sales-analysis-using-aal-data

July 20, 2024

1 Importing libraries

[1]:
```
import numpy as np
import pandas as pd

import matplotlib.pyplot as plt
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')
```

2 Dataset Description

[2]:
```
df = pd.read_csv('/kaggle/input/sales-analysis-dataset/
↪AusApparalSales4thQrt2020.csv')
```

[3]:
```
df.shape
```

[3]:
```
(7560, 6)
```

[4]:
```
df.info()
```

```
<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
```

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

[5]:

	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

3 Data Wrangling

3.0.1 Checking for missing values

[6]:
```
df.isna().sum()
```

[6]:
```
Date     0
Time     0
State    0
Group    0
Unit     0
Sales    0
dtype: int64
```

3.0.2 Manually checking for incorrect entries

[7]:
```
df['Time'].value_counts()
```

[7]:
```
Time
Morning      2520
Afternoon    2520
Evening      2520
Name: count, dtype: int64
```

[8]:
```
df['State'].value_counts()
```

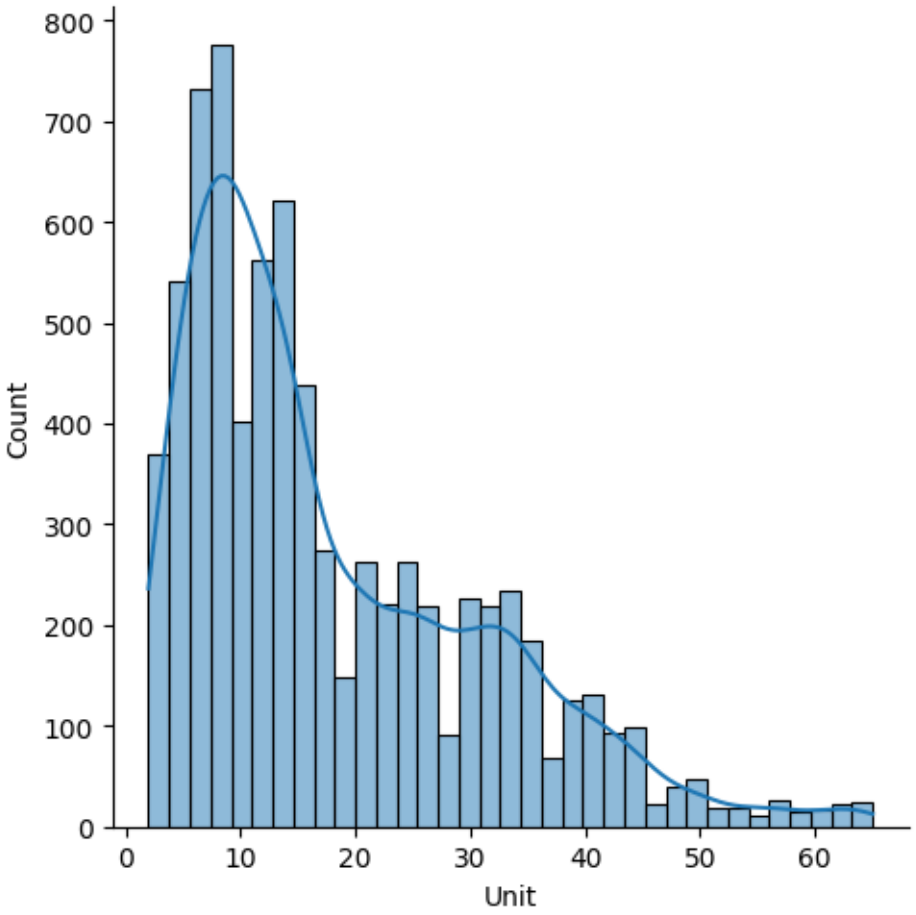
[8]:
```
State
WA     1080
NT     1080
SA     1080
VIC    1080
QLD    1080
NSW    1080
TAS    1080
Name: count, dtype: int64
```

[9]:
```
df['Group'].value_counts()
```

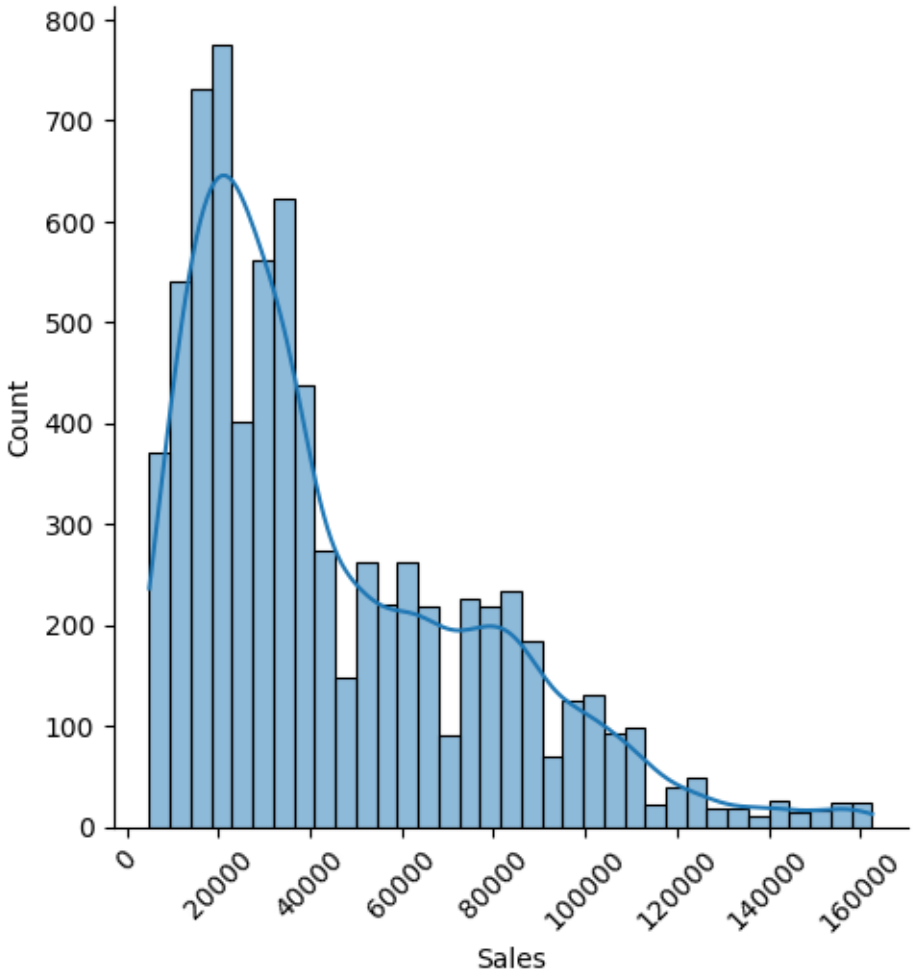
[9]:
```
Group
Kids        1890
Men         1890
Women       1890
Seniors     1890
Name: count, dtype: int64
```

[10]:
```
sns.displot(data = df, x = 'Unit', kde = True)
```

[10]:
```
<seaborn.axisgrid.FacetGrid at 0x7bc6dd8b56f0>
```



[11]:
```
sns.displot(data = df, x = 'Sales', kde = True)
plt.xticks(rotation = 45)
plt.show()
```



1. No null values.
2. No incorrect entries.

4 Data Analysis

4.0.1 Descriptive Statistical Analysis

[12]:
```
df.describe()
```

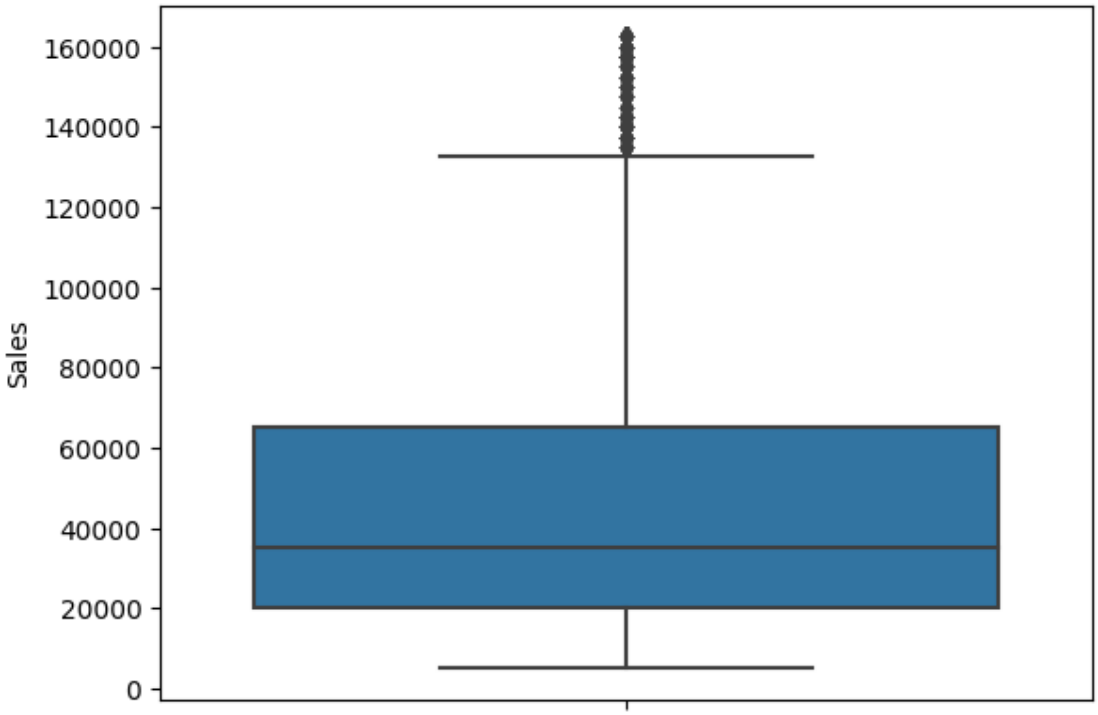
[12]:

	Unit	Sales
count	7560.000000	7560.000000
mean	18.005423	45013.558201
std	12.901403	32253.506944
min	2.000000	5000.000000
25%	8.000000	20000.000000
50%	14.000000	35000.000000

```
75%       26.000000    65000.000000
max       65.000000   162500.000000
```

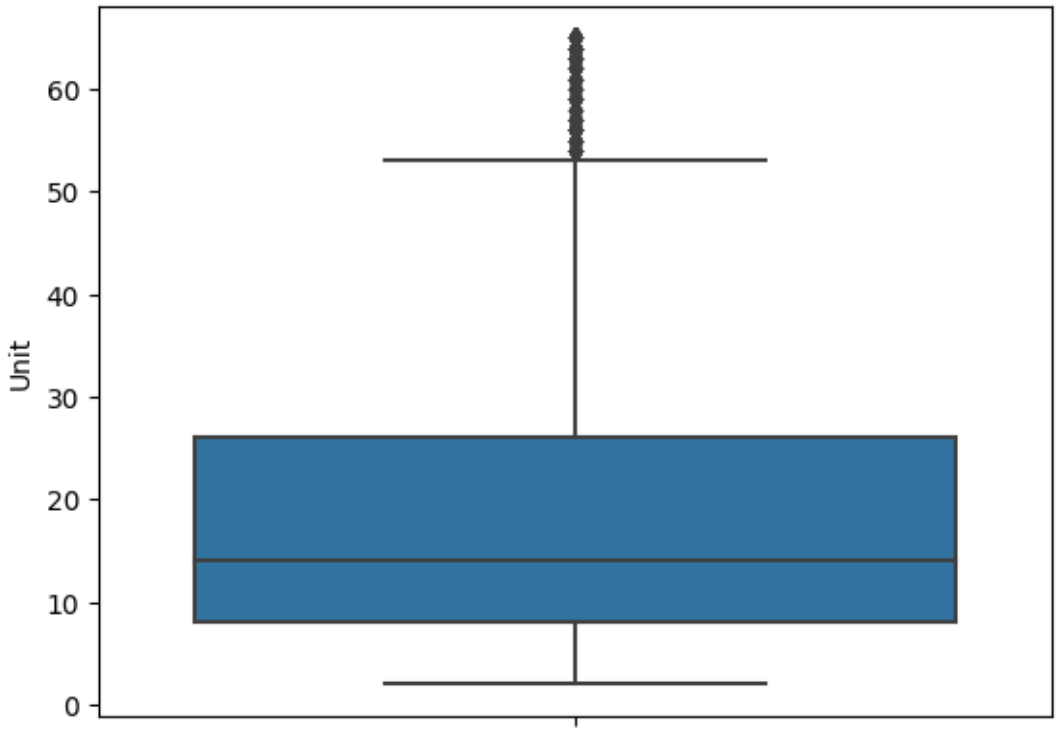
[13]:
```
sns.boxplot(y = 'Sales', data = df)
```

[13]:
```
<Axes: ylabel='Sales'>
```



[14]:
```
sns.boxplot(y = 'Unit', data = df)
```

[14]:
```
<Axes: ylabel='Unit'>
```



[15]:
```
q1 = np.percentile(df['Sales'], 25)
q3 = np.percentile(df['Sales'], 75)
iqr = q3 - q1
```

[16]:
```
upper_limit = q3 + 1.5*iqr
lower_limit = q1 - 1.5*iqr
```

[17]:
```
df[(df['Sales'] > upper_limit)]
```

[17]:

	Date	Time	State	Group	Unit	Sales
5082	1-Dec-2020	Afternoon	VIC	Women	63	157500
5083	1-Dec-2020	Afternoon	VIC	Seniors	62	155000
5161	2-Dec-2020	Morning	VIC	Men	56	140000
5162	2-Dec-2020	Morning	VIC	Women	59	147500
5169	2-Dec-2020	Evening	VIC	Men	64	160000
…	…	…	…	…	…	…
7432	29-Dec-2020	Afternoon	VIC	Kids	65	162500
7433	29-Dec-2020	Afternoon	VIC	Men	54	135000
7437	29-Dec-2020	Evening	VIC	Men	54	135000
7515	30-Dec-2020	Morning	VIC	Seniors	65	162500
7519	30-Dec-2020	Afternoon	VIC	Seniors	62	155000

[123 rows x 6 columns]

[18]:
```
df[(df['Sales'] < lower_limit)]
```

[18]:
```
Empty DataFrame
Columns: [Date, Time, State, Group, Unit, Sales]
Index: []
```

4.0.2 Groups with highest and lowest sales

[19]:
```
df.head()
```

[19]:

	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

[20]:
```
df.groupby('Time')['Sales'].sum().sort_values(ascending = False)
```

[20]:
```
Time
Morning      114207500
Afternoon    114007500
Evening      112087500
Name: Sales, dtype: int64
```

[21]:
```
df.groupby('State')['Sales'].sum().sort_values(ascending = False)
```

[21]:
```
State
VIC    105565000
NSW     74970000
SA      58857500
QLD     33417500
TAS     22760000
NT      22580000
WA      22152500
Name: Sales, dtype: int64
```

[22]:
```
df.groupby('Group')['Sales'].sum().sort_values(ascending = False)
```

[22]:
```
Group
Men        85750000
Women      85442500
Kids       85072500
Seniors    84037500
Name: Sales, dtype: int64
```

[23]:
```
df.groupby(['State', 'Time'])['Sales'].sum().sort_values(ascending = False)
```

[23]:
```
State  Time
VIC    Morning      35622500
       Afternoon    35062500
       Evening      34880000
NSW    Morning      25147500
       Afternoon    25110000
       Evening      24712500
SA     Afternoon    20025000
       Morning      19465000
       Evening      19367500
QLD    Morning      11437500
       Afternoon    11347500
       Evening      10632500
TAS    Afternoon     7670000
NT     Evening       7627500
WA     Morning       7567500
TAS    Evening       7565000
       Morning       7525000
NT     Afternoon     7510000
       Morning       7442500
WA     Evening       7302500
       Afternoon     7282500
Name: Sales, dtype: int64
```

[24]:
```
df.groupby(['State', 'Group'])['Sales'].sum().sort_values(ascending = False)
```

[24]:
```
State  Group
VIC    Women      26482500
       Men        26407500
       Kids       26360000
       Seniors    26315000
NSW    Women      19172500
       Men        19022500
       Kids       18587500
       Seniors    18187500
SA     Women      14970000
       Seniors    14717500
       Men        14655000
       Kids       14515000
QLD    Kids        8510000
       Men         8392500
       Women       8325000
       Seniors     8190000
TAS    Kids        5775000
NT     Men         5762500
TAS    Men         5757500
WA     Men         5752500
```

```
NT      Kids        5700000
        Women       5652500
TAS     Seniors     5650000
WA      Kids        5625000
TAS     Women       5577500
WA      Seniors     5512500
NT      Seniors     5465000
WA      Women       5262500
Name: Sales, dtype: int64
```

[25]:
```
df.groupby(['State', 'Time', 'Group'])['Sales'].sum().sort_values(ascending =␣
↪False)
```

[25]:
```
State  Time       Group
VIC    Morning    Seniors    9057500
                  Kids       8950000
       Evening    Women      8930000
                  Men        8900000
       Afternoon  Seniors    8830000
                             …
WA     Evening    Seniors    1792500
       Afternoon  Seniors    1770000
       Morning    Women      1767500
NT     Morning    Seniors    1760000
WA     Afternoon  Women      1685000
Name: Sales, Length: 84, dtype: int64
```

4.0.3 Weekly, Monthly & Quarterly Reports

[26]:
```
df['Date'] = pd.to_datetime(df['Date'])
```

[27]:
```
df.head()
```

[27]:

	Date	Time	State	Group	Unit	Sales
0	2020-10-01	Morning	WA	Kids	8	20000
1	2020-10-01	Morning	WA	Men	8	20000
2	2020-10-01	Morning	WA	Women	4	10000
3	2020-10-01	Morning	WA	Seniors	15	37500
4	2020-10-01	Afternoon	WA	Kids	3	7500

[28]:
```
weekly_data = df.resample('W', on='Date').sum().reset_index()
```

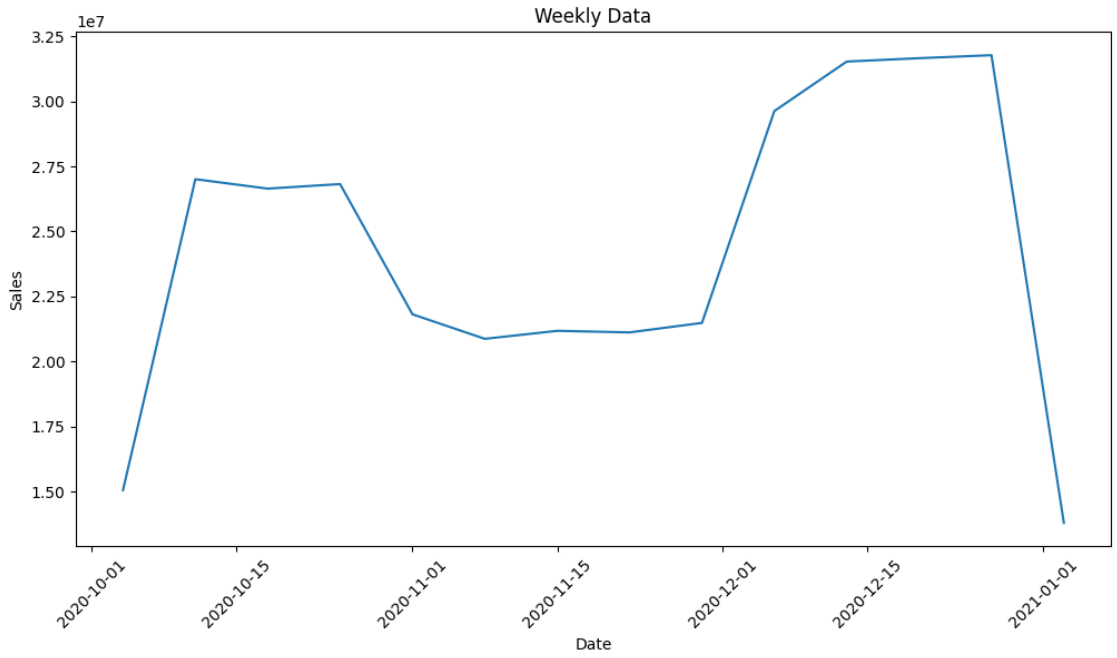
[29]:
```
weekly_data[['Date', 'Sales']]
```

[29]:

	Date	Sales
0	2020-10-04	15045000
1	2020-10-11	27002500

```
2  2020-10-18  26640000
3  2020-10-25  26815000
4  2020-11-01  21807500
5  2020-11-08  20865000
6  2020-11-15  21172500
7  2020-11-22  21112500
8  2020-11-29  21477500
9  2020-12-06  29622500
10 2020-12-13  31525000
11 2020-12-20  31655000
12 2020-12-27  31770000
13 2021-01-03  13792500
```

[30]:
```
plt.figure(figsize=(12, 6))
sns.lineplot(x='Date', y='Sales', data=weekly_data)
plt.title('Weekly Data')
plt.xticks(rotation=45)
plt.show()
```



[31]:
```
monthly_data = df.resample('M', on='Date').sum().reset_index()
```

[32]:
```
monthly_data
```

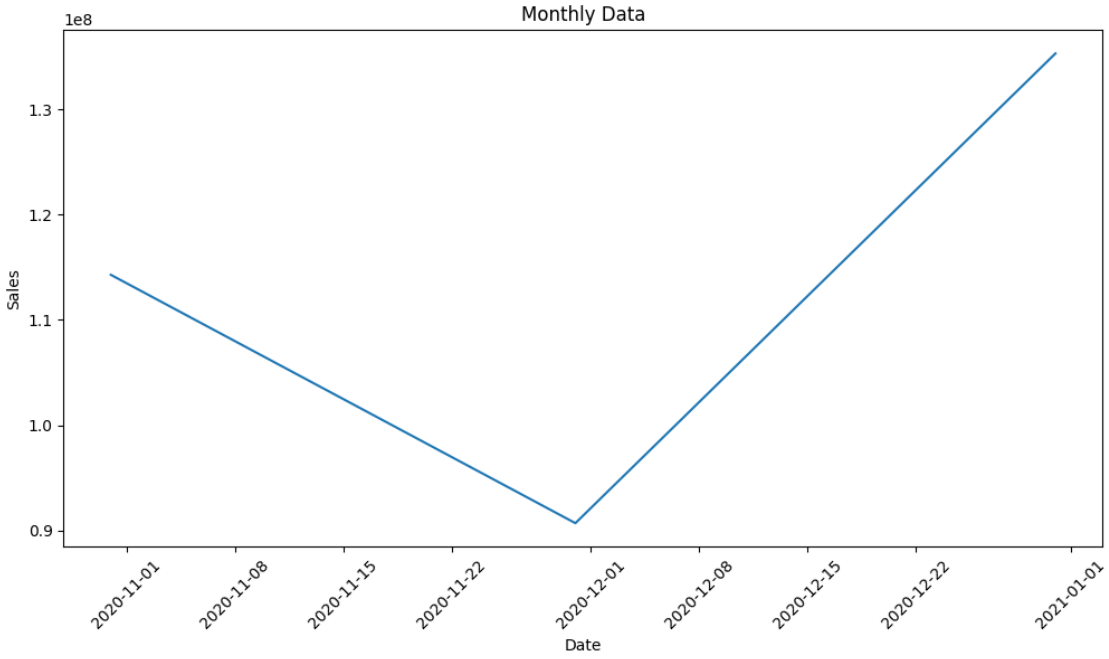
[32]:
```
        Date                                                  Time  \
0 2020-10-31   Morning Morning Morning Morning Afternoon Aft…
```

```
1 2020-11-30   Morning Morning Morning Morning Afternoon Aft…
2 2020-12-31   Morning Morning Morning Morning Afternoon Aft…

                                                    State  \
0   WA WA WA WA WA WA WA WA WA WA WA WA NT NT NT …
1   WA WA WA WA WA WA WA WA WA WA WA WA NT NT NT …
2   WA WA WA WA WA WA WA WA WA WA WA WA NT NT NT …

                                                    Group   Unit      Sales
0   Kids Men Women Seniors Kids Men Women Seniors…  45716  114290000
1   Kids Men Women Seniors Kids Men Women Seniors…  36273   90682500
2   Kids Men Women Seniors Kids Men Women Seniors…  54132  135330000
```

[33]:
```
monthly_data[['Date', 'Sales']]
```

[33]:
```
         Date      Sales
0 2020-10-31  114290000
1 2020-11-30   90682500
2 2020-12-31  135330000
```

[34]:
```
plt.figure(figsize=(12, 6))
sns.lineplot(x='Date', y='Sales', data=monthly_data)
plt.title('Monthly Data')
plt.xticks(rotation=45)
plt.show()
```



[35]:
```
quarterly_data = df.resample('QE', on='Date').sum().reset_index()
quarterly_data['Sales']
```

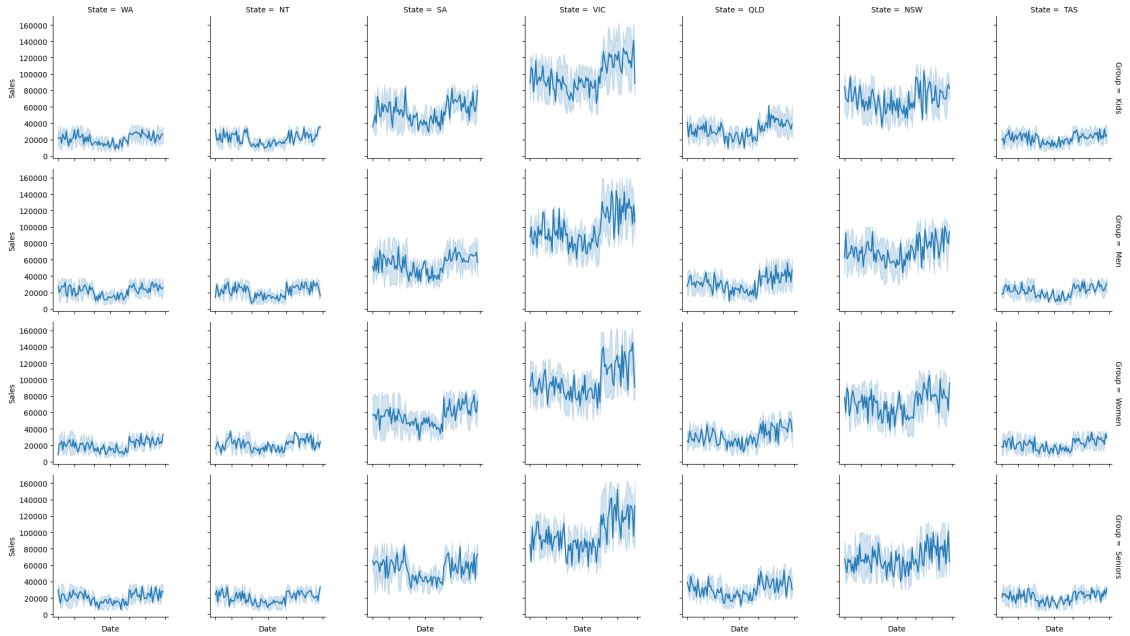
[35]:
```
0     340302500
Name: Sales, dtype: int64
```

1. We have outliers in Sales and Unit columns.
2. Most of the sales are seen in Morning time of the day.
3. VIC state has the highest sales.
4. Men group has the highest sales.

5 Data Visualization

5.0.1 State-wise Sales Analysis for Different Demographic Groups (Kids, Women, Men, and Seniors).

[36]:
```
g = sns.FacetGrid(df, col='State', row='Group', margin_titles=True)
g.map(sns.lineplot, 'Date', 'Sales')
g.set_xticklabels(rotation=45)
plt.show()
```



5.0.2 Time-of-the-Day Analysis

[37]:
```
g = sns.FacetGrid(df, col='State', row='Time', margin_titles=True)
g.map(sns.lineplot, 'Date', 'Sales')
g.set_xticklabels(rotation=45)
plt.show()
```