Python Project: Germany New Cars Data Analysis & Visualization

Importing Libraries

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go
```

Loading the data in the dataframe

In [32]:

```
df = pd.read_csv("Germany New Car Data.csv", encoding='ISO-8859-1')
```

In [33]:

```
# Display the first few rows
df.head()
```

Out[33]:

	Purchase ID	Customer Name	Age	Gender	City	Car Brand	Car Model	Fuel Type	Transmission	Purchase Date	Price	Loan Taken	Down Payment	Loan Provider	Annual Income	Previous Car Owned	Customer Satisfaction Score
0	PUR100000	Laura	28	Male	Munich	BMW	C-Class	Petrol	Automatic	10/6/2021	□ 15,725.19	Yes	□ 5,004.00	Commerzbank	□ 62,770.00	Yes	2
1	PUR100001	Tim	54	Female	Stuttgart	BMW	A3	Electric	Automatic	7/10/2021	□ 37,264.71	Yes	□ 11,930.00	Commerzbank	□ 53,283.00	No	4
2	PUR100002	Lukas	42	Male	Hamburg	Opel	Octavia	Petrol	Manual	9/13/2021	□ 48,946.14	No	□ 8,263.00	Commerzbank	□ 78,976.00	Yes	4
3	PUR100003	Sophie	26	Female	Berlin	Audi	Golf	Petrol	Manual	9/5/2021	□ 23,009.41	No	□ 12,359.00	Commerzbank	□ 84,191.00	No	4
4	PUR100004	Lukas	40	Female	Berlin	Audi	C-Class	Diesel	Manual	8/18/2021	□ 12,942.71	No	□ 3,635.00	Volksbank	□ 30,924.00	No	3

In [34]:

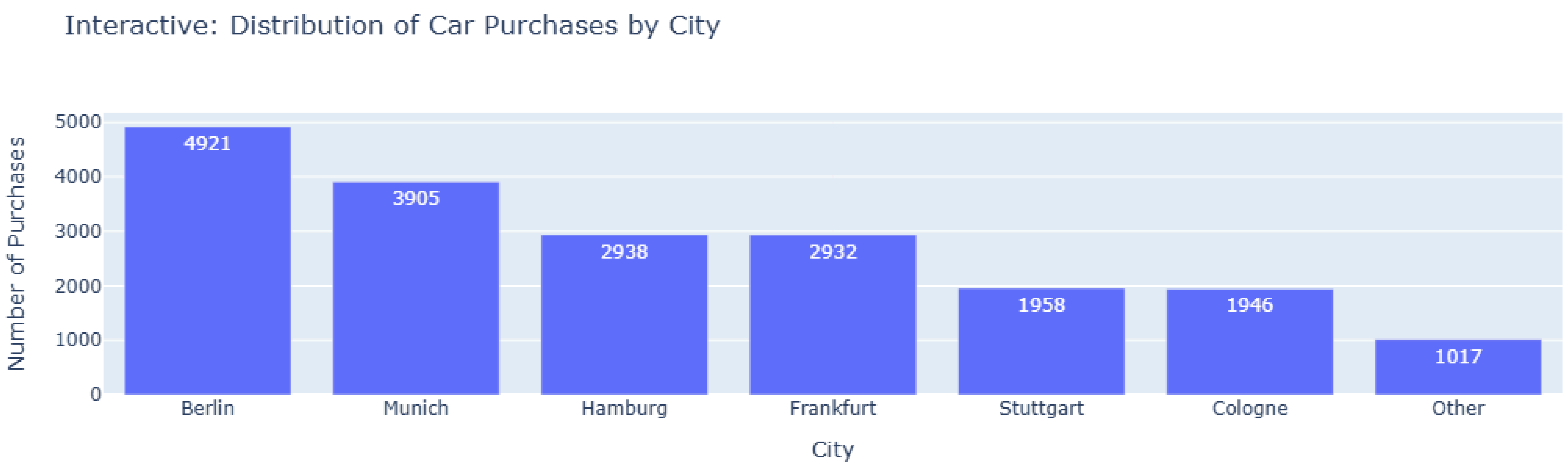
```
# To Confirm there's no null values in the dataset.
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 19617 entries, 0 to 19616
Data columns (total 17 columns):
 #   Column                       Non-Null Count  Dtype 
---  ------                       --------------  ----- 
 0   Purchase ID                  19617 non-null  object
 1   Customer Name                19617 non-null  object
 2   Age                          19617 non-null  int64 
 3   Gender                       19617 non-null  object
 4   City                         19617 non-null  object
 5   Car Brand                    19617 non-null  object
 6   Car Model                    19617 non-null  object
 7   Fuel Type                    19617 non-null  object
 8   Transmission                 19617 non-null  object
 9   Purchase Date                19617 non-null  object
 10  Price                        19617 non-null  object
 11  Loan Taken                   19617 non-null  object
 12  Down Payment                 19617 non-null  object
 13  Loan Provider                17660 non-null  object
 14  Annual Income                19617 non-null  object
 15  Previous Car Owned           19617 non-null  object
 16  Customer Satisfaction Score  19617 non-null  int64 
dtypes: int64(2), object(15)
memory usage: 2.5+ MB
```

Q1. What is the distribution of car purchases by city?

In [9]:

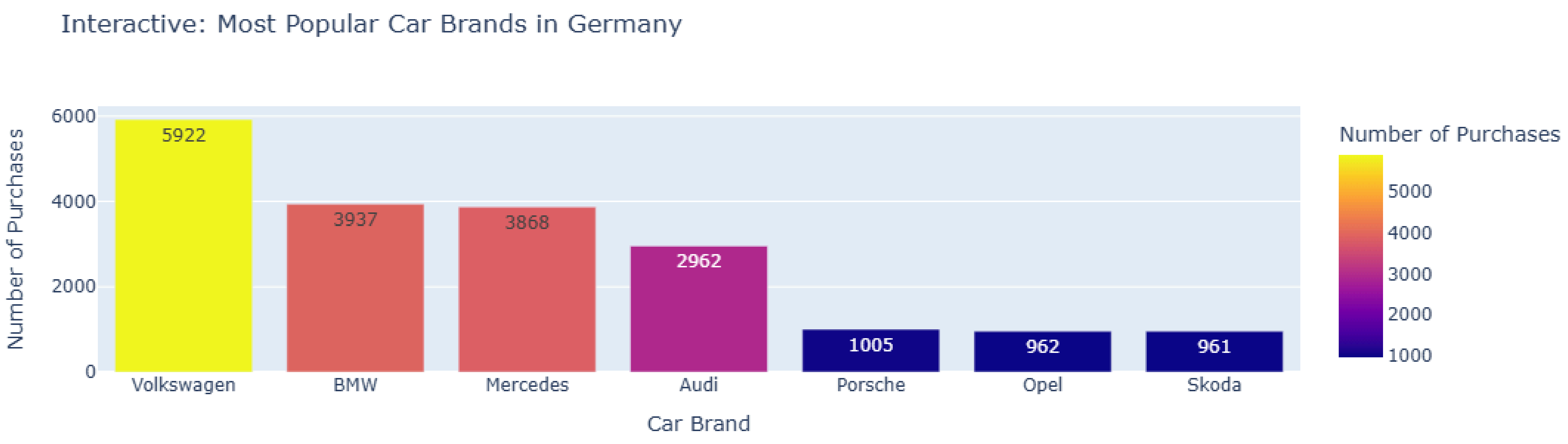
```python
# Group and count purchases by city
city_count = df['City'].value_counts().reset_index()
city_count.columns = ['City', 'Number of Purchases']

# Create interactive bar chart
fig = px.bar(
    city_count,
    x='City',
    y='Number of Purchases',
    title='Interactive: Distribution of Car Purchases by City',
    labels={'Number of Purchases': 'Number of Purchases'},
    text='Number of Purchases'
)

# Save the interactive chart as PNG
fig.write_image("Car Purchases By City.png", width=1000, height=600, scale=2)

# Show chart
fig.show()
```



Q2. Which car brands are most popular?

In [8]:

```
# Count car brand popularity
brand_count = df['Car Brand'].value_counts().reset_index()
brand_count.columns = ['Car Brand', 'Number of Purchases']

# Create interactive bar chart
fig = px.bar(
    brand_count,
    x='Car Brand',
    y='Number of Purchases',
    title='Interactive: Most Popular Car Brands in Germany',
    text='Number of Purchases',
    color='Number of Purchases'
)

# Save the interactive chart
fig.write_image("Top Popular Car Brands.png", width=1000, height=600, scale=2)

# Show chart
fig.show()
```

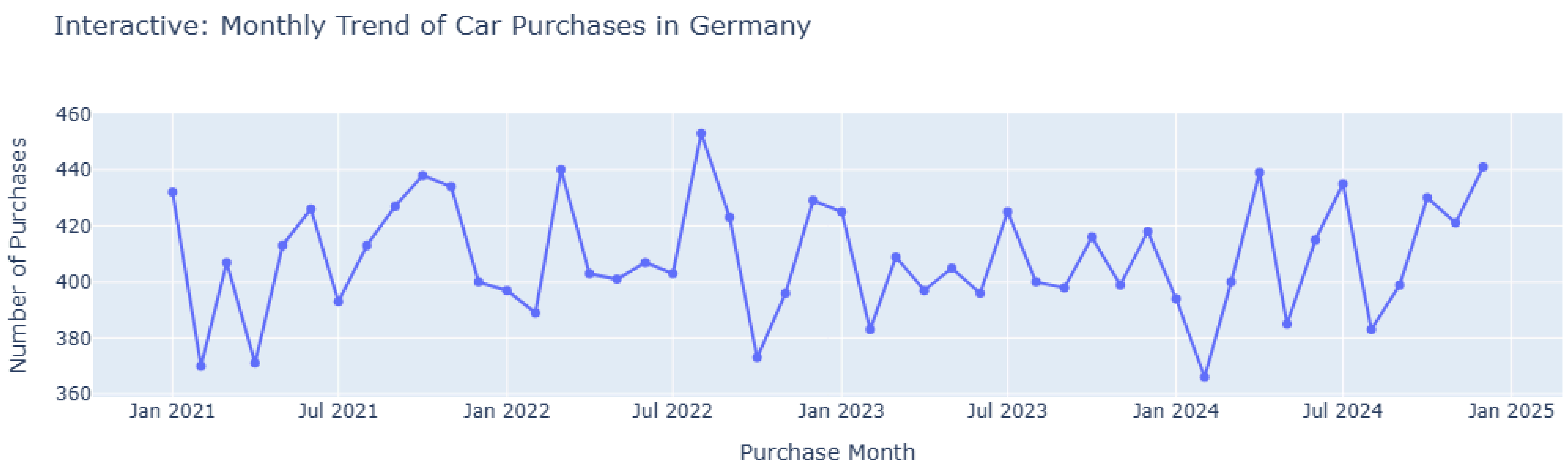


Interactive: Most Popular Car Brands in Germany

Q3. What is the trend of car purchases over time?

In [13]:

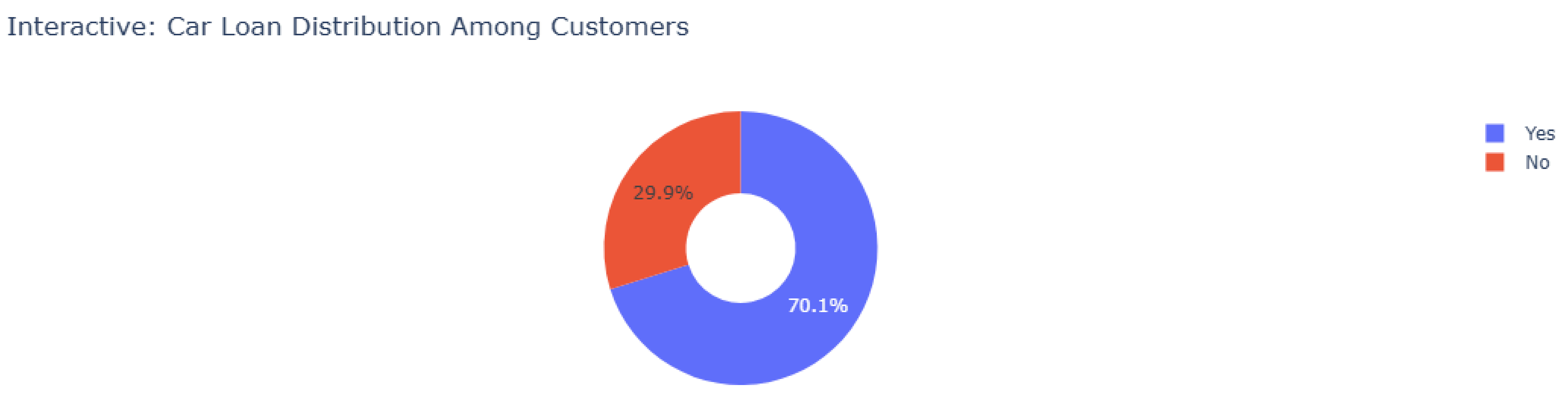
```python
# Convert 'Purchase Date' to datetime
df['Purchase Date'] = pd.to_datetime(df['Purchase Date'], errors='coerce')

# Create a new column with just the month
df['Purchase Month'] = df['Purchase Date'].dt.to_period('M').astype(str)

# Group by month and count
monthly_counts = df['Purchase Month'].value_counts().reset_index()
monthly_counts.columns = ['Purchase Month', 'Number of Purchases']
monthly_counts = monthly_counts.sort_values(by='Purchase Month')

# Plot with Plotly
fig = px.line(
    monthly_counts,
    x='Purchase Month',
    y='Number of Purchases',
    title='Interactive: Monthly Trend of Car Purchases in Germany',
    markers=True
)

# Save outputs
fig.write_image("Monthly Car Purchase Trend.png", width=1000, height=600, scale=2)

# Show plot
fig.show()
```



Q4. Loan Analysis: How many people took a car loan?

In [21]:

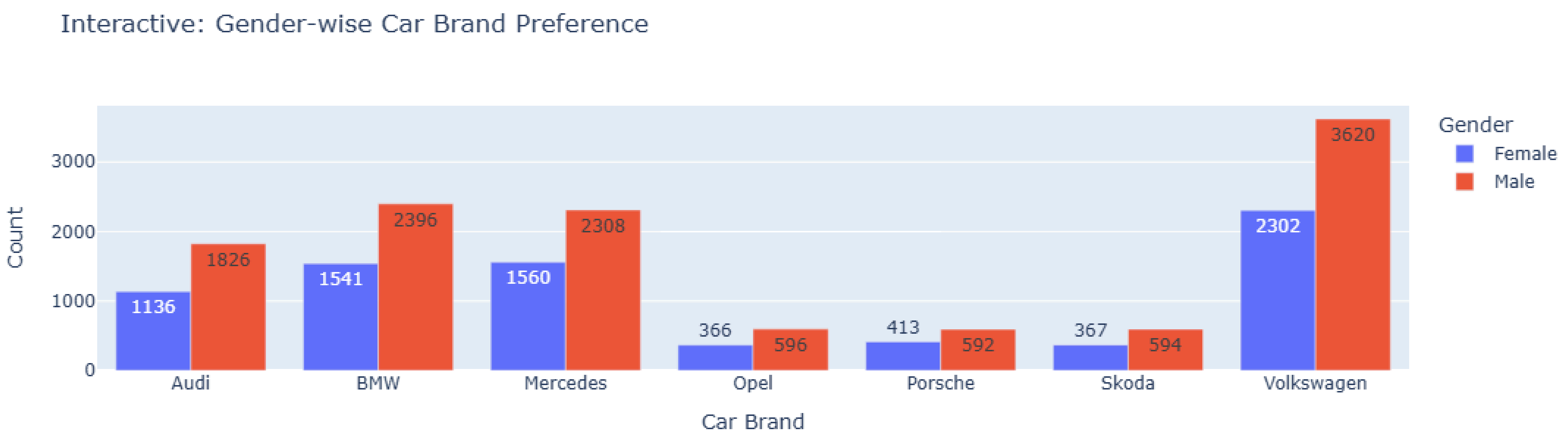
```
# Count loan status
loan_counts = df['Loan Taken'].value_counts().reset_index()
loan_counts.columns = ['Loan Taken', 'Number of Customers']

# Create interactive pie chart
fig = px.pie(
    loan_counts,
    names='Loan Taken',
    values='Number of Customers',
    title='Interactive: Car Loan Distribution Among Customers',
    hole=0.4  # donut-style
)

# Save the chart
fig.write_image("Loan Taken Pie Chart.png", width=800, height=600, scale=2)

# Show chart
fig.show()
```



Q5. Gender-wise car brand preference:

In [47]:

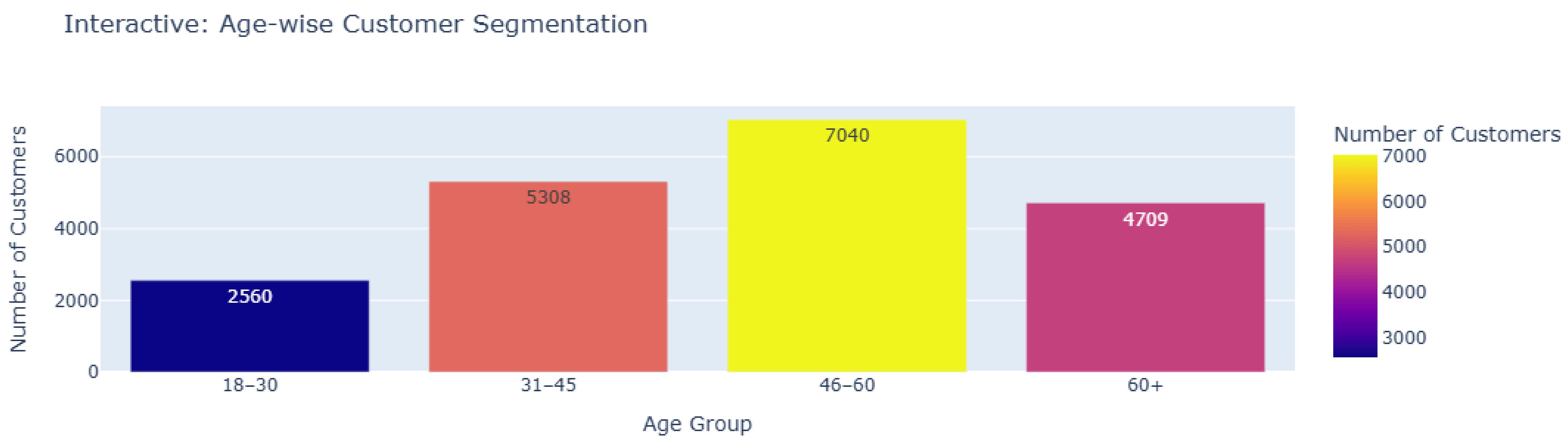
```
# Group by Car Brand and Gender
gender_brand = df.groupby(['Car Brand', 'Gender']).size().reset_index(name='Count')

# Create an interactive grouped bar chart using Plotly
fig = px.bar(
    gender_brand,
    x='Car Brand',
    y='Count',
    color='Gender',
    barmode='group',
    title='Interactive: Gender-wise Car Brand Preference',
    text='Count'                         # Show count values on bars
)

# Save as high-res PNG
fig.write_image("Gender-Wise Car Brand Preference.png", width=1000, height=600, scale=2)

# Display the Visual
fig.show()
```



Q6. Age-wise customer segmentation:

In [55]:

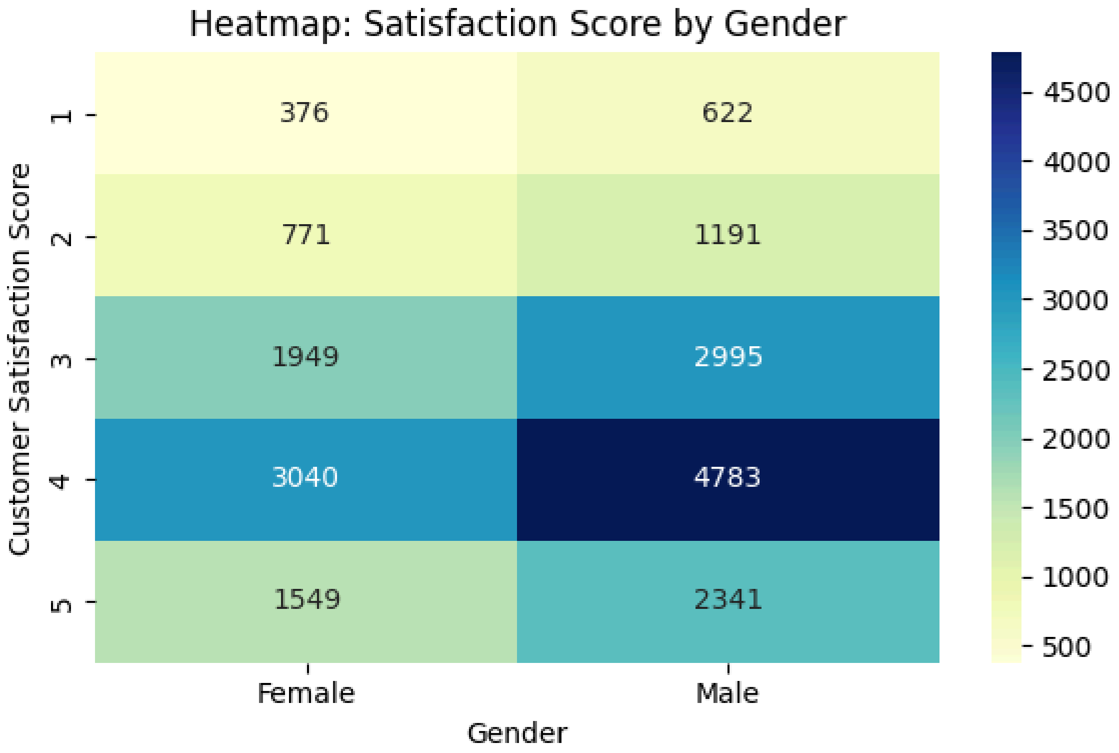
```
# Define bins and labels for age segmentation
bins = [17, 30, 45, 60, df['Age'].max()]  # use 17 to include 18 and use max age dynamically
labels = ['18-30', '31-45', '46-60', '60+']

# Create a new column 'Age Group' based on bins
df['Age Group'] = pd.cut(df['Age'], bins=bins, labels=labels, include_lowest=True)

# Count customers in each age group
age_group_counts = df['Age Group'].value_counts().sort_index().reset_index()
age_group_counts.columns = ['Age Group', 'Number of Customers']

fig = px.bar(
    age_group_counts,
    x='Age Group',
    y='Number of Customers',
    title='Interactive: Age-wise Customer Segmentation',
    text='Number of Customers',
    color='Number of Customers'
)

# Save the Visual
fig.write_image("Age-wise Customer Segmentation.png", width=900, height=600, scale=2)

# Show the Visual
fig.show()
```



Q7. Customer satisfaction distribution:

In [61]:

```python
# Pivot the data: Satisfaction vs Gender
heat_data = df.pivot_table(
    index='Customer Satisfaction Score',
    columns='Gender',
    aggfunc='size',
    fill_value=0
)

plt.figure(figsize=(6, 4))
sns.heatmap(heat_data, annot=True, cmap='YlGnBu', fmt='d')

plt.title("Heatmap: Satisfaction Score by Gender")
plt.tight_layout()

#Save the visual
plt.savefig("Heatmap Satisfaction By Gender.png", dpi=300)

# Show the visual
plt.show()
```


Heatmap: Satisfaction Score by Gender
Customer Satisfaction Score
1
2
3
4
5
376
622
771
1191
1949
2995
3040
4783
1549
2341
Female
Male
Gender
4500
4000
3500
3000
2500
2000
1500
1000
500

In [ ]: