e commerce sales

May 23, 2025

[70]:
```
import pandas as pd #pandas (pd): Data manipulation ke liye use hota hai, jaise␣
 ↪CSV file load karna aur process karna.

import plotly.express as px #plotly.express (px): Data visualization library jo␣
 ↪easy aur quick plots banata hai.
import plotly.graph_objects as go #plotly.graph_objects (go): Advanced and␣
 ↪customizable graphs banane ke liye
import plotly.io as pio   #plotly.io (pio): Graph templates ko customize karne␣
 ↪ke liye
import plotly.colors as colors
pio.templates.default = "plotly_white"  #pio.templates.default = "plotly_white":
 ↪ Default theme white rakha gaya hai graphs ke liye
```

[72]:
```
data = pd.read_csv("Sample - Superstore.csv", encoding='latin-1')
#encoding='latin-1': Special characters ko properly read karne ke liye encoding␣
 ↪use hui hai
data.head()
```

[72]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	Country	City	…	Postal Code	Region	Product ID	Category	Sub-Category
0	1	CA-2016-152156	11/8/2016	11/11/2016	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	…	42420	South	FUR-BO-10001798	Furniture	Bookcases
1	2	CA-2016-152156	11/8/2016	11/11/2016	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	…	42420	South	FUR-CH-10000454	Furniture	Chairs
2	3	CA-2016-138688	6/12/2016	6/16/2016	Second Class	DV-13045	Darrin Van Huff	Corporate	United States	Los Angeles	…	90036	West	OFF-LA-10000240	Office Supplies	Labels
3	4	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	…	33311	South	FUR-TA-10000577	Furniture	Tables
4	5	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	…					

```
4       33311   South  OFF-ST-10000760  Office Supplies      Storage

                                        Product Name     Sales  Quantity  \
0                  Bush Somerset Collection Bookcase  261.9600         2
1  Hon Deluxe Fabric Upholstered Stacking Chairs,…  731.9400         3
2  Self-Adhesive Address Labels for Typewriters b…   14.6200         2
3      Bretford CR4500 Series Slim Rectangular Table  957.5775         5
4                       Eldon Fold 'N Roll Cart System   22.3680         2

   Discount    Profit
0      0.00   41.9136
1      0.00  219.5820
2      0.00    6.8714
3      0.45 -383.0310
4      0.20    2.5164

[5 rows x 21 columns]
```

1 Let's start by looking at the descriptive statistics of the dataset

[75]:
```
data.describe()
```

[75]:
```
            Row ID   Postal Code         Sales     Quantity     Discount  \
count  9994.000000   9994.000000   9994.000000  9994.000000  9994.000000
mean   4997.500000  55190.379428    229.858001     3.789574     0.156203
std    2885.163629  32063.693350    623.245101     2.225110     0.206452
min       1.000000   1040.000000      0.444000     1.000000     0.000000
25%    2499.250000  23223.000000     17.280000     2.000000     0.000000
50%    4997.500000  56430.500000     54.490000     3.000000     0.200000
75%    7495.750000  90008.000000    209.940000     5.000000     0.200000
max    9994.000000  99301.000000  22638.480000    14.000000     0.800000

            Profit
count  9994.000000
mean     28.656896
std     234.260108
min   -6599.978000
25%       1.728750
50%       8.666500
75%      29.364000
max    8399.976000
```

The dataset has an order date column. We can use this column to create new columns like order month, order year, and order day, which will be very valuable for sales and profit analysis according to time periods. So let's add these columns:

[78]:
```
data.head()
```

[78]:
```
   Row ID        Order ID  Order Date   Ship Date       Ship Mode Customer ID  \
0       1  CA-2016-152156   11/8/2016  11/11/2016    Second Class    CG-12520
1       2  CA-2016-152156   11/8/2016  11/11/2016    Second Class    CG-12520
2       3  CA-2016-138688   6/12/2016   6/16/2016    Second Class    DV-13045
3       4  US-2015-108966  10/11/2015  10/18/2015  Standard Class    SO-20335
4       5  US-2015-108966  10/11/2015  10/18/2015  Standard Class    SO-20335

     Customer Name    Segment        Country             City  …  \
0      Claire Gute   Consumer  United States        Henderson  …
1      Claire Gute   Consumer  United States        Henderson  …
2  Darrin Van Huff  Corporate  United States      Los Angeles  …
3   Sean O'Donnell   Consumer  United States  Fort Lauderdale  …
4   Sean O'Donnell   Consumer  United States  Fort Lauderdale  …

  Postal Code  Region       Product ID         Category Sub-Category  \
0       42420   South  FUR-BO-10001798        Furniture    Bookcases
1       42420   South  FUR-CH-10000454        Furniture       Chairs
2       90036    West  OFF-LA-10000240  Office Supplies       Labels
3       33311   South  FUR-TA-10000577        Furniture       Tables
4       33311   South  OFF-ST-10000760  Office Supplies      Storage

                                        Product Name     Sales  Quantity  \
0                 Bush Somerset Collection Bookcase  261.9600         2
1  Hon Deluxe Fabric Upholstered Stacking Chairs,…  731.9400         3
2  Self-Adhesive Address Labels for Typewriters b…   14.6200         2
3      Bretford CR4500 Series Slim Rectangular Table  957.5775         5
4                    Eldon Fold 'N Roll Cart System   22.3680         2

   Discount    Profit
0      0.00   41.9136
1      0.00  219.5820
2      0.00    6.8714
3      0.45 -383.0310
4      0.20    2.5164

[5 rows x 21 columns]
```

[80]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9994 entries, 0 to 9993
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Row ID         9994 non-null   int64
 1   Order ID       9994 non-null   object
 2   Order Date     9994 non-null   object
 3   Ship Date      9994 non-null   object
```

```
 4   Ship Mode      9994 non-null   object
 5   Customer ID    9994 non-null   object
 6   Customer Name  9994 non-null   object
 7   Segment        9994 non-null   object
 8   Country        9994 non-null   object
 9   City           9994 non-null   object
 10  State          9994 non-null   object
 11  Postal Code    9994 non-null   int64
 12  Region         9994 non-null   object
 13  Product ID     9994 non-null   object
 14  Category       9994 non-null   object
 15  Sub-Category   9994 non-null   object
 16  Product Name   9994 non-null   object
 17  Sales          9994 non-null   float64
 18  Quantity       9994 non-null   int64
 19  Discount       9994 non-null   float64
 20  Profit         9994 non-null   float64
dtypes: float64(3), int64(3), object(15)
memory usage: 1.6+ MB
```

2 Converting Date Columns

[83]:
```
data['Order Date'] = pd.to_datetime(data['Order Date'])
data['Ship Date'] = pd.to_datetime(data['Ship Date'])
#Date Conversion: Order Date aur Ship Date columns ko datetime format me␣
 ↪convert kiya gaya hai for date-based analysis.
```

3 Adding New Date-Based Columns

[88]:
```
data['Order Month'] = data['Order Date'].dt.month
data['Order Year'] = data['Order Date'].dt.year
data['Order Day of Week'] = data['Order Date'].dt.dayofweek

#Order Month: Order date se month extract karte hain.
#Order Year: Order date se year extract hota hai.
#Order Day of Week: Week ka day (0 for Monday, 6 for Sunday) extract kiya gaya␣
 ↪hai.
```

[27]:
```
data.head()
```

[27]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	\
0	1	CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	
1	2	CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	
2	3	CA-2016-138688	2016-06-12	2016-06-16	Second Class	DV-13045	
3	4	US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	
4	5	US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	

```
     Customer Name    Segment        Country             City  …  \
0      Claire Gute   Consumer  United States        Henderson  …
1      Claire Gute   Consumer  United States        Henderson  …
2  Darrin Van Huff  Corporate  United States      Los Angeles  …
3   Sean O'Donnell   Consumer  United States  Fort Lauderdale  …
4   Sean O'Donnell   Consumer  United States  Fort Lauderdale  …

          Category  Sub-Category  \
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  Office Supplies       Storage

                                        Product Name     Sales Quantity  \
0                  Bush Somerset Collection Bookcase  261.9600        2
1  Hon Deluxe Fabric Upholstered Stacking Chairs,…  731.9400        3
2  Self-Adhesive Address Labels for Typewriters b…   14.6200        2
3      Bretford CR4500 Series Slim Rectangular Table  957.5775        5
4                    Eldon Fold 'N Roll Cart System   22.3680        2

  Discount    Profit  Order Month  Order Year  Order Day of Week
0     0.00   41.9136           11        2016                  1
1     0.00  219.5820           11        2016                  1
2     0.00    6.8714            6        2016                  6
3     0.45 -383.0310           10        2015                  6
4     0.20    2.5164           10        2015                  6

[5 rows x 24 columns]
```

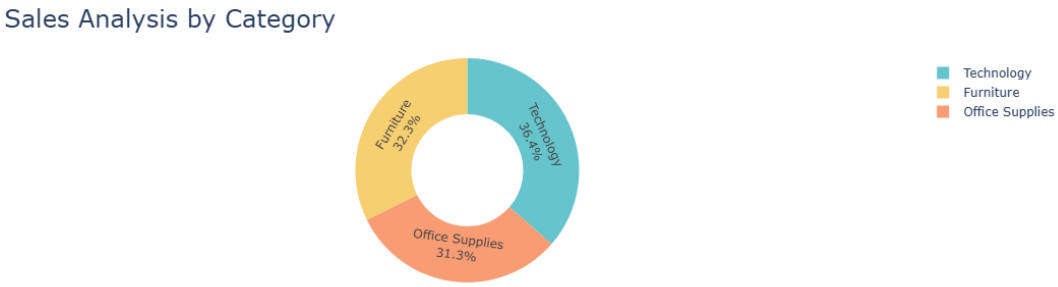
4 Monthly Sales Analysis

[30]:
```
sales_by_month = data.groupby('Order Month')['Sales'].sum().reset_index()
fig = px.line(sales_by_month,
              x='Order Month',
              y='Sales',
              title='Monthly Sales Analysis')
fig.show()
```

[90]:
```
#Data Grouping:
#data.groupby('Order Month')['Sales'].sum() se har month ki total sales nikalte␣
 ↪hain.
#.reset_index() data ko structured format me rakhta hai.
#px.line: Monthly sales trend show karne ke liye line chart banaya gaya hai.
#fig.show(): Graph display karta hai.
```

5 Sales Analysis by Category

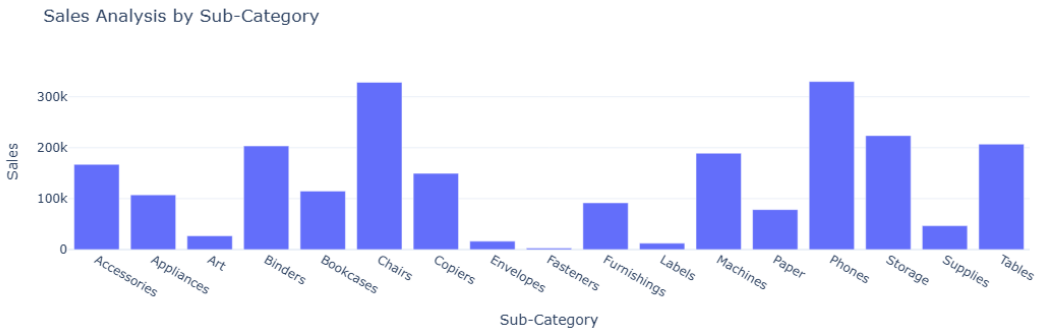
[32]:
```
sales_by_category = data.groupby('Category')['Sales'].sum().reset_index()


fig = px.pie(sales_by_category,
             values='Sales',
             names='Category',
             hole=0.5,
             color_discrete_sequence=px.colors.qualitative.Pastel)

fig.update_traces(textposition='inside', textinfo='percent+label')
fig.update_layout(title_text='Sales Analysis by Category',␣
 ↪title_font=dict(size=24))

fig.show()
```



[ ]:
```
#groupby('Category'): Category-wise sales nikalte hain.
#Pie Chart:
#px.pie: Sales proportions ko pie chart me show karta hai.
#hole=0.5: Donut-style chart banata hai.
#Pastel Colors: Chart me soft color palette use kiya gaya hai.
```

6 Sales Analysis by Sub-Category

[36]:
```
sales_by_subcategory = data.groupby('Sub-Category')['Sales'].sum().reset_index()
fig = px.bar(sales_by_subcategory,
             x='Sub-Category',
             y='Sales',
             title='Sales Analysis by Sub-Category')
fig.show()
```



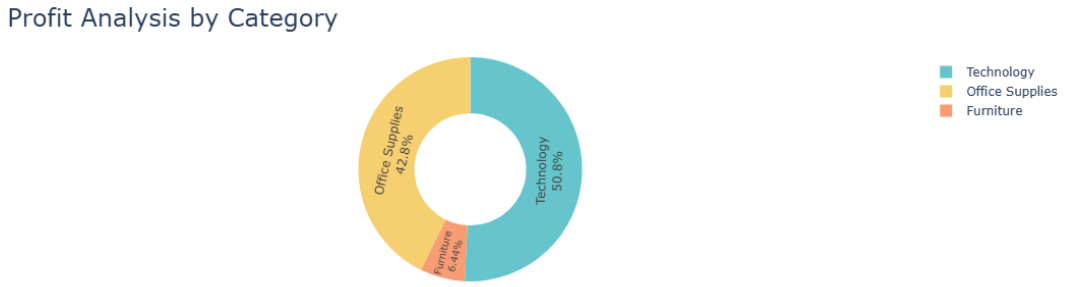
7 Monthly Profit Analysis

[39]:
```
profit_by_month = data.groupby('Order Month')['Profit'].sum().reset_index()
fig = px.line(profit_by_month,
              x='Order Month',
              y='Profit',
              title='Monthly Profit Analysis')
fig.show()
```

8 Profit Analysis by Category

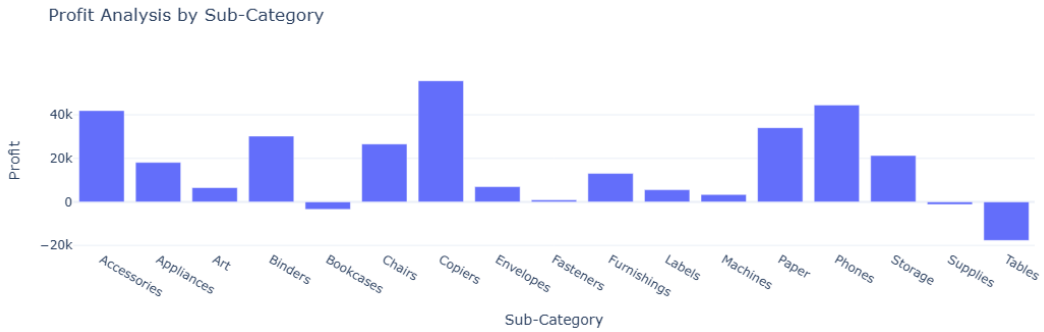
[42]:
```
profit_by_category = data.groupby('Category')['Profit'].sum().reset_index()

fig = px.pie(profit_by_category,
             values='Profit',
             names='Category',
             hole=0.5,
             color_discrete_sequence=px.colors.qualitative.Pastel)
```

```
fig.update_traces(textposition='inside', textinfo='percent+label')
fig.update_layout(title_text='Profit Analysis by Category',␣
 ↪title_font=dict(size=24))

fig.show()
```



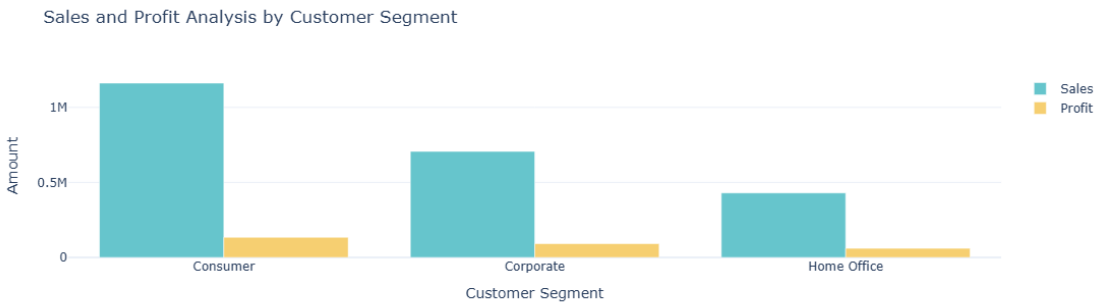
9 Profit Analysis by Sub-Category

[45]:
```
profit_by_subcategory = data.groupby('Sub-Category')['Profit'].sum().
 ↪reset_index()
fig = px.bar(profit_by_subcategory, x='Sub-Category',
             y='Profit',
             title='Profit Analysis by Sub-Category')
fig.show()
```



10 Sales and Profit Analysis by Customer Segment

[48]:
```
sales_profit_by_segment = data.groupby('Segment').agg({'Sales': 'sum', 'Profit':
 ↪ 'sum'}).reset_index()

color_palette = colors.qualitative.Pastel

fig = go.Figure()
fig.add_trace(go.Bar(x=sales_profit_by_segment['Segment'],
                     y=sales_profit_by_segment['Sales'],
                     name='Sales',
                     marker_color=color_palette[0]))

fig.add_trace(go.Bar(x=sales_profit_by_segment['Segment'],
                     y=sales_profit_by_segment['Profit'],
                     name='Profit',
                     marker_color=color_palette[1]))

fig.update_layout(title='Sales and Profit Analysis by Customer Segment',
                  xaxis_title='Customer Segment', yaxis_title='Amount')

fig.show()
```



11 analyse sales-to-profit ratio

[51]:
```
sales_profit_by_segment = data.groupby('Segment').agg({'Sales': 'sum', 'Profit':
 ↪ 'sum'}).reset_index()
sales_profit_by_segment['Sales_to_Profit_Ratio'] =␣
 ↪sales_profit_by_segment['Sales'] / sales_profit_by_segment['Profit']
print(sales_profit_by_segment[['Segment', 'Sales_to_Profit_Ratio']])
```

```
       Segment  Sales_to_Profit_Ratio
0     Consumer               8.659471
```

```
    1    Corporate               7.677245
    2  Home Office               7.125416
```

[ ]:

[ ]:

[ ]: