Pizza_sales_Analysis

September 24, 2025

1 Pizza_Sales_Analysis_Project

1.1 Overview:

- This project analyzes transactional sales data from a pizza store to uncover key insights and business trends.
- The dataset includes details such as order ID, pizza name, category, size, quantity, price, and timestamps.

1.2 Objectives:

- Calculate total revenue, total pizzas sold, and total number of orders
- Analyze sales by pizza category and size
- Identify daily, hourly, and monthly sales trends
- Highlight best-selling and least-selling pizzas
- Measure customer behavior using Average Order Value (AOV) and Average Pizzas per Order
- Provide visualizations for better decision-making

2 *Import Libraries*

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

3 *Importing Dataset*

[4]:
```
df = pd.read_csv('c:/Users/hp/Downloads/pizza_sales (1).csv')
df.head()
```

[4]:

	pizza_id	order_id	pizza_name_id	quantity	order_date	order_time
0	1	1	hawaiian_m	1	01-01-2015	11:38:36
1	2	2	classic_dlx_m	1	01-01-2015	11:57:40
2	3	2	five_cheese_l	1	01-01-2015	11:57:40
3	4	2	ital_supr_l	1	01-01-2015	11:57:40
4	5	2	mexicana_m	1	01-01-2015	11:57:40

```
   unit_price  total_price pizza_size pizza_category  \
0       13.25        13.25          M        Classic
1       16.00        16.00          M        Classic
2       18.50        18.50          L         Veggie
3       20.75        20.75          L        Supreme
4       16.00        16.00          M         Veggie

                                  pizza_ingredients  \
0          Sliced Ham, Pineapple, Mozzarella Cheese
1  Pepperoni, Mushrooms, Red Onions, Red Peppers,…
2  Mozzarella Cheese, Provolone Cheese, Smoked Go…
3  Calabrese Salami, Capocollo, Tomatoes, Red Oni…
4  Tomatoes, Red Peppers, Jalapeno Peppers, Red O…

                 pizza_name
0         The Hawaiian Pizza
1   The Classic Deluxe Pizza
2      The Five Cheese Pizza
3  The Italian Supreme Pizza
4         The Mexicana Pizza
```

[5]:
```
df.tail()
```

[5]:
```
       pizza_id  order_id  pizza_name_id  quantity  order_date order_time  \
48615     48616     21348  ckn_alfredo_m         1  31-12-2015   21:23:10
48616     48617     21348  four_cheese_l         1  31-12-2015   21:23:10
48617     48618     21348   napolitana_s         1  31-12-2015   21:23:10
48618     48619     21349     mexicana_l         1  31-12-2015   22:09:54
48619     48620     21350      bbq_ckn_s         1  31-12-2015   23:02:05

       unit_price  total_price pizza_size pizza_category  \
48615       16.75        16.75          M        Chicken
48616       17.95        17.95          L         Veggie
48617       12.00        12.00          S        Classic
48618       20.25        20.25          L         Veggie
48619       12.75        12.75          S        Chicken

                                    pizza_ingredients  \
48615  Chicken, Red Onions, Red Peppers, Mushrooms, A…
48616  Ricotta Cheese, Gorgonzola Piccante Cheese, Mo…
48617  Tomatoes, Anchovies, Green Olives, Red Onions,…
48618  Tomatoes, Red Peppers, Jalapeno Peppers, Red O…
48619  Barbecued Chicken, Red Peppers, Green Peppers,…

                      pizza_name
48615   The Chicken Alfredo Pizza
48616       The Four Cheese Pizza
```

```
48617        The Napolitana Pizza
48618          The Mexicana Pizza
48619  The Barbecue Chicken Pizza
```

4 *Understand_The_Data*

[6]:
```
print(df.columns)
```

```
Index(['pizza_id', 'order_id', 'pizza_name_id', 'quantity', 'order_date',
       'order_time', 'unit_price', 'total_price', 'pizza_size',
       'pizza_category', 'pizza_ingredients', 'pizza_name'],
      dtype='object')
```

[7]:
```
df.shape
```

[7]: (48620, 12)

[8]:
```
# for rows
print("The Rows of  The Dataset: ",df.shape[0])
```

```
The Rows of  The Dataset:  48620
```

[9]:
```
print("The columns of The Dataset: ",df.shape[1])
```

```
The columns of The Dataset:  12
```

[10]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48620 entries, 0 to 48619
Data columns (total 12 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   pizza_id           48620 non-null  int64
 1   order_id           48620 non-null  int64
 2   pizza_name_id      48620 non-null  object
 3   quantity           48620 non-null  int64
 4   order_date         48620 non-null  object
 5   order_time         48620 non-null  object
 6   unit_price         48620 non-null  float64
 7   total_price        48620 non-null  float64
 8   pizza_size         48620 non-null  object
 9   pizza_category     48620 non-null  object
 10  pizza_ingredients  48620 non-null  object
 11  pizza_name         48620 non-null  object
dtypes: float64(2), int64(3), object(7)
memory usage: 4.5+ MB
```

[11]:
```
df.info
```

[11]:
```
<bound method DataFrame.info of        pizza_id  order_id  pizza_name_id
quantity  order_date order_time  \
0             1         1     hawaiian_m         1  01-01-2015   11:38:36
1             2         2  classic_dlx_m         1  01-01-2015   11:57:40
2             3         2  five_cheese_l         1  01-01-2015   11:57:40
3             4         2    ital_supr_l         1  01-01-2015   11:57:40
4             5         2     mexicana_m         1  01-01-2015   11:57:40
…           …       …             …       …         …          …
48615     48616     21348  ckn_alfredo_m         1  31-12-2015   21:23:10
48616     48617     21348  four_cheese_l         1  31-12-2015   21:23:10
48617     48618     21348   napolitana_s         1  31-12-2015   21:23:10
48618     48619     21349     mexicana_l         1  31-12-2015   22:09:54
48619     48620     21350      bbq_ckn_s         1  31-12-2015   23:02:05

       unit_price  total_price pizza_size pizza_category  \
0           13.25        13.25          M        Classic
1           16.00        16.00          M        Classic
2           18.50        18.50          L         Veggie
3           20.75        20.75          L        Supreme
4           16.00        16.00          M         Veggie
…           …          …        …             …
48615       16.75        16.75          M        Chicken
48616       17.95        17.95          L         Veggie
48617       12.00        12.00          S        Classic
48618       20.25        20.25          L         Veggie
48619       12.75        12.75          S        Chicken

                                    pizza_ingredients  \
0                Sliced Ham, Pineapple, Mozzarella Cheese
1      Pepperoni, Mushrooms, Red Onions, Red Peppers,…
2      Mozzarella Cheese, Provolone Cheese, Smoked Go…
3      Calabrese Salami, Capocollo, Tomatoes, Red Oni…
4      Tomatoes, Red Peppers, Jalapeno Peppers, Red O…
…                                                    …
48615  Chicken, Red Onions, Red Peppers, Mushrooms, A…
48616  Ricotta Cheese, Gorgonzola Piccante Cheese, Mo…
48617  Tomatoes, Anchovies, Green Olives, Red Onions,…
48618  Tomatoes, Red Peppers, Jalapeno Peppers, Red O…
48619  Barbecued Chicken, Red Peppers, Green Peppers,…

                      pizza_name
0              The Hawaiian Pizza
1        The Classic Deluxe Pizza
2           The Five Cheese Pizza
3       The Italian Supreme Pizza
```

```
4              The Mexicana Pizza
…                             …
48615   The Chicken Alfredo Pizza
48616       The Four Cheese Pizza
48617        The Napolitana Pizza
48618          The Mexicana Pizza
48619  The Barbecue Chicken Pizza

[48620 rows x 12 columns]>
```

5 *Data_Types*

[12]:
```
# Data_Types
df.dtypes
```

[12]:
```
pizza_id              int64
order_id              int64
pizza_name_id        object
quantity              int64
order_date           object
order_time           object
unit_price          float64
total_price         float64
pizza_size           object
pizza_category       object
pizza_ingredients    object
pizza_name           object
dtype: object
```

[13]:
```
df.describe()
```

[13]:

	pizza_id	order_id	quantity	unit_price	total_price
count	48620.000000	48620.000000	48620.000000	48620.000000	48620.000000
mean	24310.500000	10701.479761	1.019622	16.494132	16.821474
std	14035.529381	6180.119770	0.143077	3.621789	4.437398
min	1.000000	1.000000	1.000000	9.750000	9.750000
25%	12155.750000	5337.000000	1.000000	12.750000	12.750000
50%	24310.500000	10682.500000	1.000000	16.500000	16.500000
75%	36465.250000	16100.000000	1.000000	20.250000	20.500000
max	48620.000000	21350.000000	4.000000	35.950000	83.000000

6 *Check_Missing_Values*

[14]:
```
df.isnull().sum()
```

[14]:
```
pizza_id             0
order_id             0
pizza_name_id        0
quantity             0
order_date           0
order_time           0
unit_price           0
total_price          0
pizza_size           0
pizza_category       0
pizza_ingredients    0
pizza_name           0
dtype: int64
```

[15]:
```
df.isnull().sum().sum()
```

[15]:
```
np.int64(0)
```

7 *Check_Duplicated_Values*

[16]:
```
df.duplicated().sum()
```

[16]:
```
np.int64(0)
```

8 *Key_Performance_Indicators*

- Total Revenue
- Total Pizzas Sold
- Total Orders
- Average Order Value (AOV)
- Average Pizza per Order

[17]:
```
Total_revenue = df['total_price'].sum()
Total_Pizzas_Sold = df['quantity'].sum()
Total_Orders = df['order_id'].nunique()
Average_Order_Value = Total_revenue / Total_Orders
Average_Pizza_per_Order  = Total_Pizzas_Sold / Total_Orders
```

[18]:
```
print(f"Total Revenue :              ${Total_revenue:,.2f}")
print(f"Total Pizzas Sold :           {Total_Pizzas_Sold:,}")
print(f"Total Orders :                {Total_Orders:,.2f}")
print(f"Average Order Value  :       ${Average_Order_Value:,.2f}")
```

```
print(f"Average Pizza per Order:     {Average_Pizza_per_Order:,.2f}")
```

```
Total Revenue :              $817,860.05
Total Pizzas Sold :           49,574
Total Orders :                21,350.00
Average Order Value  :       $38.31
Average Pizza per Order:      2.32
```

9 *Data_Visualization*

- Ingredient Analysis

[37]:
```
ingredients = (
    df['pizza_ingredients']
    .str.split(',')
    .explode().str.strip()
    .value_counts()
    .reset_index()
    .rename(columns={'index': 'count', 'pizza_ingredients': 'ingredients'})
)
```

[38]:
```
print(ingredients)
```

```
           ingredients  count
0               Garlic  27422
1             Tomatoes  26601
2           Red Onions  19547
3         Red Peppers   16284
4    Mozzarella Cheese  10333
..                  …    …
60   Brie Carre Cheese    480
61          Prosciutto    480
62  Caramelized Onions    480
63               Pears    480
64               Thyme    480

[65 rows x 2 columns]
```

[36]:
```
ingredients.head(10)
```

[36]:
```
          ingredients  count
0              Garlic  27422
1            Tomatoes  26601
2          Red Onions  19547
3        Red Peppers   16284
4  Mozzarella Cheese   10333
5           Pepperoni  10300
```

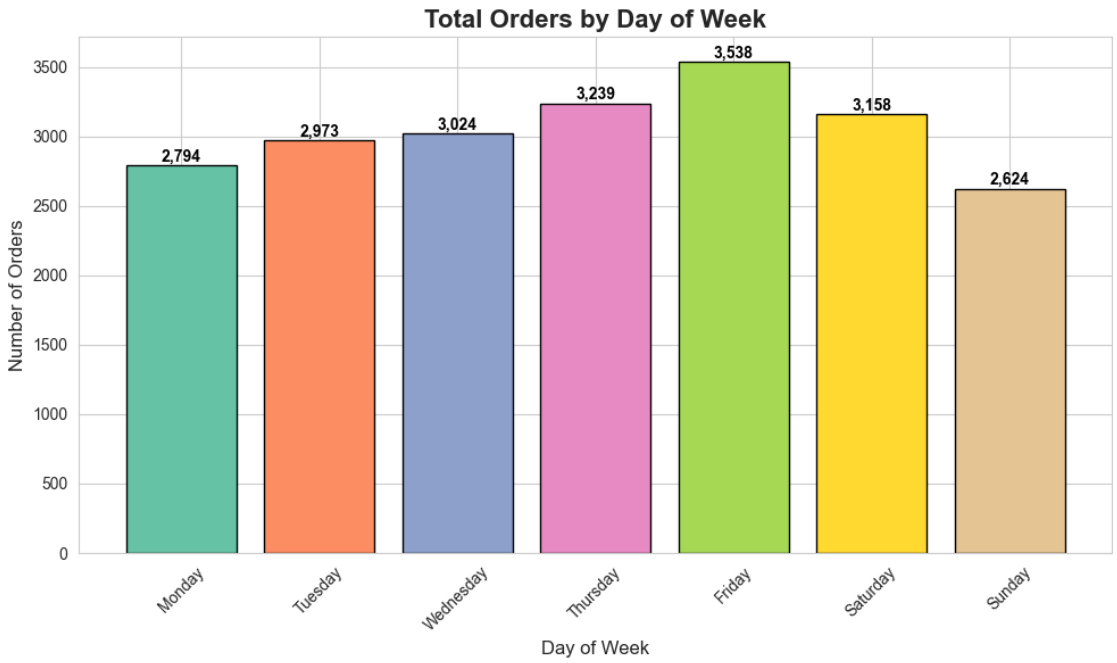
```
6            Spinach  10012
7          Mushrooms   9624
8            Chicken   8443
9          Capocollo   6572
```

10 *Trends*

- Daily_Trend -> Total Orders

[41]:
```
df['order_date'] = pd.to_datetime(df['order_date'], dayfirst=True)
df['day_name'] = df['order_date'].dt.day_name()

weekday_order = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday",␣
 ↪"Saturday", "Sunday"]
df['day_name'] = pd.Categorical(df['day_name'], categories=weekday_order,␣
 ↪ordered=True)

orders_by_day = df.groupby('day_name', observed=False)['order_id'].nunique()
orders_by_day = orders_by_day.sort_index()
```

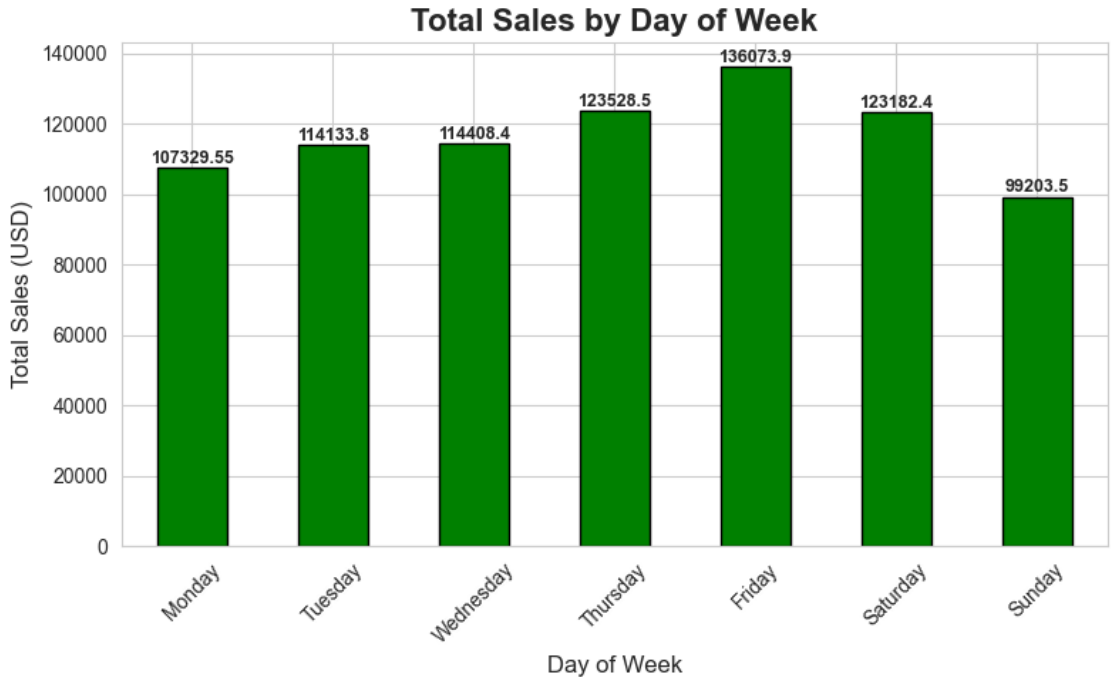
[42]:
```
sns.set_style("whitegrid")
palette = sns.color_palette("Set2")

# Create plot
fig, ax = plt.subplots(figsize=(10, 6))
bars = ax.bar(orders_by_day.index, orders_by_day.values, color=palette,␣
 ↪edgecolor='black')

plt.title("Total Orders by Day of Week", fontsize=16, fontweight='bold')
plt.xlabel("Day of Week", fontsize=12)
plt.ylabel("Number of Orders", fontsize=12)
plt.xticks(rotation=45, fontsize=10)
plt.yticks(fontsize=10)

for bar in bars:
    height = bar.get_height()
    ax.text(bar.get_x() + bar.get_width()/2, height + 5, f'{height:,}',
            ha='center', va='bottom', fontsize=10, fontweight='bold',␣
 ↪color='black')

plt.tight_layout()
plt.show()
```



- Daily_Trend -> Total Revenue

[55]:
```
df['order_date'] = pd.to_datetime(df['order_date'], dayfirst=True)

df['day_name'] = df['order_date'].dt.day_name()

weekday_order = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday",␣
 ↪"Saturday", "Sunday"]

df['day_name'] = pd.Categorical(df['day_name'], categories=weekday_order,␣
 ↪ordered=True)

orders_by_day = df.groupby('day_name', observed=False)['total_price'].sum()

ax = orders_by_day.plot(kind='bar', figsize=(8,5), color="green",␣
 ↪edgecolor='black')

plt.title("Total Sales by Day of Week", fontsize=16, fontweight='bold')
plt.xlabel("Day of Week", fontsize=12)
plt.ylabel("Total Sales (USD)", fontsize=12)
plt.xticks(rotation=45, fontsize=10)
plt.yticks(fontsize=10)

for i, val in enumerate(orders_by_day):
```

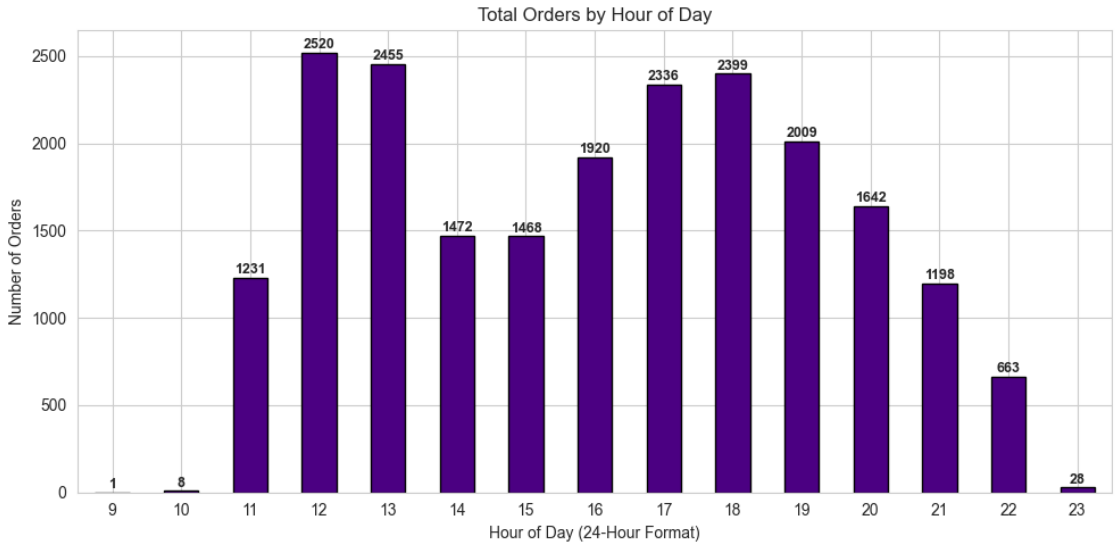
```
    plt.text(i, val + 20, str(val), ha='center', va='bottom', fontsize=9,␣
 ↪fontweight='bold')

plt.tight_layout()
plt.show()
```



11 *Hourely_Trend*

[60]:
```
df['order_time'] = pd.to_datetime(df['order_time'], format='%H:%M:%S')

df['order_hour'] = df['order_time'].dt.hour

orders_by_hour = df.groupby('order_hour', observed=False)['order_id'].nunique()

ax = orders_by_hour.plot(kind='bar', figsize=(10,5), color='Indigo',␣
 ↪edgecolor='black')

plt.title("Total Orders by Hour of Day")
plt.xlabel("Hour of Day (24-Hour Format)")
plt.ylabel("Number of Orders")
plt.xticks(rotation=0)

for i, val in enumerate(orders_by_hour):
```

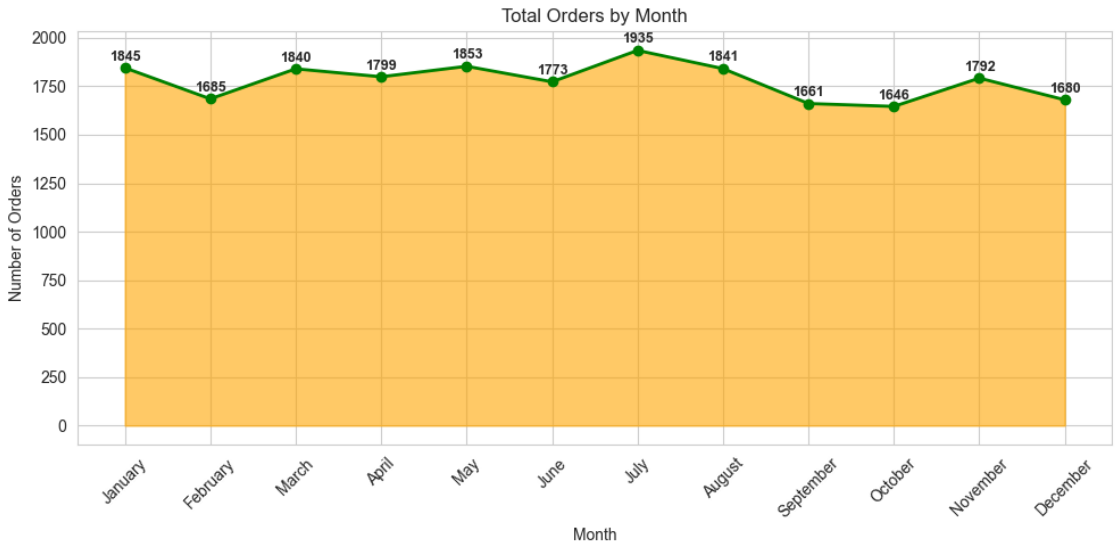
```
    plt.text(i, val + 5, str(val), ha='center', va='bottom', fontsize=9,␣
 ↪fontweight='bold')

plt.tight_layout()
plt.show()
```



12 *Monthly_Trend*

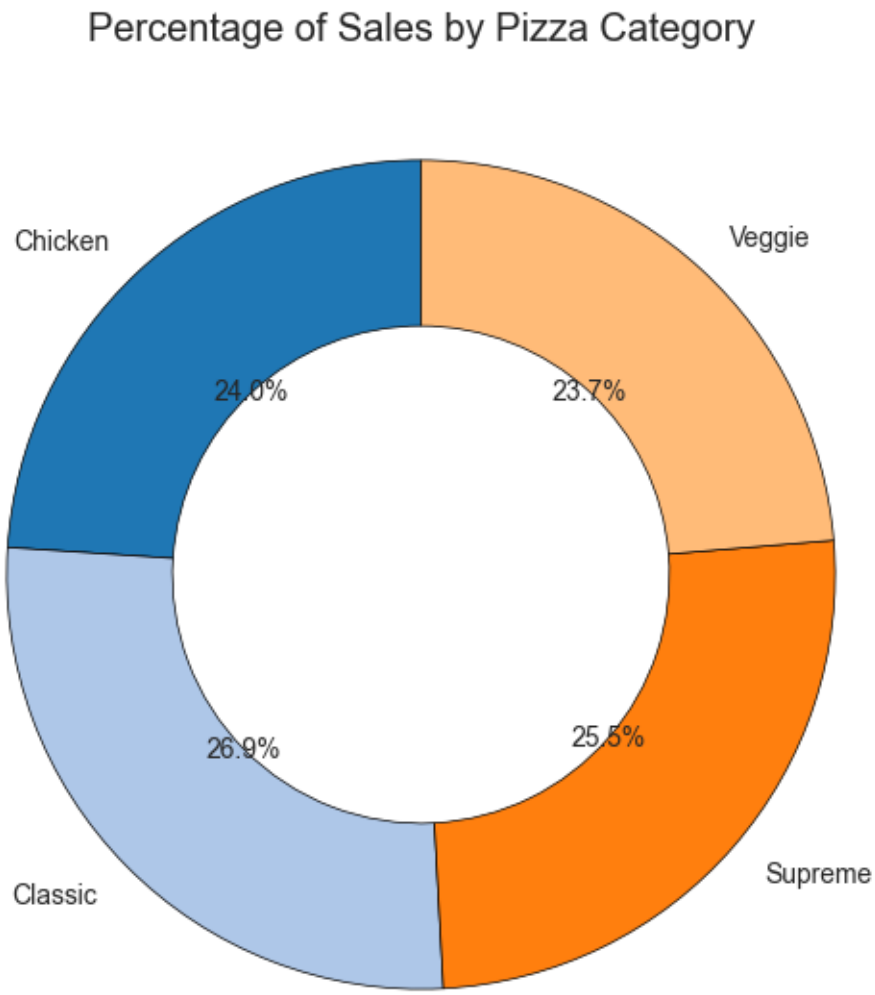
[70]:
```
df['order_date'] = pd.to_datetime(df['order_date'], dayfirst=True)

df['month_name'] = df['order_date'].dt.month_name()

month_order = ["January", "February", "March", "April", "May", "June",
               "July", "August", "September", "October", "November", "December"]

df['month_name'] = pd.Categorical(df['month_name'], categories=month_order,␣
 ↪ordered=True)

orders_by_month = df.groupby('month_name', observed=False)['order_id'].nunique()

plt.figure(figsize=(10,5))
plt.fill_between(orders_by_month.index, orders_by_month.values, color="orange",␣
 ↪alpha=0.6)
plt.plot(orders_by_month.index, orders_by_month.values, color="green",␣
 ↪linewidth=2, marker='o')

plt.title("Total Orders by Month")
```

```
plt.xlabel("Month")
plt.ylabel("Number of Orders")
plt.xticks(rotation=45)

for i, val in enumerate(orders_by_month):
    plt.text(i, val + 20, str(val), ha='center', va='bottom', fontsize=9,␣
 ↪fontweight='bold')

plt.tight_layout()
plt.show()
```



13 Sales_Category_Percentage

[79]:
```
category_sales = df.groupby('pizza_category')['total_price'].sum()

category_pct = category_sales / category_sales.sum() * 100

plt.figure(figsize=(7, 7))
colors = plt.get_cmap('tab20').colors
plt.pie(category_pct, labels=category_pct.index, autopct='%1.1f%%',␣
 ↪startangle=90,
        colors=colors, wedgeprops={'edgecolor':'black', 'width':0.4})

plt.title("Percentage of Sales by Pizza Category")
plt.show()
```

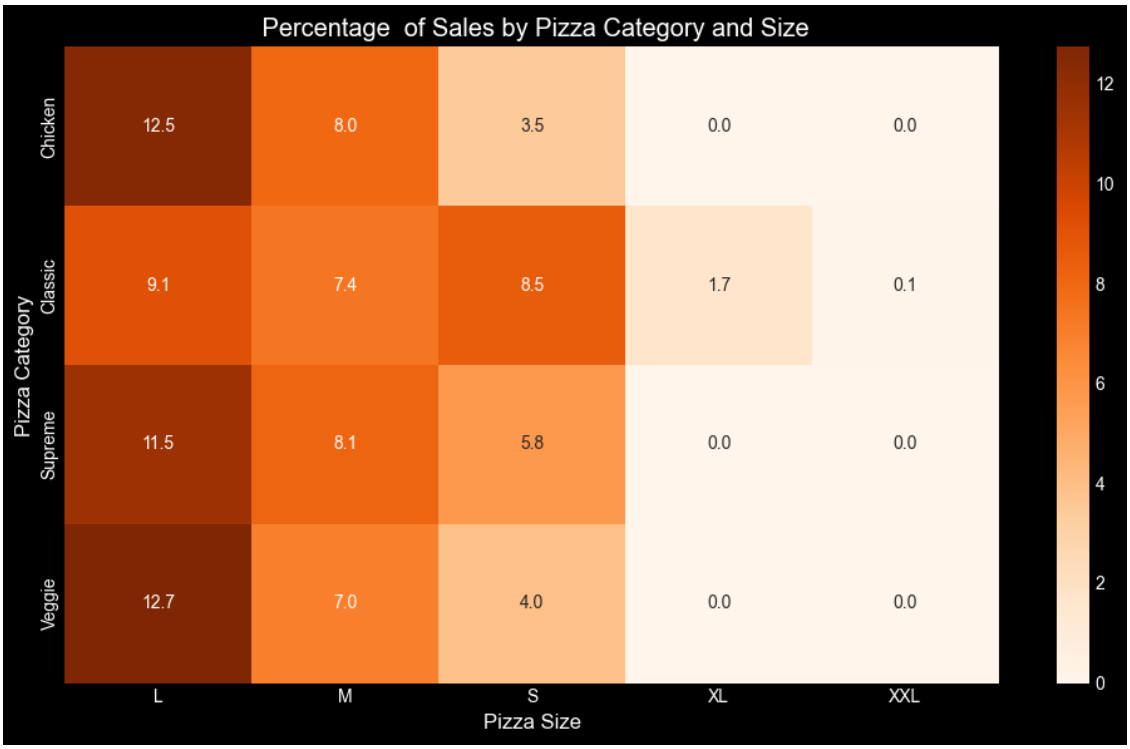


14 *Heatmap*

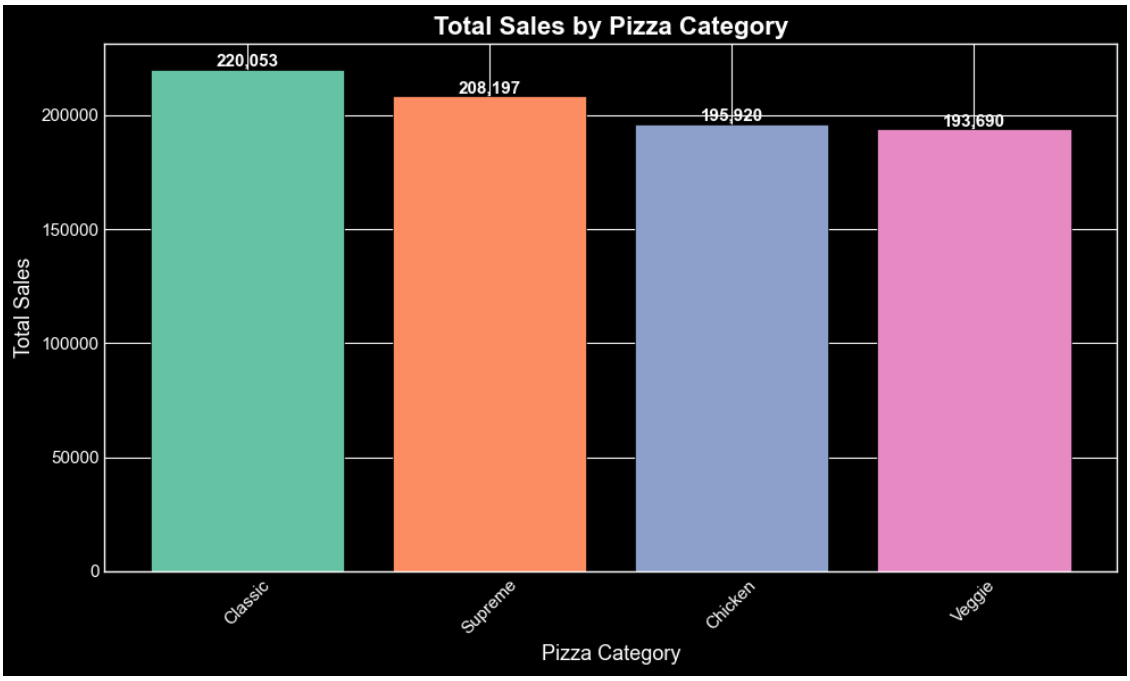
[82]:
```
print(plt.style.available)
```

```
['Solarize_Light2', '_classic_test_patch', '_mpl-gallery', '_mpl-gallery-
nogrid', 'bmh', 'classic', 'dark_background', 'fast', 'fivethirtyeight',
'ggplot', 'grayscale', 'seaborn-v0_8', 'seaborn-v0_8-bright',
'seaborn-v0_8-colorblind', 'seaborn-v0_8-dark', 'seaborn-v0_8-dark-palette',
'seaborn-v0_8-darkgrid', 'seaborn-v0_8-deep', 'seaborn-v0_8-muted',
'seaborn-v0_8-notebook', 'seaborn-v0_8-paper', 'seaborn-v0_8-pastel',
'seaborn-v0_8-poster', 'seaborn-v0_8-talk', 'seaborn-v0_8-ticks',
'seaborn-v0_8-white', 'seaborn-v0_8-whitegrid', 'tableau-colorblind10']
```

[ ]:
```
sales_pivot = df.pivot_table(
    index='pizza_category',
    columns='pizza_size',
    values='total_price',
    aggfunc='sum',
    fill_value=0
)

sales_pct = sales_pivot / sales_pivot.sum().sum() * 100

plt.figure(figsize=(10, 6))
sns.heatmap(
    sales_pct,
    annot=True,
    fmt=".1f",
    cmap="Oranges",
    linecolor="white"
)

plt.title(" Percentage  of Sales by Pizza Category and Size")
plt.xlabel("Pizza Size")
plt.ylabel("Pizza Category")
plt.tight_layout()
plt.show()
```

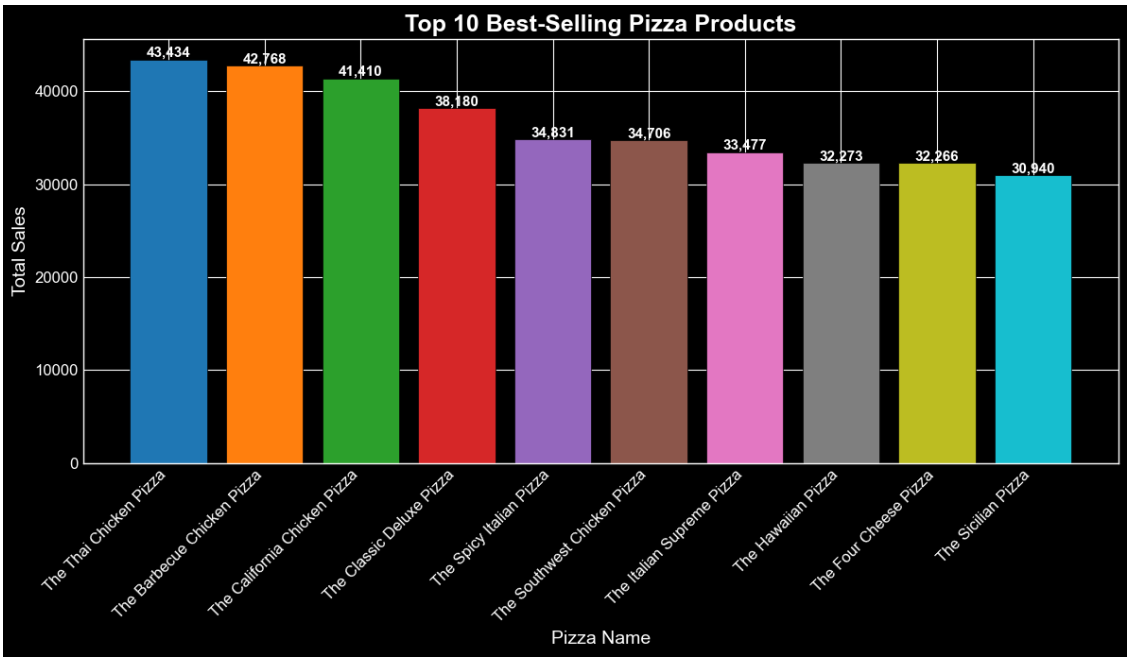


[96]:
```
import matplotlib.pyplot as plt

# Group total sales by pizza category
category_sales = df.groupby('pizza_category')['total_price'].sum().
 ↪sort_values(ascending=False)

# Create a color palette with unique colors
colors = plt.cm.Set2(range(len(category_sales)))

# Plot bar chart
plt.figure(figsize=(10, 6))
bars = plt.bar(category_sales.index, category_sales.values, color=colors,␣
 ↪edgecolor='black')

# Add value labels on top of each bar
for bar in bars:
    height = bar.get_height()
    plt.text(bar.get_x() + bar.get_width()/2, height + 1, f'{height:,.0f}',
             ha='center', va='bottom', fontsize=11, fontweight='bold')

# Styling
plt.title("Total Sales by Pizza Category", fontsize=16, fontweight='bold')
plt.xlabel("Pizza Category", fontsize=13)
plt.ylabel("Total Sales", fontsize=13)
plt.xticks(rotation=45, fontsize=11)
plt.yticks(fontsize=11)
plt.tight_layout()
plt.show()
```



15 Top 10 Best-Selling Pizza Products by Total Sales

[99]:
```
top_10 = df.groupby('pizza_name')['total_price'].sum().
 ↪sort_values(ascending=False).head(10)

colors = plt.cm.tab10(range(10))

plt.figure(figsize=(12, 7))
bars = plt.bar(top_10.index, top_10.values, color=colors, edgecolor='black')

for bar in bars:
    height = bar.get_height()
    plt.text(bar.get_x() + bar.get_width() / 2, height + 1,
             f'{height:,.0f}', ha='center', va='bottom', fontsize=11,␣
 ↪fontweight='bold')

plt.title("Top 10 Best-Selling Pizza Products", fontsize=18, fontweight='bold')
plt.xlabel("Pizza Name", fontsize=14)
plt.ylabel("Total Sales", fontsize=14)
plt.xticks(rotation=45, ha='right', fontsize=12)
plt.yticks(fontsize=12)
plt.tight_layout()
plt.show()
```


Top 10 Best-Selling Pizza Products
Total Sales
0
10000
20000
30000
40000
43,434
42,768
41,410
38,180
34,831
34,706
33,477
32,273
32,266
30,940
The Thai Chicken Pizza
The Barbecue Chicken Pizza
The California Chicken Pizza
The Classic Deluxe Pizza
The Spicy Italian Pizza
The Southwest Chicken Pizza
The Italian Supreme Pizza
The Hawaiian Pizza
The Four Cheese Pizza
The Sicilian Pizza
Pizza Name

[ ]: