mod4_assigment-uc4

November 3, 2024

1 Module4: Numpy, Pandas, Matplotlib

1.1 Assignment: Use-Case IV

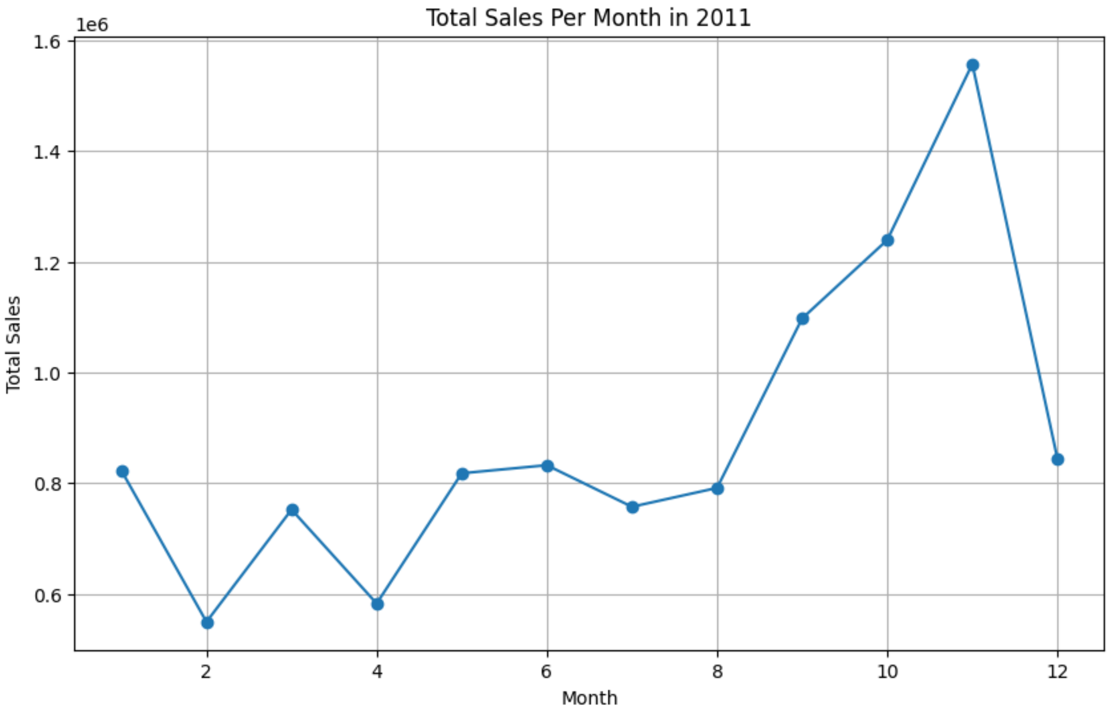
[1]:

```
#1  Load the Data
import pandas as pd
from matplotlib import pyplot as plt

# Load the data
sales_data = pd.read_csv('BigMartSalesData.csv')


# Print basic information about the data (Optional)
print("\nSales Data:\n-------------  ")
print(sales_data.info())
print(sales_data.head())

# Filter data for the year 2011
sales_data_2011 = sales_data[sales_data['Year'] == 2011]
```

```
Sales Data:
-------------
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 541874 entries, 0 to 541873
Data columns (total 12 columns):
 #   Column       Non-Null Count   Dtype
---  ------       --------------   -----
 0   InvoiceNo    541874 non-null  object
 1   StockCode    541874 non-null  object
 2   Description  540422 non-null  object
 3   Quantity     541874 non-null  int64
 4   UnitPrice    541874 non-null  float64
 5   Amount       541874 non-null  float64
 6   InvoiceDate  541874 non-null  object
 7   Day          541874 non-null  int64
 8   Month        541874 non-null  int64
 9   Year         541874 non-null  int64
 10  CustomerID   406829 non-null  float64
 11  Country      541874 non-null  object 
dtypes: float64(3), int64(4), object(5)
memory usage: 49.6+ MB
None
  InvoiceNo StockCode                          Description  Quantity  \
0    536365    85123A   WHITE HANGING HEART T-LIGHT HOLDER         6   
1    536365     71053                  WHITE METAL LANTERN         6   
2    536365    84406B       CREAM CUPID HEARTS COAT HANGER         8   
3    536365    84029G  KNITTED UNION FLAG HOT WATER BOTTLE         6   
4    536365    84029E       RED WOOLLY HOTTIE WHITE HEART.         6   

   UnitPrice  Amount InvoiceDate  Day  Month  Year  CustomerID         Country
0       2.55   15.30    01-12-10    1     12  2010     17850.0  United Kingdom
1       3.39   20.34    01-12-10    1     12  2010     17850.0  United Kingdom
2       2.75   22.00    01-12-10    1     12  2010     17850.0  United Kingdom
3       3.39   20.34    01-12-10    1     12  2010     17850.0  United Kingdom
4       3.39   20.34    01-12-10    1     12  2010     17850.0  United Kingdom
```

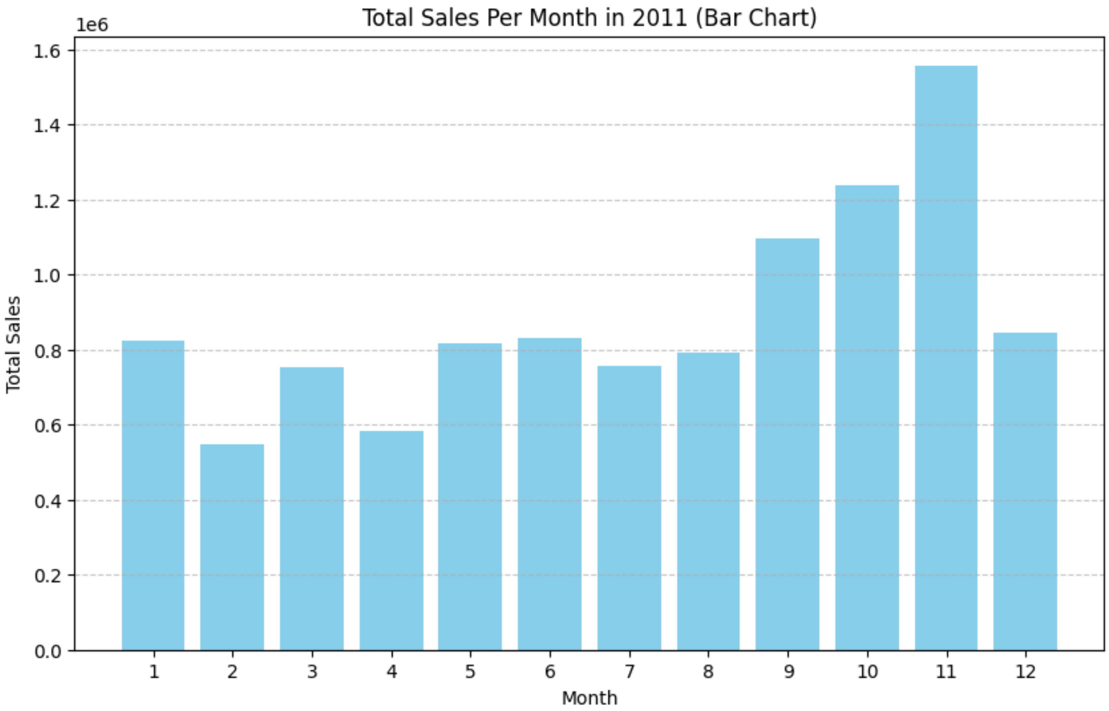
[2]:

```python
#2. Plot Total Sales Per Month for the Year 2011
monthly_sales = sales_data_2011.groupby('Month')['Amount'].sum()

plt.figure(figsize=(10, 6))
plt.plot(monthly_sales.index, monthly_sales.values, marker='o', linestyle='-')
plt.title("Total Sales Per Month in 2011")
plt.xlabel("Month")
plt.ylabel("Total Sales")
plt.grid(True)
plt.show()

# Determine the month with the lowest sales
lowest_sales_month = monthly_sales.idxmin()
lowest_sales_value = monthly_sales.min()
lowest_sales_month, lowest_sales_value
```



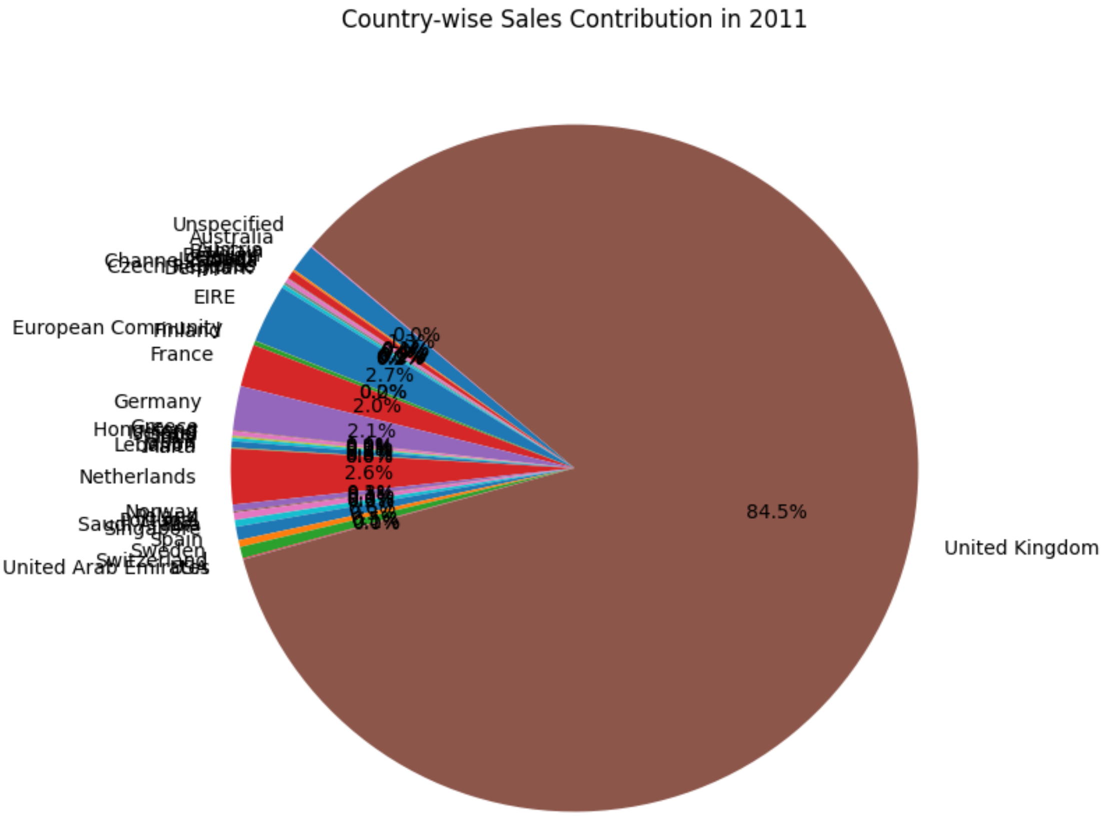
```
[2]: (np.int64(2), np.float64(549134.46))
```

```
[3]: #3. Plot Total Sales Per Month for the Year 2011 as a Bar Chart

     plt.figure(figsize=(10, 6))
     plt.bar(monthly_sales.index, monthly_sales.values, color='skyblue')
     plt.title("Total Sales Per Month in 2011 (Bar Chart)")
     plt.xlabel("Month")
     plt.ylabel("Total Sales")
     plt.xticks(monthly_sales.index)
     plt.grid(axis='y', linestyle='--', alpha=0.7)
     plt.show()
```



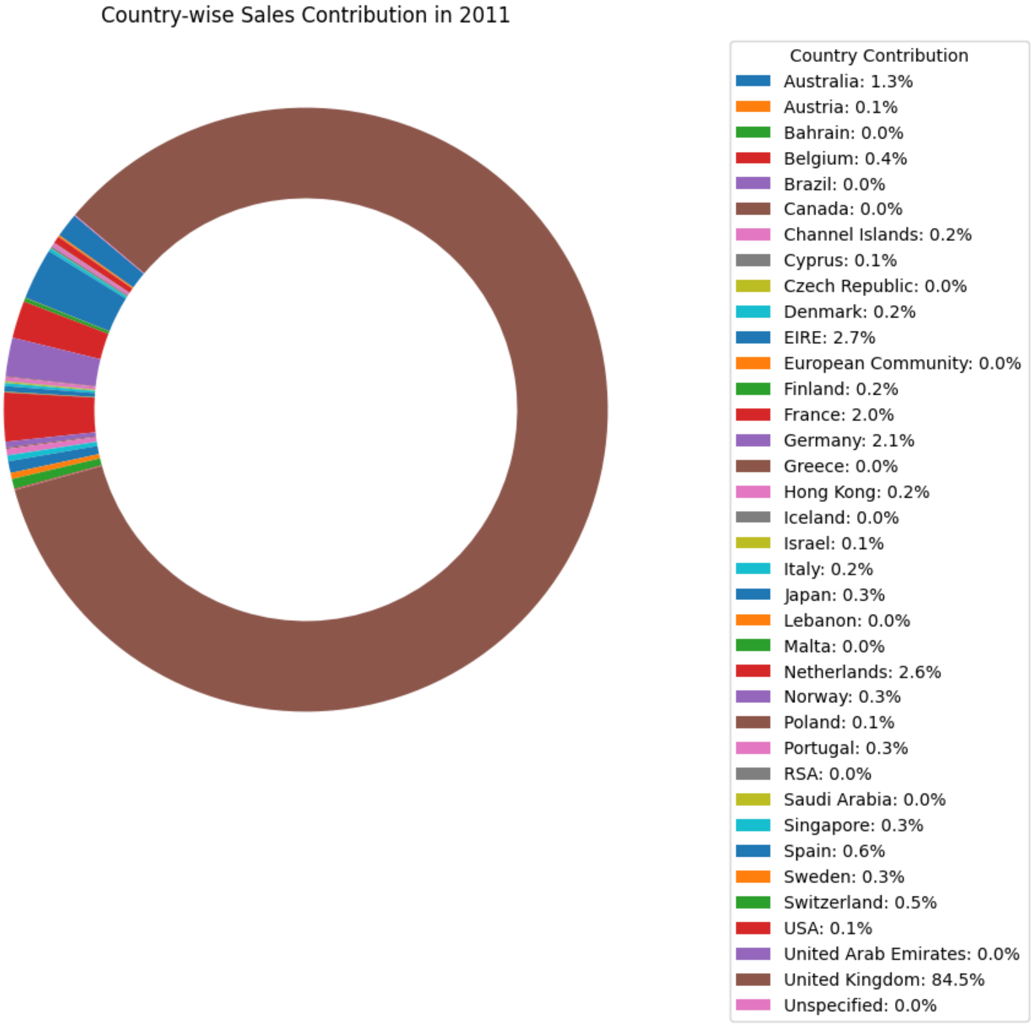
[4]:

```
#3. Plot Pie Chart for the Year 2011 Country Wise
country_sales = sales_data_2011.groupby('Country')['Amount'].sum()

plt.figure(figsize=(12, 8))
plt.pie(country_sales, labels=country_sales.index, autopct='%1.1f%%',␣
 ↪startangle=140)
plt.title("Country-wise Sales Contribution in 2011")
plt.show()

# Determine the country with the highest contribution to sales
highest_contributing_country = country_sales.idxmax()
highest_contributing_sales = country_sales.max()
highest_contributing_country, highest_contributing_sales
```

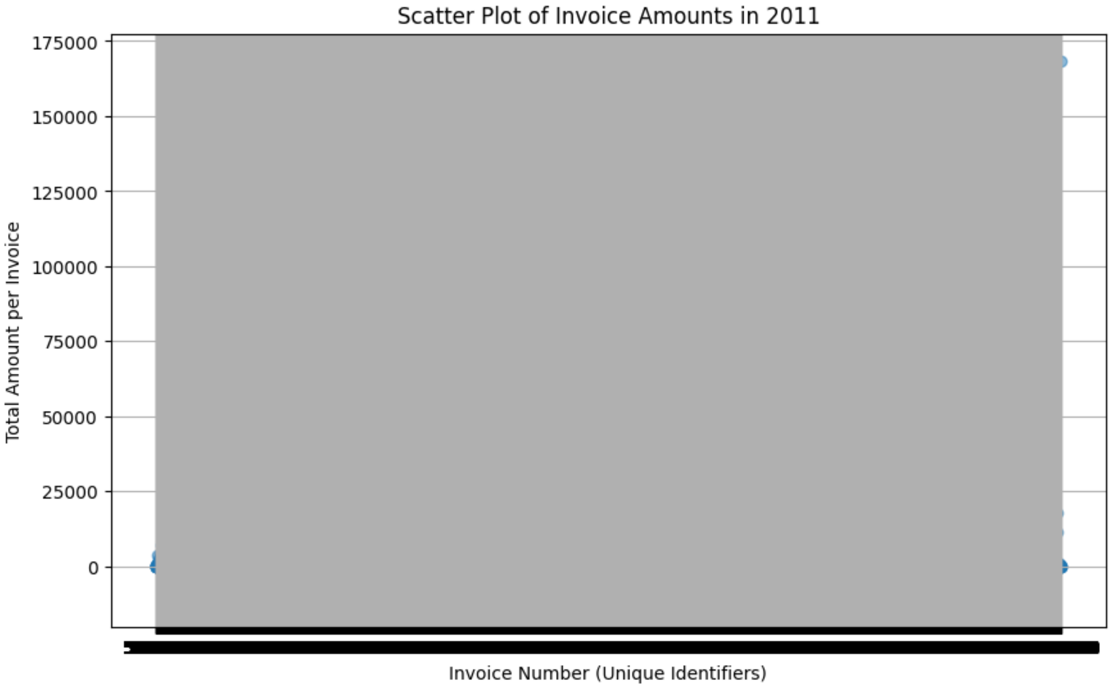


```
[4]: ('United Kingdom', np.float64(8997901.674))
```

```
[8]: # Enhanced Pie Chart with Country Names and Percentages in the Legend

     plt.figure(figsize=(12, 8))
     plt.pie(
         country_sales,
         labels=None,  # Remove direct labels from pie chart
         autopct=None,
         startangle=140,
         labeldistance=1.2,  # Adjust label distance
         wedgeprops=dict(width=0.3)  # Optional: use donut style for separation
     )

     # Create labels with both country names and percentages
     country_labels = [f"{country}: {pct:.1f}%" for country, pct in␣
      ↪zip(country_sales.index,
                                                                        100 *␣
       ↪country_sales / country_sales.sum())]

     # Add legend with combined labels
     plt.legend(country_labels, title="Country Contribution", bbox_to_anchor=(1.05,␣
       ↪1), loc="best")
     plt.title("Country-wise Sales Contribution in 2011")
     plt.show()
```



[5]:
```
#5 # 4. Scatter Plot for Invoice Amounts

# Group by InvoiceNo to calculate the total amount for each invoice
invoice_totals = sales_data_2011.groupby('InvoiceNo')['Amount'].sum()

plt.figure(figsize=(10, 6))
plt.scatter(invoice_totals.index, invoice_totals.values, alpha=0.5)
plt.title("Scatter Plot of Invoice Amounts in 2011")
plt.xlabel("Invoice Number (Unique Identifiers)")
plt.ylabel("Total Amount per Invoice")
plt.grid(True)
plt.show()

# Determine the range where most invoice amounts are concentrated
invoice_amounts_concentration = invoice_totals.describe(percentiles=[0.25, 0.5,␣
 ↪0.75])
invoice_amounts_concentration[['25%', '50%', '75%']]
```



```
[5]: 25%      44.5500
     50%     220.0600
     75%     424.2525
     Name: Amount, dtype: float64
```

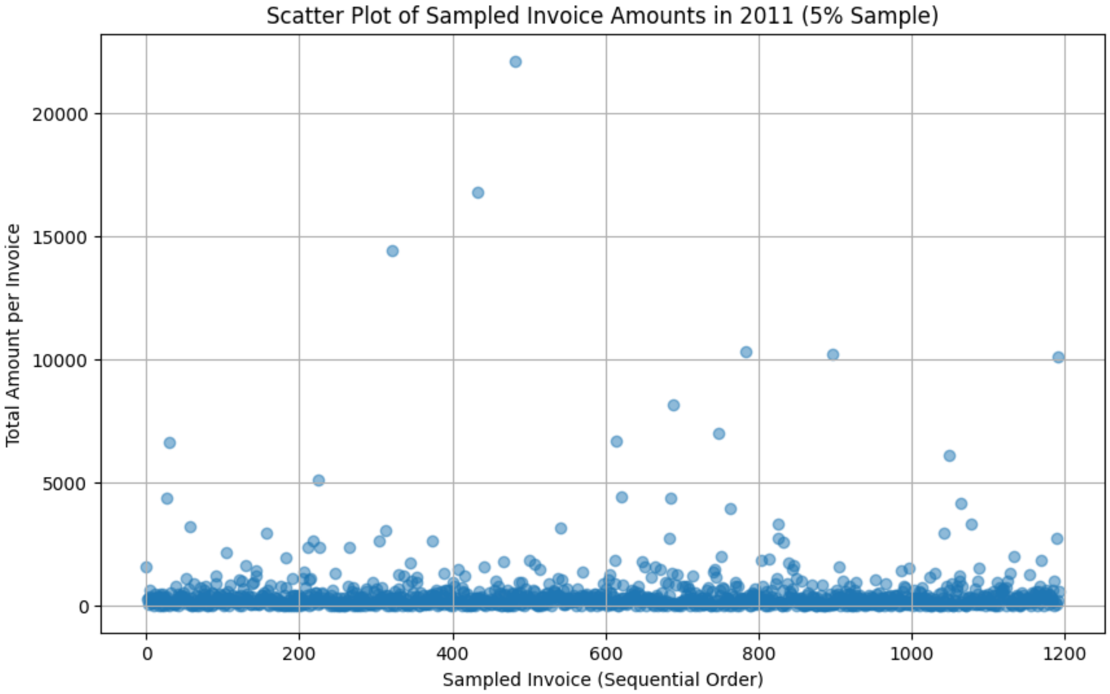
The scatter plot of invoice amounts reveals the concentration of amounts per invoice. Most of the invoice amounts are concentrated in the following ranges:

- 25th percentile: 44.55
- 50th percentile (median): 220.06
- 75th percentile: 424.25

This indicates that a significant portion of invoices have amounts below 425, with the majority falling near or below 220.

[7]:

```
# Randomly sample 5% of the invoices for scatter plot visualization
sampled_invoices = invoice_totals.sample(frac=0.05) #, random_state=42)

# Plot Scatter Plot for the sampled Invoice Amounts
plt.figure(figsize=(10, 6))
plt.scatter(range(len(sampled_invoices)), sampled_invoices.values, alpha=0.5)
plt.title("Scatter Plot of Sampled Invoice Amounts in 2011 (5% Sample)")
plt.xlabel("Sampled Invoice (Sequential Order)")
plt.ylabel("Total Amount per Invoice")
plt.grid(True)
plt.show()
```


Scatter Plot of Sampled Invoice Amounts in 2011 (5% Sample)
Total Amount per Invoice
Sampled Invoice (Sequential Order)