SA Project

December 14, 2025

[1]:
```
import pandas as pd

df = pd.read_csv("AusApparalSales4thQrt2020.csv")
df.head()
```

[1]:

	Date	Time	State	Group	Unit	Sales
0	1-Oct-2020	Morning	WA	Kids	8	20000
1	1-Oct-2020	Morning	WA	Men	8	20000
2	1-Oct-2020	Morning	WA	Women	4	10000
3	1-Oct-2020	Morning	WA	Seniors	15	37500
4	1-Oct-2020	Afternoon	WA	Kids	3	7500

[2]:
```
df
```

[2]:

	Date	Time	State	Group	Unit	Sales
0	1-Oct-2020	Morning	WA	Kids	8	20000
1	1-Oct-2020	Morning	WA	Men	8	20000
2	1-Oct-2020	Morning	WA	Women	4	10000
3	1-Oct-2020	Morning	WA	Seniors	15	37500
4	1-Oct-2020	Afternoon	WA	Kids	3	7500
…	…	…	…	…	…	…
7555	30-Dec-2020	Afternoon	TAS	Seniors	14	35000
7556	30-Dec-2020	Evening	TAS	Kids	15	37500
7557	30-Dec-2020	Evening	TAS	Men	15	37500
7558	30-Dec-2020	Evening	TAS	Women	11	27500
7559	30-Dec-2020	Evening	TAS	Seniors	13	32500

[7560 rows x 6 columns]

[3]:
```
#task 1-a
print("Missing Values in each column: ")
print(df.isna().sum())

print("\n Non-missing values in each column: ")
print(df.notna().sum())
```

```
Missing Values in each column:
Date     0
```

```
Time     0
State    0
Group    0
Unit     0
Sales    0
dtype: int64

 Non-missing values in each column:
Date     7560
Time     7560
State    7560
Group    7560
Unit     7560
Sales    7560
dtype: int64
```

[4]:
```
#Taks 1-b
df.dropna(how='all',inplace=True)
df.info()

df['Sales'] = df['Sales'].fillna(df['Sales'].mean())
df['Sales']
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7560 entries, 0 to 7559
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Date    7560 non-null   object
 1   Time    7560 non-null   object
 2   State   7560 non-null   object
 3   Group   7560 non-null   object
 4   Unit    7560 non-null   int64
 5   Sales   7560 non-null   int64
dtypes: int64(2), object(4)
memory usage: 354.5+ KB
```

[4]:
```
0       20000
1       20000
2       10000
3       37500
4        7500
        ...
7555    35000
7556    37500
7557    37500
7558    27500
```

```
7559    32500
Name: Sales, Length: 7560, dtype: int64
```

[5]:
```
#Task 1-c
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler()

df[['Sales','Unit']]=scaler.fit_transform(df[['Sales','Unit']])
df[['Sales','Unit']]
```

[5]:

	Sales	Unit
0	0.095238	0.095238
1	0.095238	0.095238
2	0.031746	0.031746
3	0.206349	0.206349
4	0.015873	0.015873
…	…	…
7555	0.190476	0.190476
7556	0.206349	0.206349
7557	0.206349	0.206349
7558	0.142857	0.142857
7559	0.174603	0.174603

[7560 rows x 2 columns]

[6]:
```
#Taks 1-d
State_Sales= df.groupby("State")["Sales"].sum().reset_index()
print(State_Sales)

State_Sales.sort_values(by="Sales", ascending=False)
```

	State	Sales
0	NSW	441.714286
1	NT	109.079365
2	QLD	177.888889
3	SA	339.412698
4	TAS	110.222222
5	VIC	635.968254
6	WA	106.365079

[6]:

	State	Sales
5	VIC	635.968254
0	NSW	441.714286
3	SA	339.412698
2	QLD	177.888889
4	TAS	110.222222

```
1     NT  109.079365
6     WA  106.365079
```

[7]:
```
#task 2-a

print(df[["Sales", "Unit"]].describe())

print(df[["Sales", "Unit"]].mode())
```

```
              Sales         Unit
count  7560.000000  7560.000000
mean      0.254054     0.254054
std       0.204784     0.204784
min       0.000000     0.000000
25%       0.095238     0.095238
50%       0.190476     0.190476
75%       0.380952     0.380952
max       1.000000     1.000000
      Sales      Unit
0  0.111111  0.111111
```

[8]:
```
#Task 2-b & 2-c
top_sales_group = df.groupby("Group")["Sales"].sum().idxmax()

bottom_sales_group = df.groupby("Group")["Sales"].sum().idxmin()

print(f"Highest Sales by Group: {top_sales_group}")
print(f"Lowest Sales by Group: {bottom_sales_group}")
```

```
Highest Sales by Group:  Men
Lowest Sales by Group:  Seniors
```

[9]:
```
#Task 2-D
df['Date']= pd.to_datetime(df['Date'])

df['Week']= df['Date'].dt.isocalendar().week
df['Month']= df['Date'].dt.month
df['Quarter']= df['Date'].dt.quarter
```

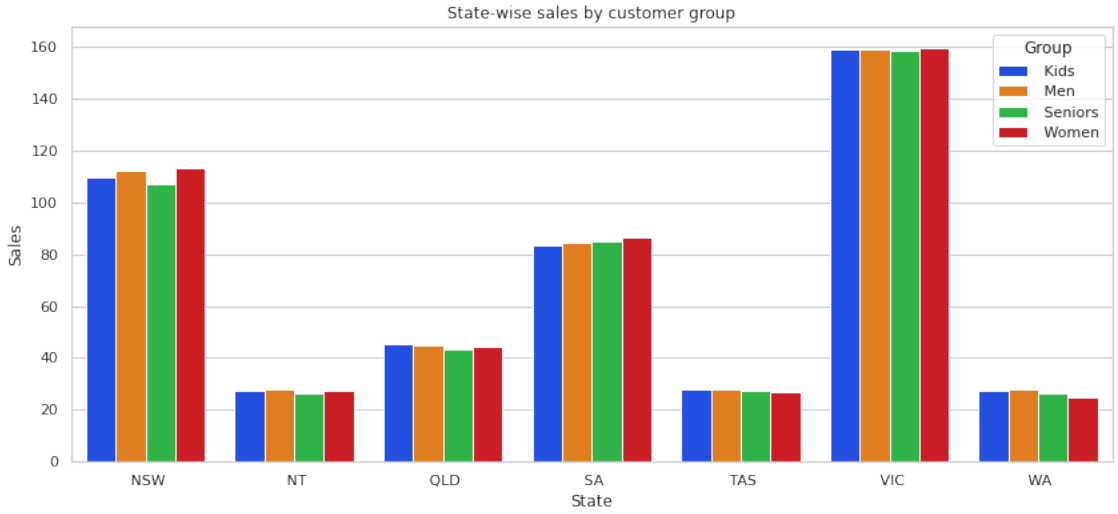
[25]:
```
#Weekly Sales Report
Weekly_sales =df.groupby("Week")["Sales"].sum().reset_index()
print(weekly_sales)

#Monthy Sales Report
Monthly_sales =df.groupby("Month")["Sales"].sum().reset_index()
print(Monthly_sales)
```

```
#Quarter Sales Report
Quarterly_sales =df.groupby("Quarter")["Sales"].sum().reset_index()
print(Quarterly_sales)
```

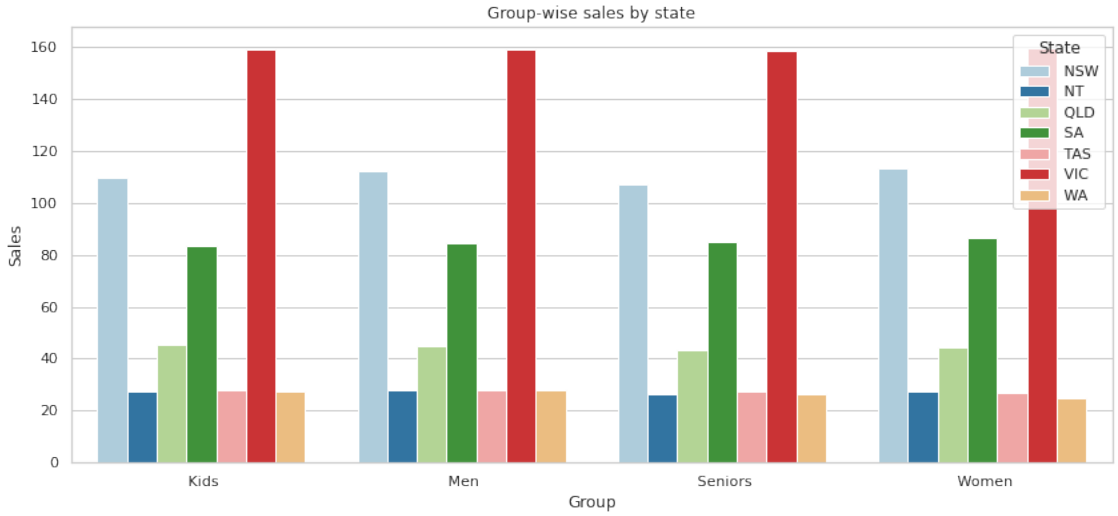
```
    Week       Sales
0     40   84.857143
1     41  152.777778
2     42  150.476190
3     43  151.587302
4     44  122.460317
5     45  113.809524
6     46  115.761905
7     47  115.380952
8     48  117.698413
9     49  169.412698
10    50  181.492063
11    51  182.317460
12    52  183.047619
13    53   79.571429
   Month       Sales
0     10  645.650794
1     11  495.761905
2     12  779.238095
   Quarter        Sales
0        4  1920.650794
```

[26]:
```
#Task 3-a
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np

sns.set(style="whitegrid")

%matplotlib inline
```

[27]:
```
#taks 3-a-1

state_group_sales = df.groupby(['State', 'Group']) ['Sales'].sum().reset_index()
plt.figure(figsize=(14, 6))

sns.barplot(data=state_group_sales, x='State', y='Sales', hue='Group',␣
 ↪palette='bright')
plt.title("State-wise sales by customer group")
plt.show()
```

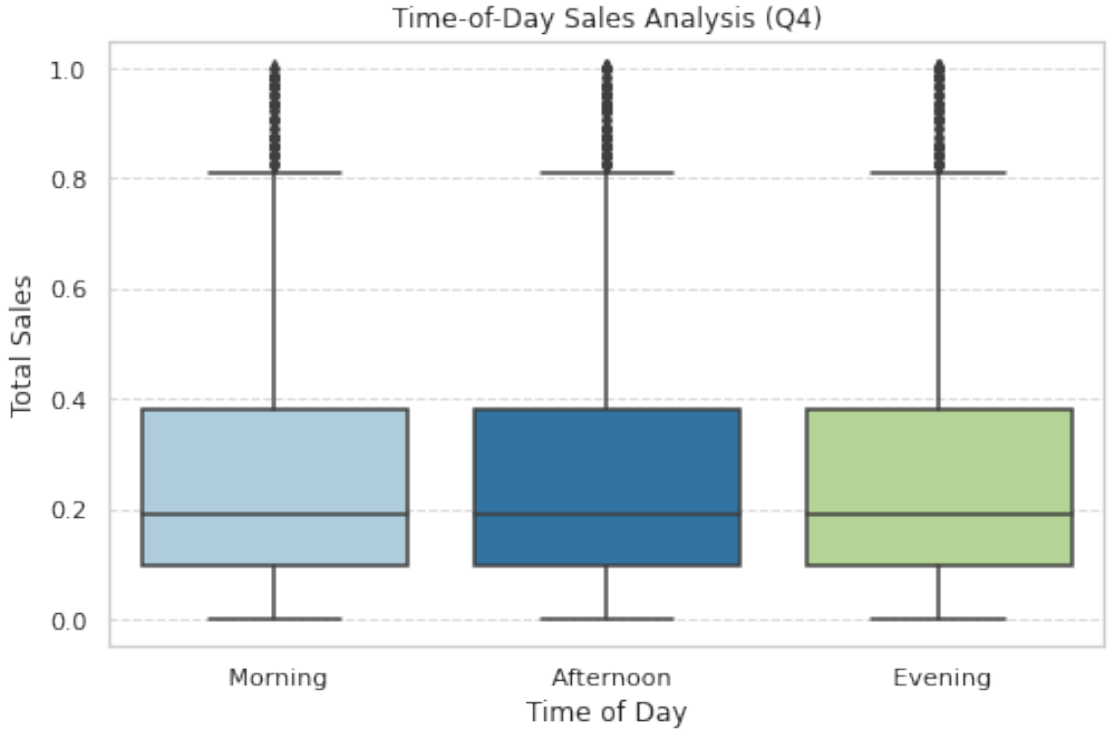


[28]:
```
#taks 3-a-2

group_state_sales = df.groupby(['Group', 'State']) ['Sales'].sum().reset_index()
plt.figure(figsize=(14, 6))

sns.barplot(data=group_state_sales, x='Group', y='Sales',␣
 ↪hue='State',palette='Paired')
plt.title("Group-wise sales by state")
plt.show()
```

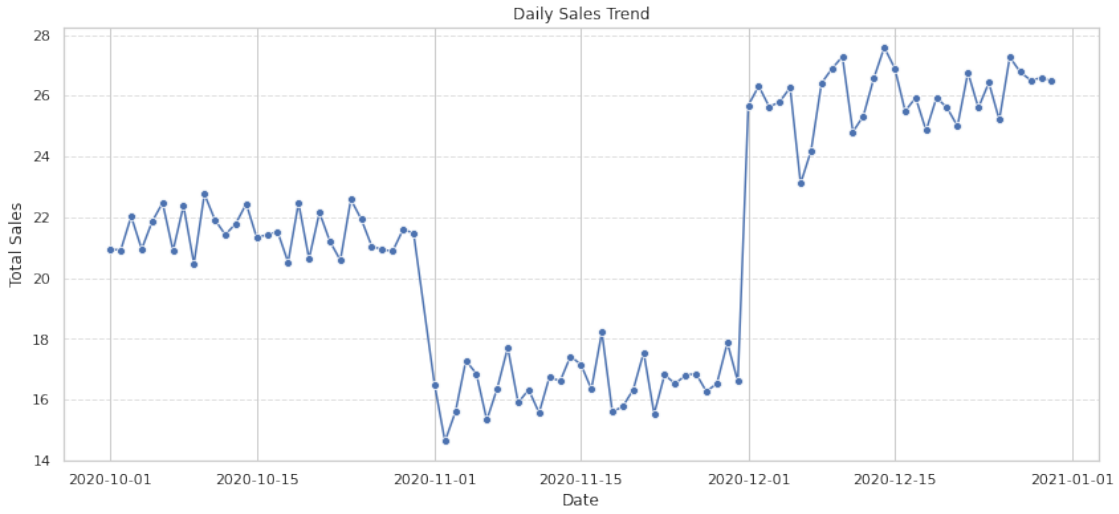


[29]:
```
#Task 3-a-3
```

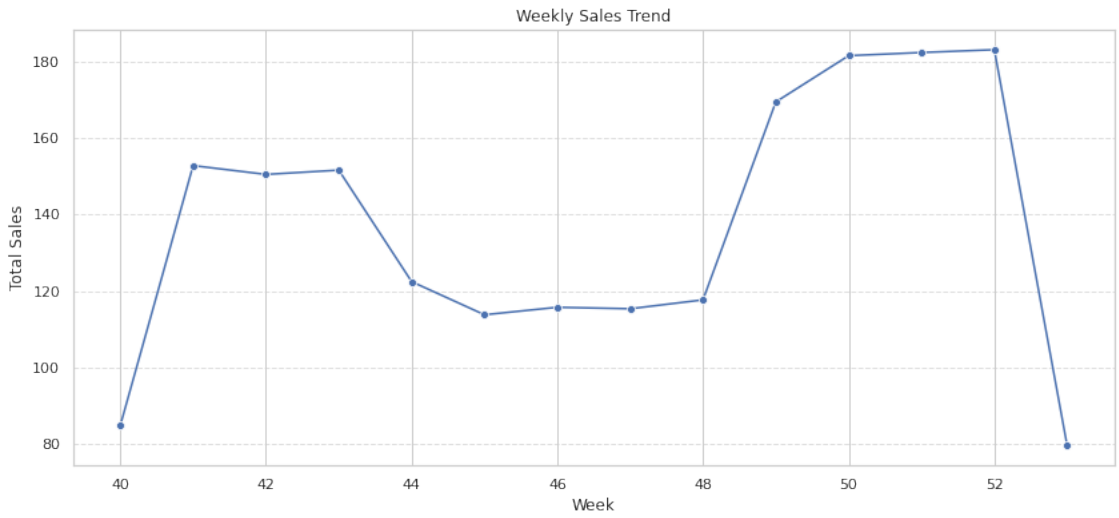
```
plt.figure(figsize=(8, 5))

sns.boxplot(data=df, x="Time", y="Sales", palette='Paired')
plt.title("Time-of-Day Sales Analysis (Q4)")
plt.xlabel("Time of Day")
plt.ylabel("Total Sales")

plt.grid(axis='y', linestyle="--", alpha=0.7)
plt.show()
```



[32]:
```
#Task 3-b Daily sales

daily_sales = df.groupby('Date')['Sales'].sum().reset_index()
plt.figure(figsize=(14, 6))
sns.lineplot(data=daily_sales, x='Date', y='Sales', marker='o')
plt.title("Daily Sales Trend")
plt.xlabel("Date")
plt.ylabel("Total Sales")
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.show()
```

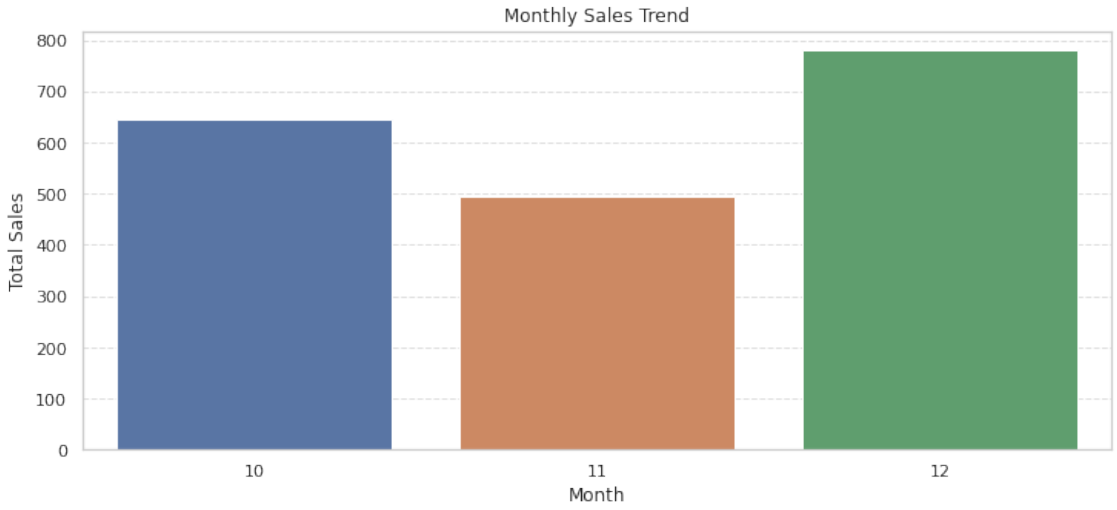


[35]:
```
#Task 3-b # weekly sales

plt.figure(figsize=(14, 6))
sns.lineplot(data=Weekly_sales, x='Week', y='Sales', marker='o', estimator=None)
plt.title("Weekly Sales Trend")
plt.xlabel("Week")
plt.ylabel("Total Sales")
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.show()
```



[36]:
```
#Task 3-b # Monthly sales
```

```
plt.figure(figsize=(12, 5))
sns.barplot(data=Monthly_sales, x='Month', y='Sales')
plt.title("Monthly Sales Trend")
plt.xlabel("Month")
plt.ylabel("Total Sales")
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.show()
```



[38]:
```
#Task 3-b # Quarterly sales

plt.figure(figsize=(12, 5))
sns.barplot(data=Quarterly_sales, x='Quarter', y='Sales')
plt.title("Quaterly Sales Trend")
plt.xlabel("Quarter")
plt.ylabel("Total Sales")
plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.show()
```

Task 3C: Recommendation – Visualization Package For this project, the recommended visualization package is Seaborn.

Reason: Seaborn is built on top of Matplotlib and provides:

- Clean and professional plots with minimal code.
- Better support for statistical visualizations (bar plots, box plots, line plots).
- Readable styles and built-in themes, making the charts clear for business dashboards.

Therefore, Seaborn is the preferred choice for building the sales analysis dashboard in this project.

[40]:
```
# Task 4: Report Generation
report = """
Sales Analysis Report (Q4)

1. State-wise Sales Analysis:
- Top states: VIC
- Lowest performing states: WA

2. Sales Distribution by Group:
- Highest sales category: Men
- Lowest sales category: Seniors

3. Time-of-Day Sales Analysis:
- Peak hours: Morning
- Off-peak hours: Afternoon

4. Sales Trends:
- Daily: Sales fluctuations throughout Q4
- Weekly: Identified high and low sales weeks
- Monthly: Sales trends for each month in Q4
```

```
- Quarterly: Overall Q4 sales comparison by state

Recommendations:
- Optimize inventory for peak hours
- Improve marketing strategies in low-sales states
- Leverage Q4 sales trends for better promotions
"""
print(report)
```

```
Sales Analysis Report (Q4)

1. State-wise Sales Analysis:
- Top states: VIC
- Lowest performing states: WA

2. Sales Distribution by Group:
- Highest sales category: Men
- Lowest sales category: Seniors

3. Time-of-Day Sales Analysis:
- Peak hours: Morning
- Off-peak hours: Afternoon

4. Sales Trends:
- Daily: Sales fluctuations throughout Q4
- Weekly: Identified high and low sales weeks
- Monthly: Sales trends for each month in Q4
- Quarterly: Overall Q4 sales comparison by state

Recommendations:
- Optimize inventory for peak hours
- Improve marketing strategies in low-sales states
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```

[ ]: