In [1]:
```python
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
```

In [2]:
```python
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()
```

Out[2]:

	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	Product Name	Sales	Quantity	Discount
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	Bush Somerset Collection Bookcase	261.9600	2	0.00
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	Hon Deluxe Fabric Upholstered Stacking Chairs,...	731.9400	3	0.00
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	Self-Adhesive Address Labels for Typewriters b...	14.6200	2	0.00
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	Bretford CR4500 Series Slim Rectangular Table	957.5775	5	0.45
4	5	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	...	33311	South	OFF-ST-10000760	Office Supplies	Storage	Eldon Fold 'N Roll Cart System	22.3680	2	0.20

5 rows × 21 columns

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

In [3]:
```python
data.describe()
```

Out[3]:

	Row ID	Postal Code	Sales	Quantity	Discount	Profit
count	9994.000000	9994.000000	9994.000000	9994.000000	9994.000000	9994.000000
mean	4997.500000	55190.379428	229.858001	3.789574	0.156203	28.656896
std	2885.163629	32063.693350	623.245101	2.225110	0.206452	234.260108
min	1.000000	1040.000000	0.444000	1.000000	0.000000	-6599.978000
25%	2499.250000	23223.000000	17.280000	2.000000	0.000000	1.728750
50%	4997.500000	56430.500000	54.490000	3.000000	0.200000	8.666500
75%	7495.750000	90008.000000	209.940000	5.000000	0.200000	29.364000
max	9994.000000	99301.000000	22638.480000	14.000000	0.800000	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:

In [4]:
```python
data.head()
```

Out[4]:

	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	Product Name	Sales	Quantity	Discount
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	Bush Somerset Collection Bookcase	261.9600	2	0.00
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	Hon Deluxe Fabric Upholstered Stacking Chairs,...	731.9400	3	0.00
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	Self-Adhesive Address Labels for Typewriters b...	14.6200	2	0.00
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	Bretford CR4500 Series Slim Rectangular Table	957.5775	5	0.45
4	5	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	...	33311	South	OFF-ST-10000760	Office Supplies	Storage	Eldon Fold 'N Roll Cart System	22.3680	2	0.20

5 rows × 21 columns

In [5]:
```python
data.info()
```

```
&lt;class 'pandas.core.frame.DataFrame'&gt;
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
```

Converting Date Columns

In [6]:
```python
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.
```

Adding New Date-Based Columns

In [7]:
```python
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.
```

In [8]:
```python
data.head()
```

Out[8]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	Country	City	...	Category	Sub-Category	Product Name	Sales	Quantity	Discount	Profit	Order Month	Order Year	Order Day of Week
0	1	CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	...	Furniture	Bookcases	Bush Somerset Collection Bookcase	261.9600	2	0.00	41.9136	11	2016	1
1	2	CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	Claire Gute	Consumer	United States	Henderson	...	Furniture	Chairs	Hon Deluxe Fabric Upholstered Stacking Chairs,...	731.9400	3	0.00	219.5820	11	2016	1
2	3	CA-2016-138688	2016-06-12	2016-06-16	Second Class	DV-13045	Darrin Van Huff	Corporate	United States	Los Angeles	...	Office Supplies	Labels	Self-Adhesive Address Labels for Typewriters b...	14.6200	2	0.00	6.8714	6	2016	6
3	4	US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	...	Furniture	Tables	Bretford CR4500 Series Slim Rectangular Table	957.5775	5	0.45	-383.0310	10	2015	6
4	5	US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	Sean O'Donnell	Consumer	United States	Fort Lauderdale	...	Office Supplies	Storage	Eldon Fold 'N Roll Cart System	22.3680	2	0.20	2.5164	10	2015	6

5 rows × 24 columns

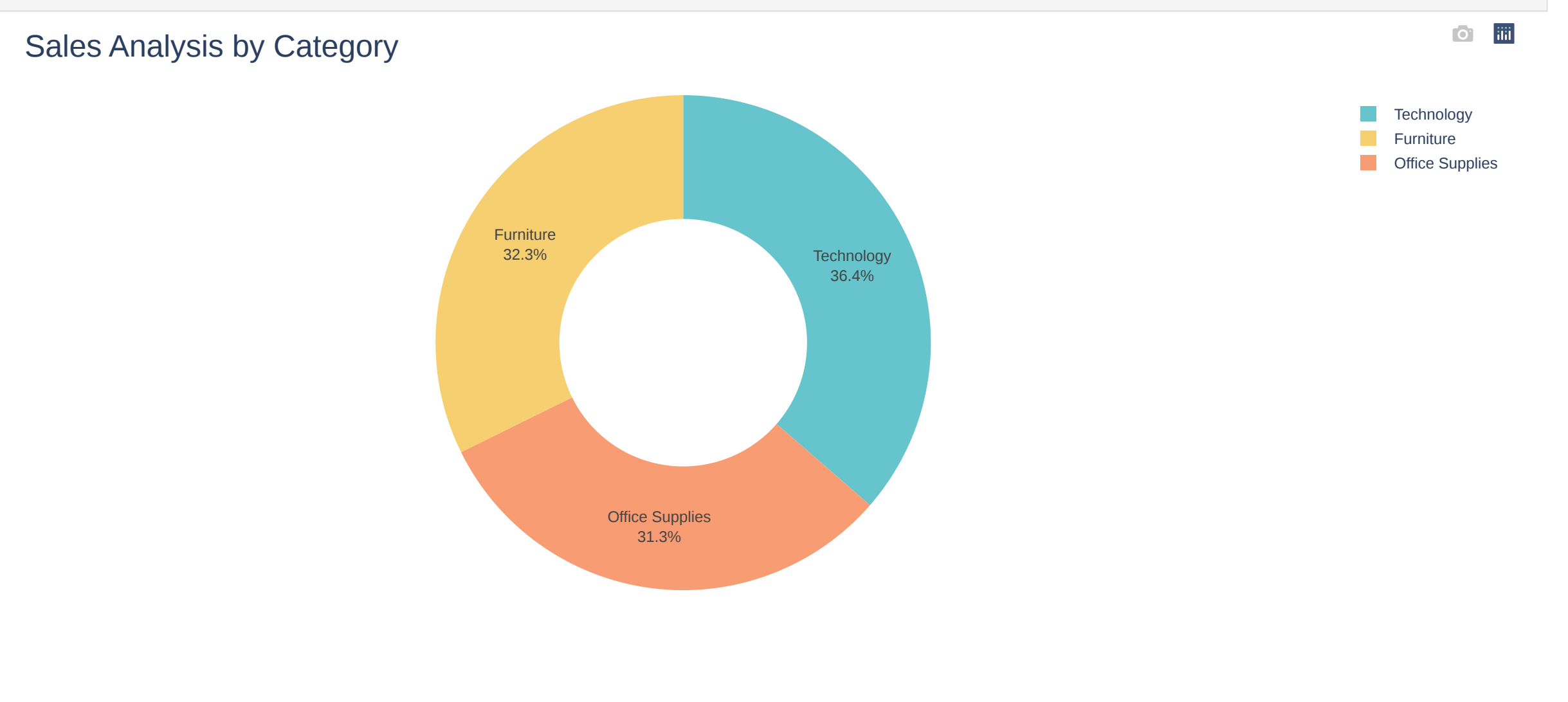
Monthly Sales Analysis

In [9]:
```python
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()
```

In [10]:
```python
#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.
```

Sales Analysis by Category

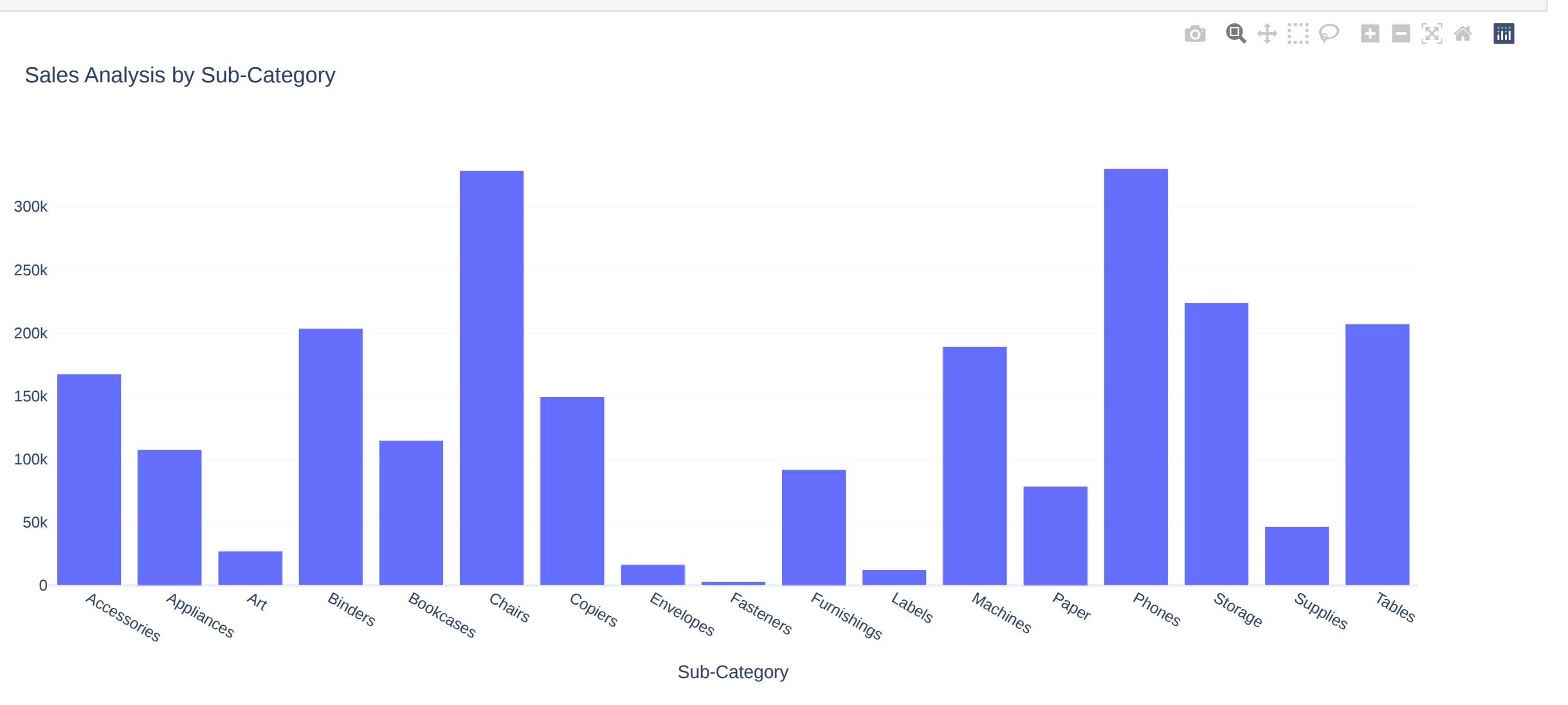
In [11]:
```python
sales_by_category = data.groupby('Category')['Sales'].sum().reset_index()


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()
```



In [12]:
```python
#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.
```

Sales Analysis by Sub-Category

In [13]:
```python
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()
```

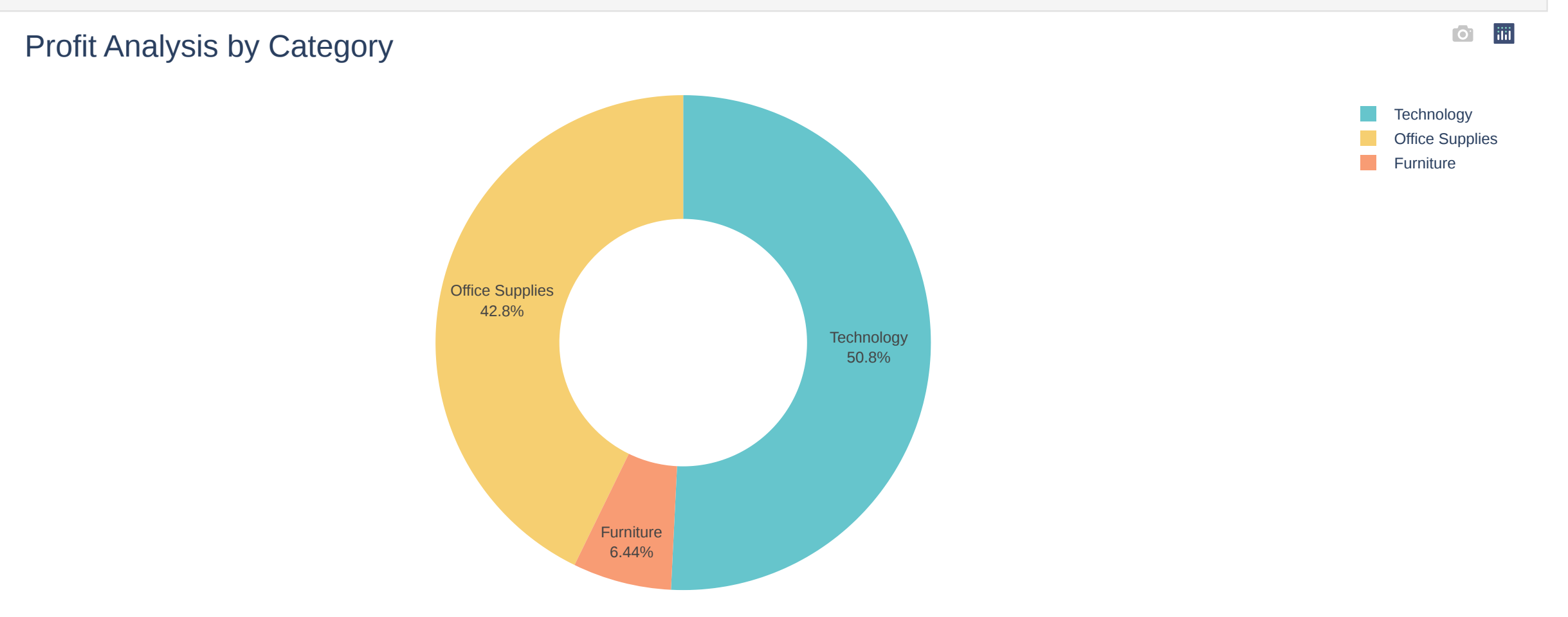


Monthly Profit Analysis

In [14]:
```python
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()
```

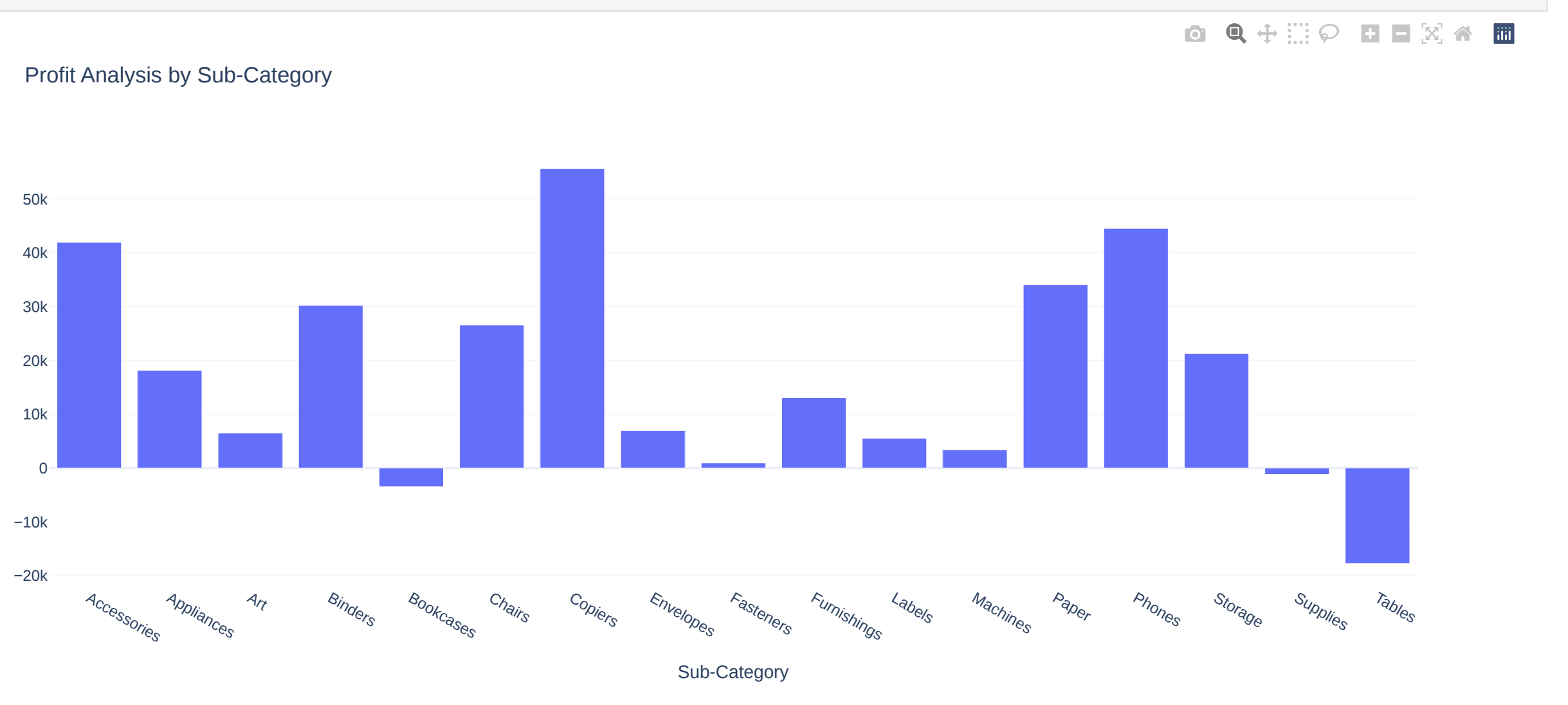
Profit Analysis by Category

In [15]:
```python
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()
```



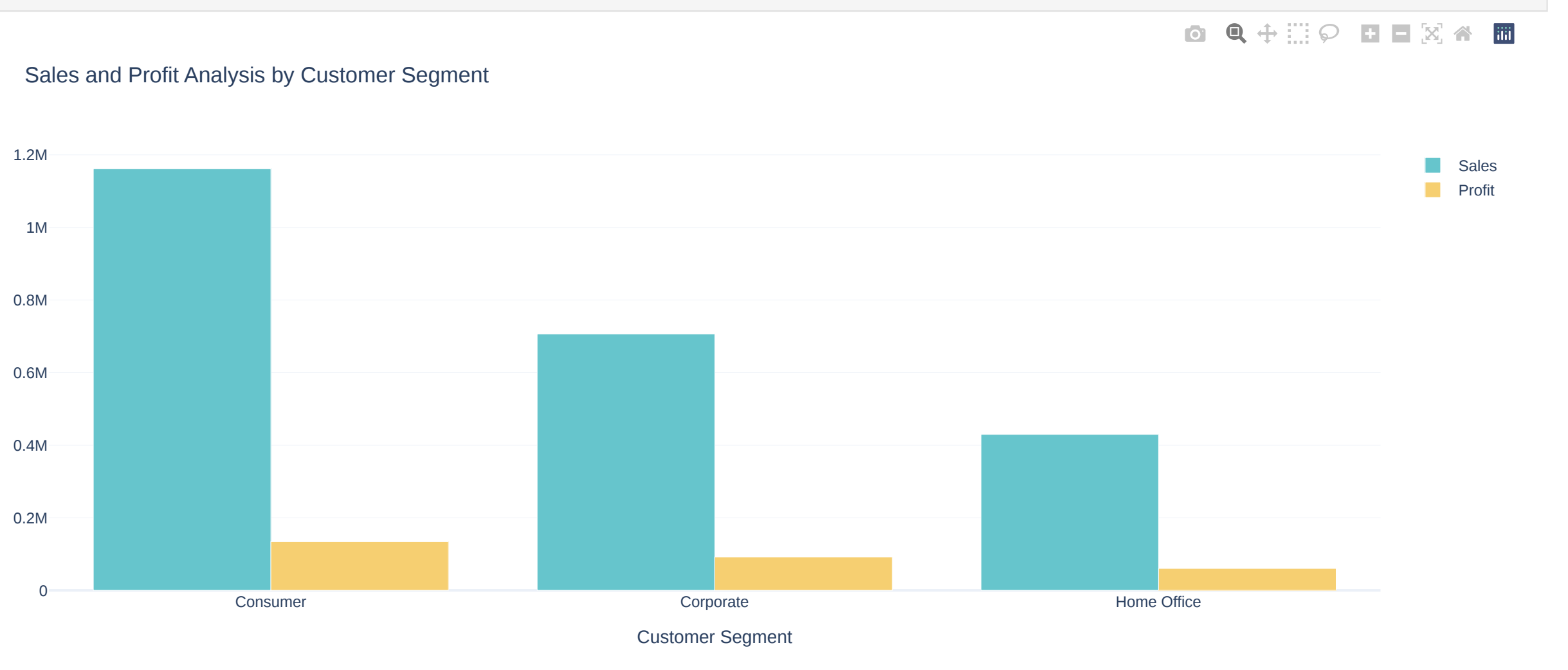
Profit Analysis by Sub-Category

In [16]:
```python
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()
```



Sales and Profit Analysis by Customer Segment

In [17]:
```python
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()
```



analyse sales-to-profit ratio

In [18]:
```python
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
```

In [ ]:

In [ ]:

In [ ]: