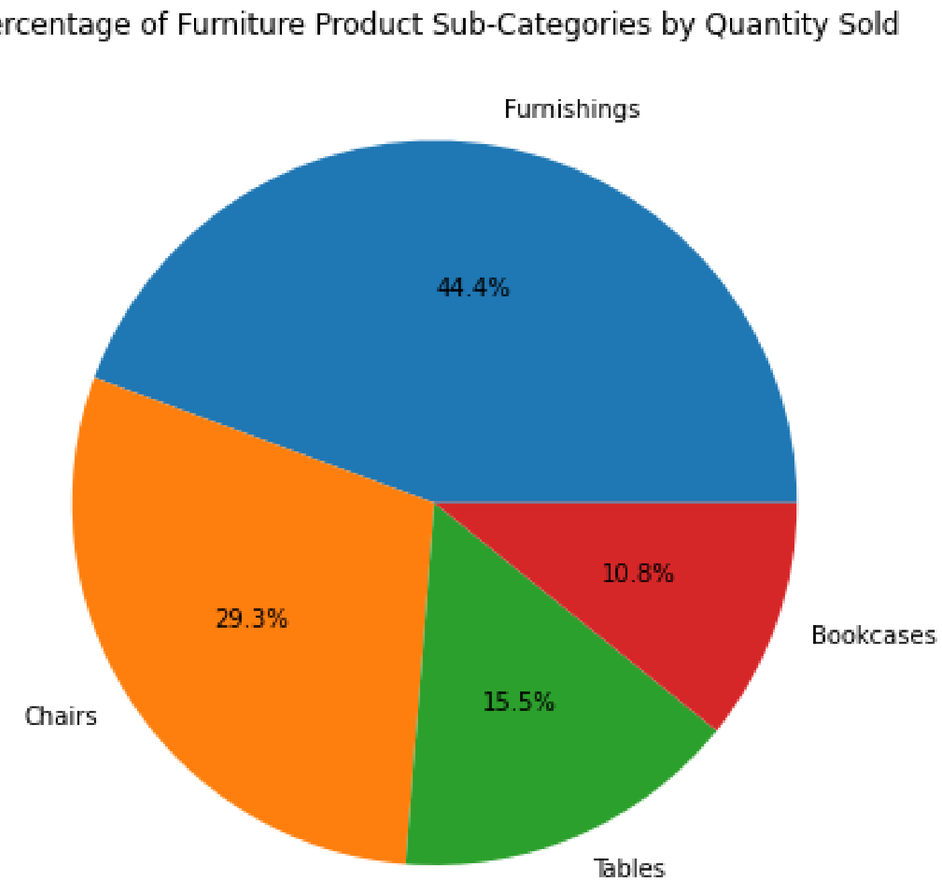
Resulting DataFrames

	Sub-Category	Category	Quantity
0	Binders	Office Supplies	5974
1	Paper	Office Supplies	5178
2	Storage	Office Supplies	3158
3	Art	Office Supplies	3000
4	Appliances	Office Supplies	1729
5	Labels	Office Supplies	1400
6	Fasteners	Office Supplies	914
7	Envelopes	Office Supplies	906
8	Supplies	Office Supplies	647

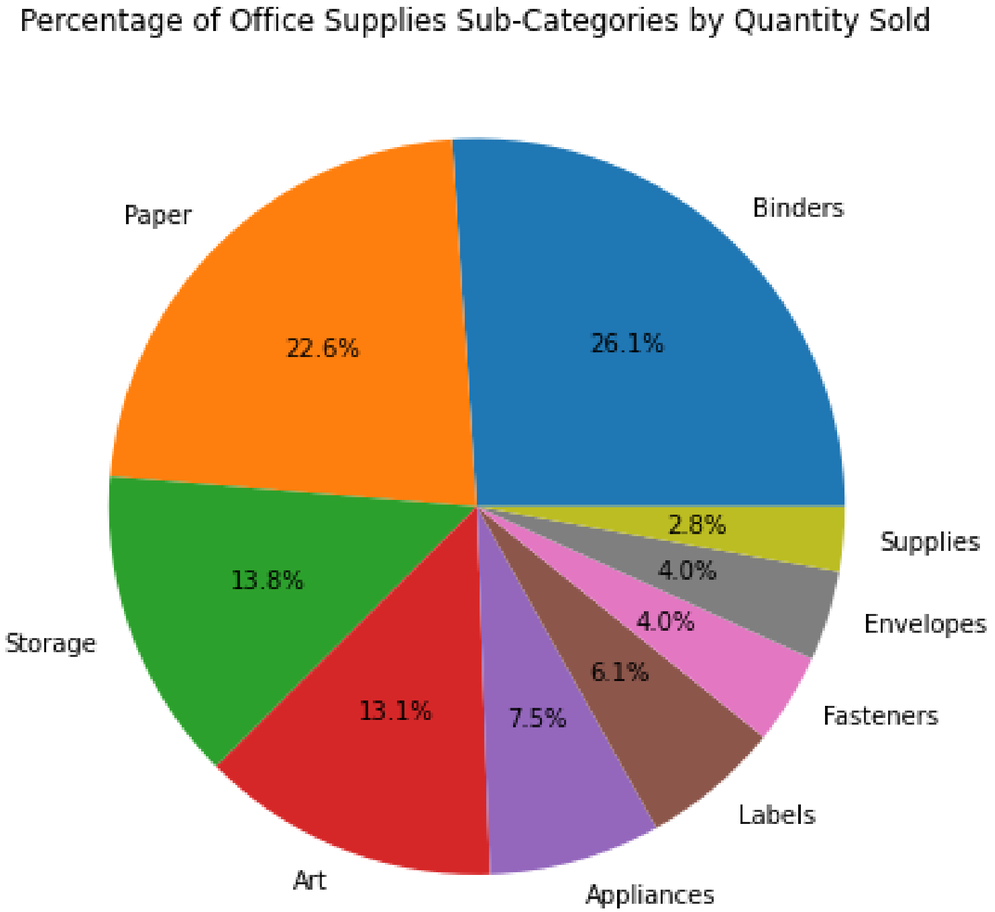
Plotting Charts

```
#Plotting Pie Chart (Furniture Sub-Categories by Quantity)
import matplotlib.pyplot as plt

#https://www.geeksforgeeks.org/plot-a-pie-chart-in-python-using-matplotlib/
#http://www.learningaboutelectronics.com/Articles/How-to-create-a-pie-chart-in-matplotlib-with-Python.php

# Creating dataset
sub_cat = furniture_df1["Sub-Category"]
data = furniture_df1["Quantity"]

# Creating plot
fig = plt.figure(figsize =(10, 7))
plt.pie(data, labels = sub_cat,autopct='%1.1f%%')
plt.title("Percentage of Furniture Product Sub-Categories by Quantity Sold")

# show plot
fig.savefig("Percentage of Furniture Product Sub-Categories by Quantity Sold")
plt.show()
```

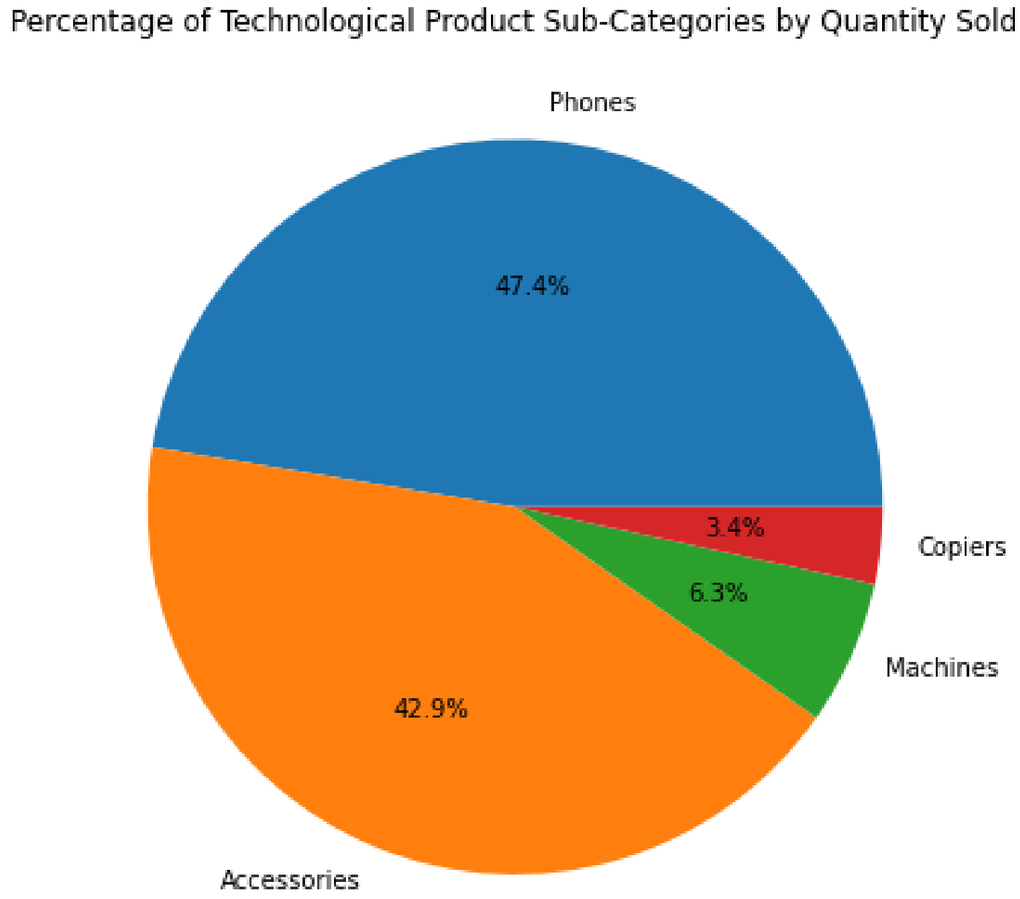
Most Popular Sub-Categories by Quantity Sold



Most Popular Sub-Categories by Quantity Sold



Most Popular Sub-Categories by Quantity Sold



\data_by_profit_and_shipmode.ipnyb

Sorting data for Ship Mode Popularity

```
# counting data by ship mode
shipmode = dataset.groupby('Ship Mode')
shipmode_df = pd.DataFrame(shipmode['Ship Mode'].count())
shipmode_df.index.name = None
shipmode_df['Count']=shipmode_df['Ship Mode']
shipmode_df = shipmode_df.drop(columns=['Ship Mode'])
shipmode_df.index.name = 'Ship Mode'
shipmode_df = shipmode_df.sort_values('Count').reset_index()
```

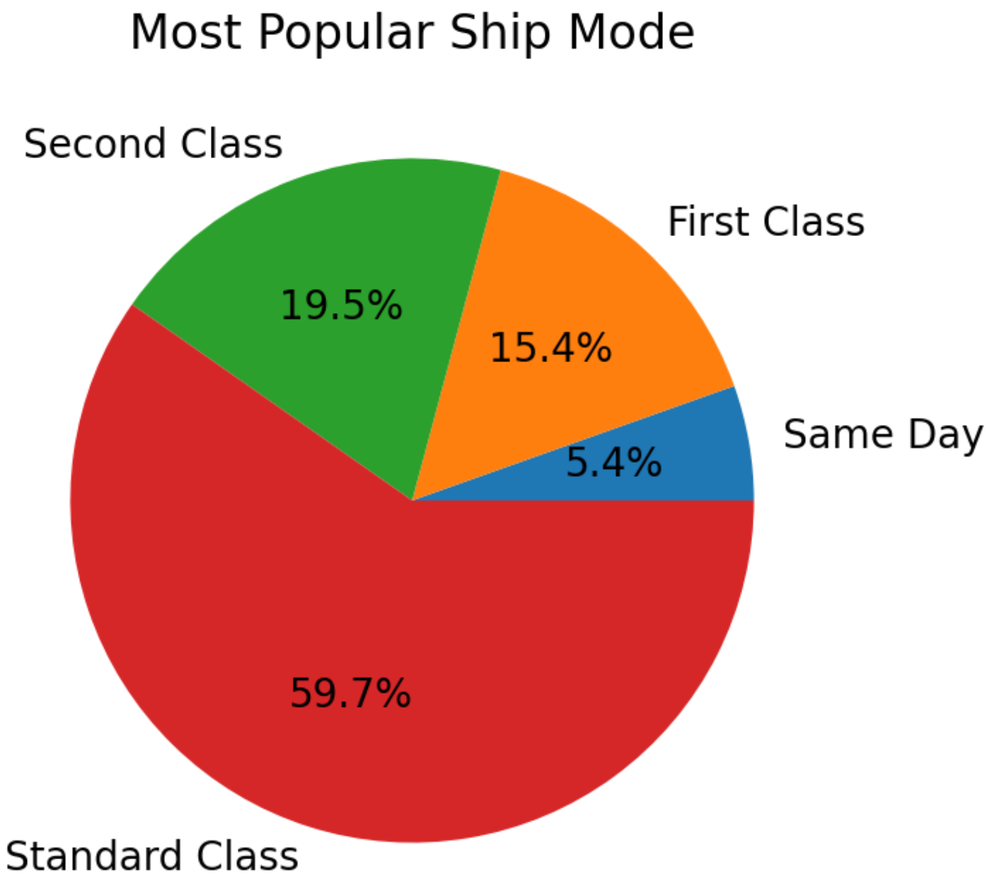
Resulting Data Frame

	Ship Mode	Count
0	Same Day	543
1	First Class	1538
2	Second Class	1945
3	Standard Class	5968

Charting data by Ship Mode Popularity

```
# chart by ship mode popularity
fig = plt.pie(shipmode_df['Count'],labels=list(shipmode_df['Ship Mode']),autopct='%1.1f%%') #https://datatofish.com/pie-chart-matplotlib/
plt.title('Most Popular Ship Mode')
plt.savefig("./charts_by_ship_mode/Ship_Mode_Popularity.png", dpi=200)
```

\charts_by_ship_mode\Ship_Mode_Popularity.png



Creating Dataframes for Profit Based on Ship Mode by Region

```
# dataframe per class
fstclass_df = dataset[dataset['Ship Mode']=='First Class'].drop(columns=["Region","State","City","Customer ID","Segment","Prod
uct ID","Product Name","Category","Sub-Category"])
stdclass_df = dataset[dataset['Ship Mode']=='Standard Class'].drop(columns=["Region","State","City","Customer ID","Segment","P
roduct ID","Product Name","Category","Sub-Category"])
scdclass_df = dataset[dataset['Ship Mode']=='Second Class'].drop(columns=["Region","State","City","Customer ID","Segment","Pro
duct ID","Product Name","Category","Sub-Category"])
sameday_df = dataset[dataset['Ship Mode']=='Same Day'].drop(columns=["Region","State","City","Customer ID","Segment","Product
ID","Product Name","Category","Sub-Category"])
```

```
# profit by region
fstclass_bylocation = dataset[dataset['Ship Mode']=='First Class'].drop(columns=["Customer ID","Segment","Product ID","Product
Name","Category","Sub-Category"])
fstclass_region = fstclass_bylocation.groupby('Region').sum().sort_values('Profit').reset_index()

stdclass_bylocation = dataset[dataset['Ship Mode']=='Standard Class'].drop(columns=["Customer ID","Segment","Product ID","Prod
uct Name","Category","Sub-Category"])
stdclass_region = stdclass_bylocation.groupby('Region').sum().sort_values('Profit').reset_index()

scdclass_bylocation = dataset[dataset['Ship Mode']=='Second Class'].drop(columns=["Customer ID","Segment","Product ID","Produc
t Name","Category","Sub-Category"])
scdclass_region = scdclass_bylocation.groupby('Region').sum().sort_values('Profit').reset_index()

sameday_bylocation = dataset[dataset['Ship Mode']=='Same Day'].drop(columns=["Customer ID","Segment","Product ID","Product Nam
e","Category","Sub-Category"])
sameday_region = sameday_bylocation.groupby('Region').sum().sort_values('Profit').reset_index()
```

Dataframes for Profit Based on Ship Mode by Region

```
fstclass_region
```

	Region	Sales	Quantity	Discount	Profit
0	Central	58746.9154	1156	79.42	3707.2672
1	South	49332.5660	830	34.30	6892.3854
2	East	113587.0530	1805	76.50	15732.0141
3	West	129761.8885	1902	62.95	22638.1732

```
scdclass_region
```

	Region	Sales	Quantity	Discount	Profit
0	Central	103550.0054	1795	104.60	9114.8349
1	East	116545.5240	2026	70.00	10787.2908
2	South	93758.6125	1294	36.15	14667.1469
3	West	145339.4275	2308	59.40	22877.3628

```
stdclass_region
```

	Region	Sales	Quantity	Discount	Profit
0	Central	318527.5600	5437	347.42	25352.3807
1	South	227613.5535	3761	156.80	26952.2330
2	West	406752.7985	7385	208.90	54760.9657
3	East	405321.8310	6214	241.90	57023.2081

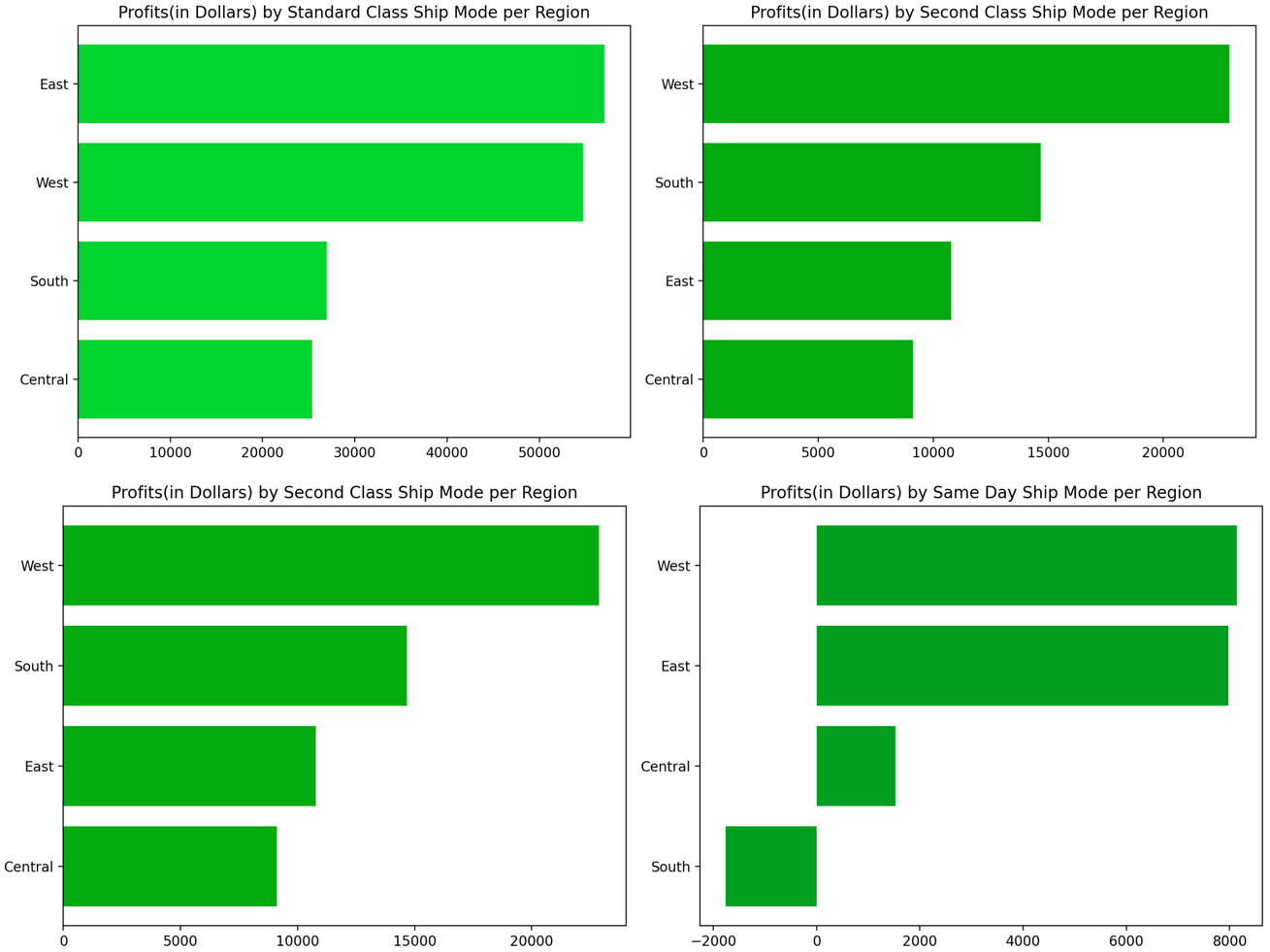
```
sameday_region
```

	Region	Sales	Quantity	Discount	Profit
0	South	21017.173	324	11.30	-1762.3350
1	Central	20415.410	392	26.90	1531.8797
2	East	43326.832	573	25.60	7980.2670
3	West	43603.710	671	18.95	8141.9472

Creating Charts for Profit Based on Ship Mode by Region

```
# plotting profits per class by region
fig,ax = plt.subplots(1,4)
plt.figure(figsize=(15, 6))
fig.set_size_inches(26,5)

ax[0].barh(y = fstclass_region['Region'], width = fstclass_region['Profit'],color='#00e050')
ax[0].set_title('Profits(in Dollars) by First Class Ship Mode per Region') # https://stackoverflow.com/questions/6963035/pyplot-axes-labels-for-subplots
ax[1].barh(y = stdclass_region['Region'],width = stdclass_region['Profit'],color='#00d42f')
ax[1].set_title('Profits(in Dollars) by Standard Class Ship Mode per Region')
ax[2].barh(y = scdclass_region['Region'], width = scdclass_region['Profit'],color='#00aa0f')
ax[2].set_title('Profits(in Dollars) by Second Class Ship Mode per Region')
ax[3].barh(y = sameday_region['Region'],width = sameday_region['Profit'],color='#009f20')
ax[3].set_title('Profits(in Dollars) by Same Day Ship Mode per Region')

fig.tight_layout()
plt.show()
fig.savefig("./charts_by_ship_mode/Profits_by_ShipMode_per_Region.png", dpi=200)
```

\charts_by_ship_mode\Profits_by_ShipMode_per_Region.png



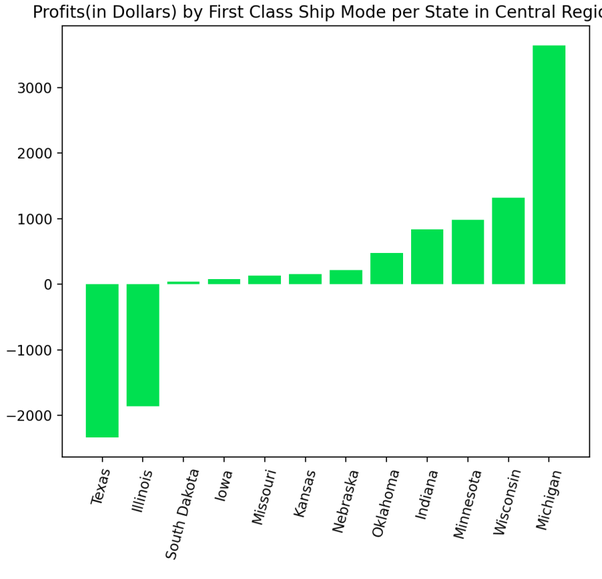
Creating Dataframes for Profit Based on Ship Mode by Region and State (First Class)

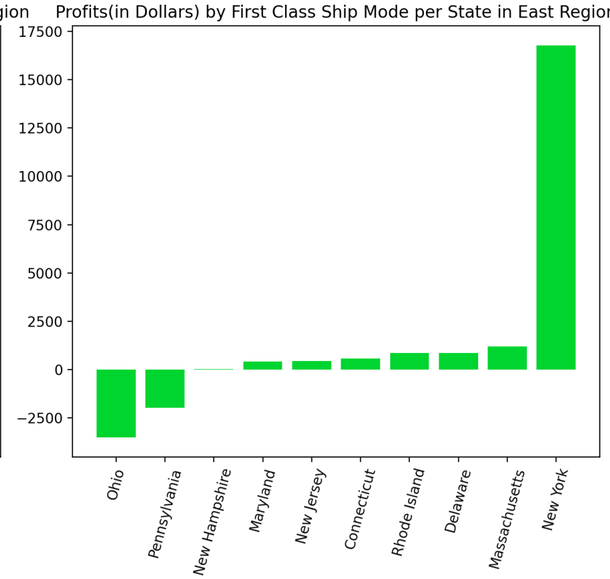
```
# profit by first class per region & state
# grouping by region
fstclass_bycentral = fstclass_bylocation[fstclass_bylocation['Region']=='Central'].drop(columns=['City','Ship Mode'])
fstclass_bycentral = fstclass_bycentral.groupby('State').sum().sort_values("Profit").reset_index()

fstclass_byeast = fstclass_bylocation[fstclass_bylocation['Region']=='East'].drop(columns=['City','Ship Mode'])
fstclass_byeast = fstclass_byeast.groupby('State').sum().sort_values("Profit").reset_index()

fstclass_bywest = fstclass_bylocation[fstclass_bylocation['Region']=='West'].drop(columns=['City','Ship Mode'])
fstclass_bywest = fstclass_bywest.groupby('State').sum().sort_values("Profit").reset_index()

fstclass_bysouth = fstclass_bylocation[fstclass_bylocation['Region']=='South'].drop(columns=['City','Ship Mode'])
fstclass_bysouth = fstclass_bysouth.groupby('State').sum().sort_values("Profit").reset_index()
```

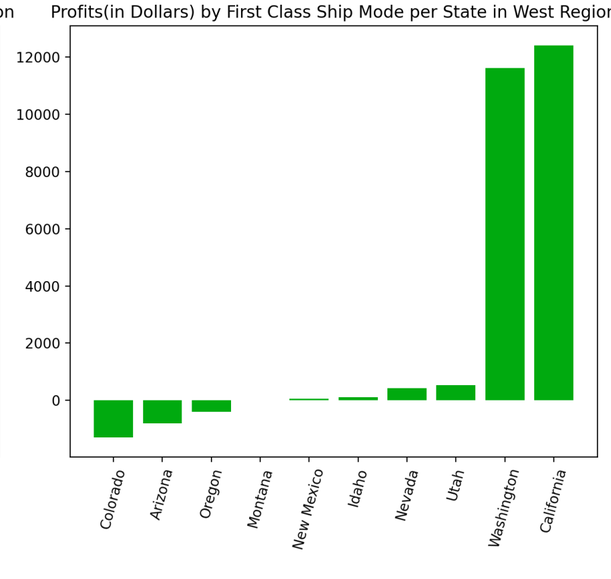
Creating Charts for Profit Based on Ship Mode by Region and State (First Class)

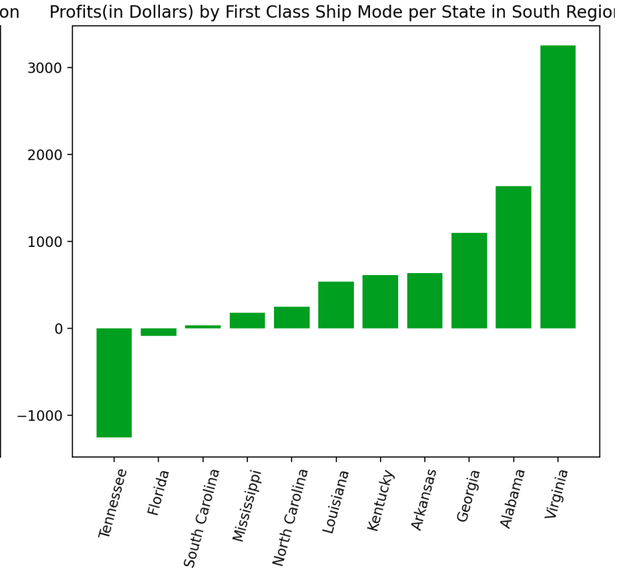
```
# plotting
fig,ax = plt.subplots(1,4)
fig.set_size_inches(24,6)

ax[0].bar(x = fstclass_bycentral['State'], height = fstclass_bycentral['Profit'],color='#00e050')
ax[0].tick_params(axis='x', rotation=75) # https://stackoverflow.com/questions/31186019/rotate-tick-labels-in-subplot-pyplot-matplotlib-gridspec/52461208
ax[0].set_title('Profits(in Dollars) by First Class Ship Mode per State in Central Region')
ax[1].bar(x = fstclass_byeast['State'], height = fstclass_byeast['Profit'],color='#00d42f')
ax[1].tick_params(axis='x', rotation=75)
ax[1].set_title('Profits(in Dollars) by First Class Ship Mode per State in East Region')
ax[2].bar(x = fstclass_bywest['State'], height = fstclass_bywest['Profit'],color='#00aa0f')
ax[2].tick_params(axis='x', rotation=75)
ax[2].set_title('Profits(in Dollars) by First Class Ship Mode per State in West Region')
ax[3].bar(x = fstclass_bysouth['State'], height = fstclass_bysouth['Profit'],color='#009f20')
ax[3].tick_params(axis='x', rotation=75)
ax[3].set_title('Profits(in Dollars) by First Class Ship Mode per State in South Region')

fig.tight_layout()
plt.show()
fig.savefig("./charts_by_ship_mode/Profits_by_FirstClass_ShipMode_per_State.png", dpi=200)
```

\charts_by_ship_mode\Profits_by_FirstClass_ShipMode_per_State.png









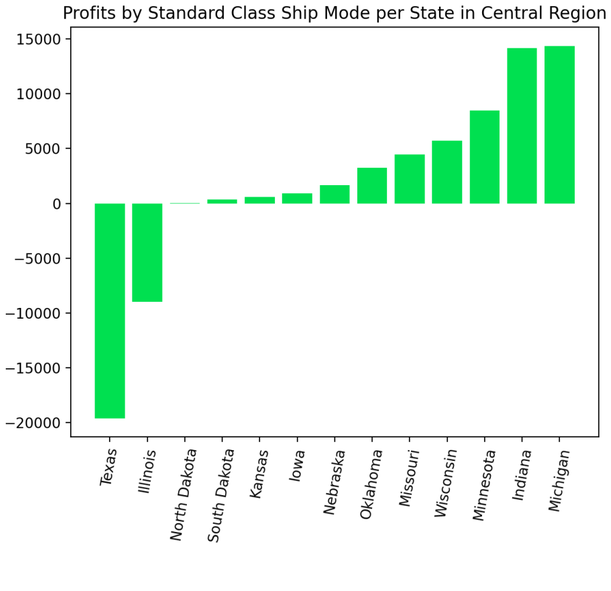
Creating Dataframes for Profit Based on Ship Mode by Region and State (Standard Class)

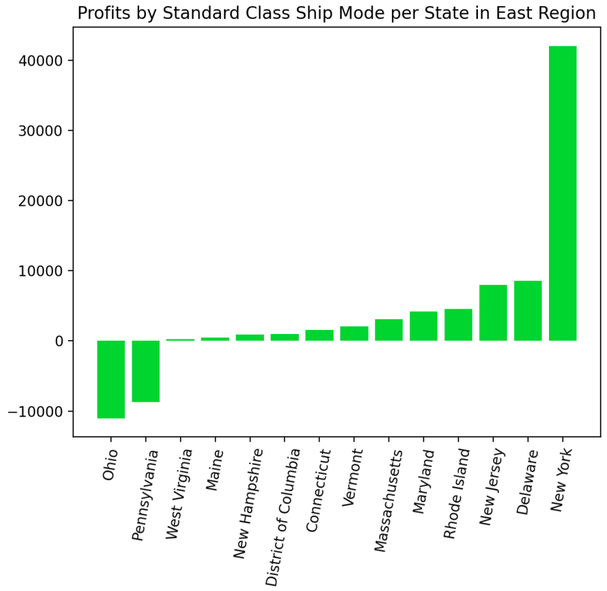
```
# profit by standard class shipping per region & state
# grouping by region
stdclass_bycentral = stdclass_bylocation[stdclass_bylocation['Region']=='Central'].drop(columns=['City','Ship Mode'])
stdclass_bycentral = stdclass_bycentral.groupby('State').sum().sort_values("Profit").reset_index()

stdclass_byeast = stdclass_bylocation[stdclass_bylocation['Region']=='East'].drop(columns=['City','Ship Mode'])
stdclass_byeast = stdclass_byeast.groupby('State').sum().sort_values("Profit").reset_index()

stdclass_bywest = stdclass_bylocation[stdclass_bylocation['Region']=='West'].drop(columns=['City','Ship Mode'])
stdclass_bywest = stdclass_bywest.groupby('State').sum().sort_values("Profit").reset_index()

stdclass_bysouth = stdclass_bylocation[stdclass_bylocation['Region']=='South'].drop(columns=['City','Ship Mode'])
stdclass_bysouth = stdclass_bysouth.groupby('State').sum().sort_values("Profit").reset_index()
```

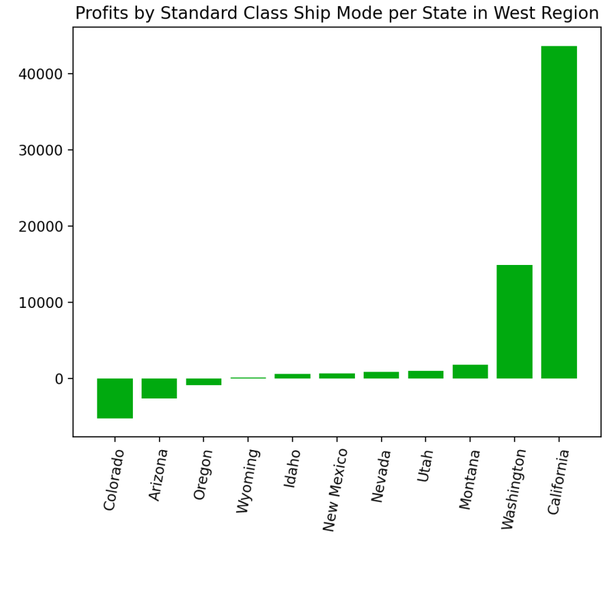
Creating Charts for Profit Based on Ship Mode by Region and State (Standard Class)

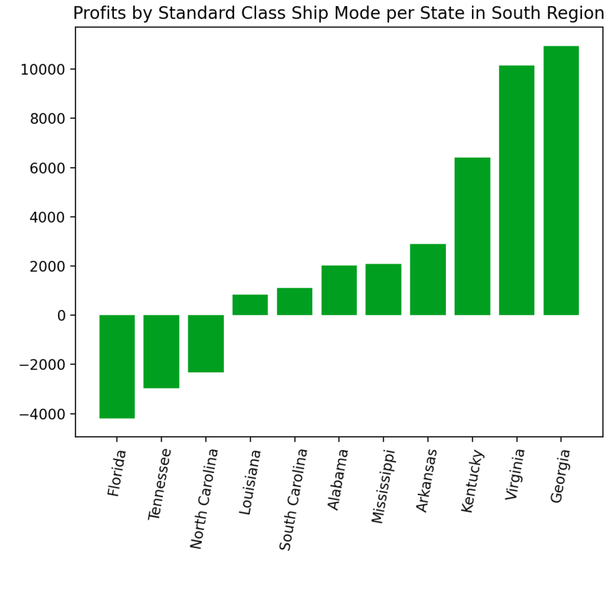
```
# plotting
fig,ax = plt.subplots(1,4)
fig.set_size_inches(24,6)

ax[0].bar(x = stdclass_bycentral['State'], height = stdclass_bycentral['Profit'],color='#00e050')
ax[0].tick_params(axis='x', rotation=80)
ax[0].set_title('Profits by Standard Class Ship Mode per State in Central Region')
ax[1].bar(x = stdclass_byeast['State'], height = stdclass_byeast['Profit'],color='#00d42f')
ax[1].tick_params(axis='x', rotation=80)
ax[1].set_title('Profits by Standard Class Ship Mode per State in East Region')
ax[2].bar(x = stdclass_bywest['State'], height = stdclass_bywest['Profit'],color='#00aa0f')
ax[2].tick_params(axis='x', rotation=80)
ax[2].set_title('Profits by Standard Class Ship Mode per State in West Region')
ax[3].bar(x = stdclass_bysouth['State'], height = stdclass_bysouth['Profit'],color='#009f20')
ax[3].tick_params(axis='x', rotation=80)
ax[3].set_title('Profits by Standard Class Ship Mode per State in South Region')

fig.tight_layout()
plt.show()
fig.savefig("./charts_by_ship_mode/Profits_by_StandardClass_ShipMode_per_State.png", dpi=200)
```

\charts_by_ship_mode\Profits_by_StandardClass_ShipMode_per_State.png









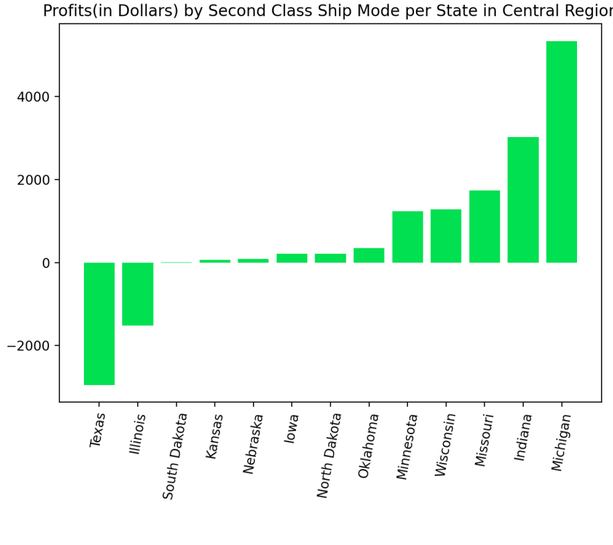
Creating Dataframes for Profit Based on Ship Mode by Region and State (Second Class)

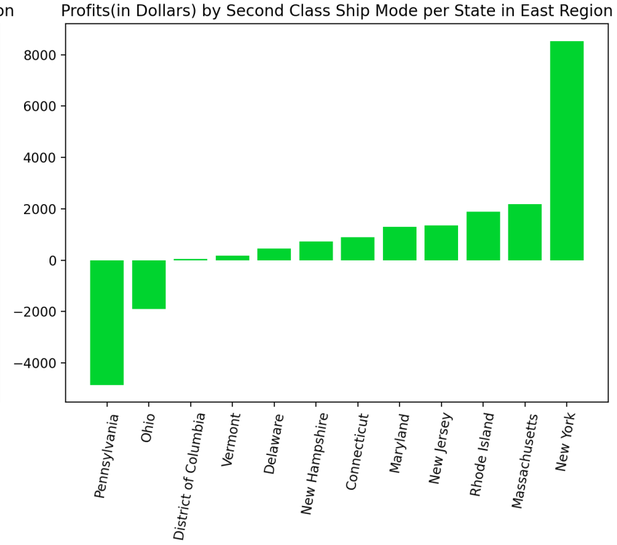
```
# profit by second class shipping per region & state
# grouping by region
scdclass_bycentral = scdclass_bylocation[scdclass_bylocation['Region']=='Central'].drop(columns=['City','Ship Mode'])
scdclass_bycentral = scdclass_bycentral.groupby('State').sum().sort_values("Profit").reset_index()

scdclass_byeast = scdclass_bylocation[scdclass_bylocation['Region']=='East'].drop(columns=['City','Ship Mode'])
scdclass_byeast = scdclass_byeast.groupby('State').sum().sort_values("Profit").reset_index()

scdclass_bywest = scdclass_bylocation[scdclass_bylocation['Region']=='West'].drop(columns=['City','Ship Mode'])
scdclass_bywest = scdclass_bywest.groupby('State').sum().sort_values("Profit").reset_index()

scdclass_bysouth = scdclass_bylocation[scdclass_bylocation['Region']=='South'].drop(columns=['City','Ship Mode'])
scdclass_bysouth = scdclass_bysouth.groupby('State').sum().sort_values("Profit").reset_index()
```

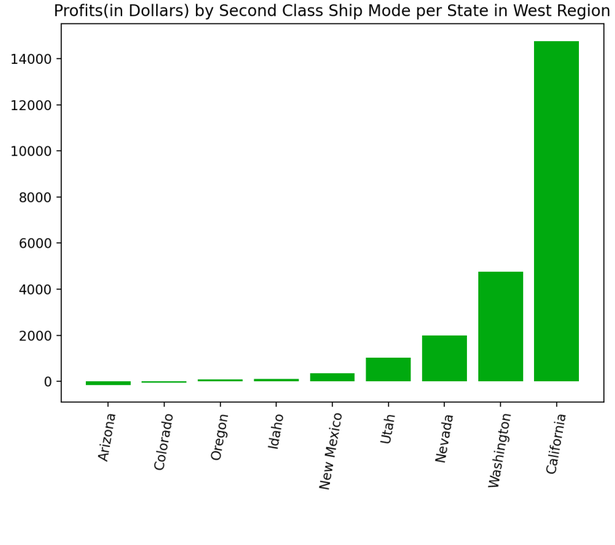
Creating Charts for Profit Based on Ship Mode by Region and State (Second Class)

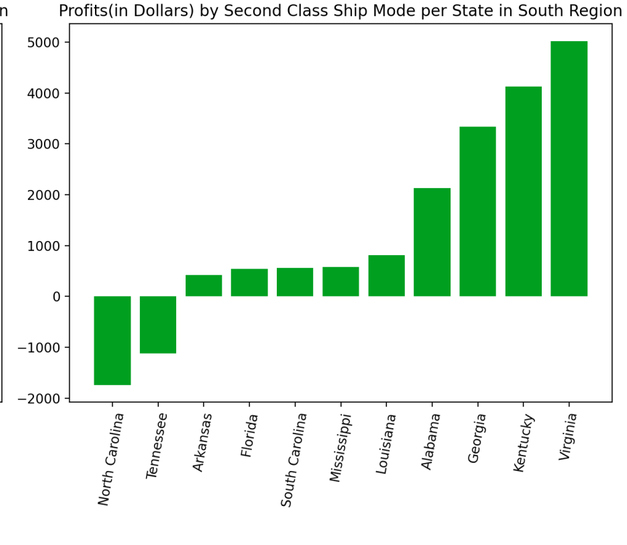
```
# plotting
fig,ax = plt.subplots(1,4)
fig.set_size_inches(26,6)

ax[0].bar(x = scdclass_bycentral['State'], height = scdclass_bycentral['Profit'],color='#00e050')
ax[0].tick_params(axis='x', rotation=80)
ax[0].set_title('Profits(in Dollars) by Second Class Ship Mode per State in Central Region')
ax[1].bar(x = scdclass_byeast['State'], height = scdclass_byeast['Profit'],color='#00d42f')
ax[1].tick_params(axis='x', rotation=80)
ax[1].set_title('Profits(in Dollars) by Second Class Ship Mode per State in East Region')
ax[2].bar(x = scdclass_bywest['State'], height = scdclass_bywest['Profit'],color='#00aa0f')
ax[2].tick_params(axis='x', rotation=80)
ax[2].set_title('Profits(in Dollars) by Second Class Ship Mode per State in West Region')
ax[3].bar(x = scdclass_bysouth['State'], height = scdclass_bysouth['Profit'],color='#009f20')
ax[3].tick_params(axis='x', rotation=80)
ax[3].set_title('Profits(in Dollars) by Second Class Ship Mode per State in South Region')
fig.tight_layout()
plt.show()
fig.savefig("./charts_by_ship_mode/Profits_by_SecondClass_ShipMode_per_State.png", dpi=200)
```

\charts_by_ship_mode\Profits_by_SecondClass_ShipMode_per_State.png









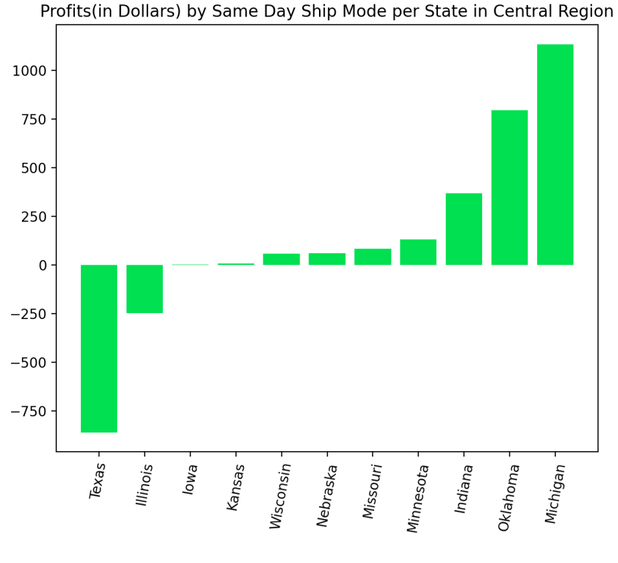
Creating Dataframes for Profit Based on Ship Mode by Region and State (Same Day)

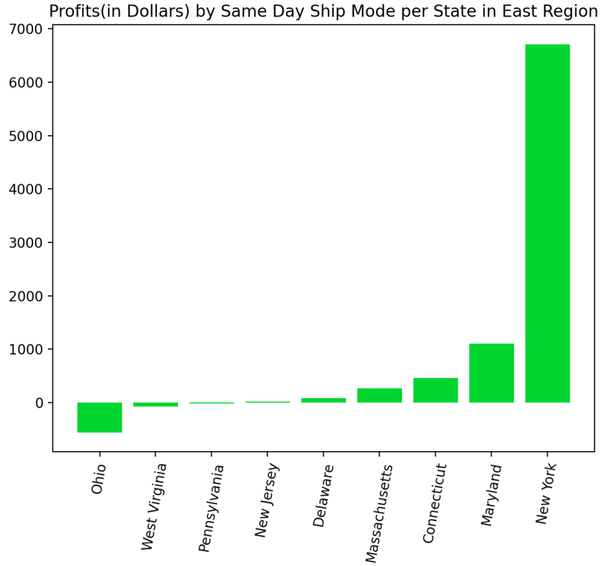
```
# profit by same day shipping per region & state
# grouping by region
sameday_bycentral = sameday_bylocation[sameday_bylocation['Region']=='Central'].drop(columns=['City','Ship Mode'])
sameday_bycentral = sameday_bycentral.groupby('State').sum().sort_values("Profit").reset_index()

sameday_byeast = sameday_bylocation[sameday_bylocation['Region']=='East'].drop(columns=['City','Ship Mode'])
sameday_byeast = sameday_byeast.groupby('State').sum().sort_values("Profit").reset_index()

sameday_bywest = sameday_bylocation[sameday_bylocation['Region']=='West'].drop(columns=['City','Ship Mode'])
sameday_bywest = sameday_bywest.groupby('State').sum().sort_values("Profit").reset_index()

sameday_bysouth = sameday_bylocation[sameday_bylocation['Region']=='South'].drop(columns=['City','Ship Mode'])
sameday_bysouth = sameday_bysouth.groupby('State').sum().sort_values("Profit").reset_index()
```

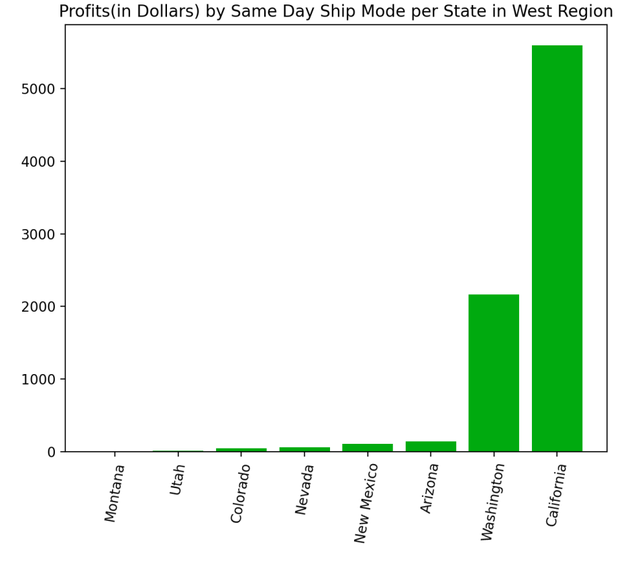
Creating Charts for Profit Based on Ship Mode by Region and State (Same Day)

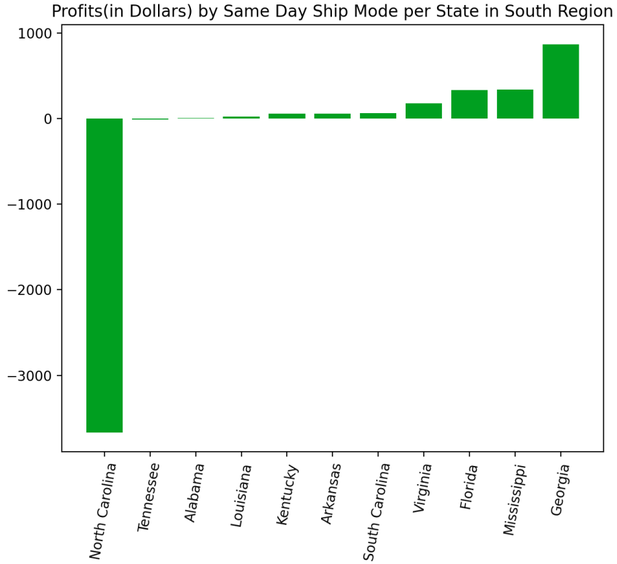
```
# plotting
fig,ax = plt.subplots(1,4)
fig.set_size_inches(25,6)

ax[0].bar(x = sameday_bycentral['State'], height = sameday_bycentral['Profit'],color='#00e050')
ax[0].tick_params(axis='x', rotation=80)
ax[0].set_title('Profits(in Dollars) by Same Day Ship Mode per State in Central Region')
ax[1].bar(x = sameday_byeast['State'], height = sameday_byeast['Profit'],color='#00d42f')
ax[1].tick_params(axis='x', rotation=80)
ax[1].set_title('Profits(in Dollars) by Same Day Ship Mode per State in East Region')
ax[2].bar(x = sameday_bywest['State'], height = sameday_bywest['Profit'],color='#00aa0f')
ax[2].tick_params(axis='x', rotation=80)
ax[2].set_title('Profits(in Dollars) by Same Day Ship Mode per State in West Region')
ax[3].bar(x = sameday_bysouth['State'], height = sameday_bysouth['Profit'],color='#009f20')
ax[3].tick_params(axis='x', rotation=80)
ax[3].set_title('Profits(in Dollars) by Same Day Ship Mode per State in South Region')
fig.tight_layout()
plt.show()
fig.savefig("./charts_by_ship_mode/Profits_by_SameDay_ShipMode_per_State.png", dpi=200)
```

\charts_by_ship_mode\Profits_by_SameDay_ShipMode_per_State.png









source for dataset:
https://www.kaggle.com/dhirajnirne/online-store-dataset