Data analytics workflow

Data analysis example workbook

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Table of contents

```
#!pip install calmap
!pip install ydata-profiling
```

1. Libraries

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings as wrn

wrn.filterwarnings('ignore', category = DeprecationWarning)
wrn.filterwarnings('ignore', category = FutureWarning)
wrn.filterwarnings('ignore', category = UserWarning)
#from pandas_profiling import ProfileReport
```

Context

1. Invoice ID: A unique identifier for each invoice or transaction.
2. Branch: The branch or location where the transaction occurred.
3. City: The city where the branch is located.
4. Customer Type: Indicates whether the customer is a regular or new customer.
5. Gender: The gender of the customer.
6. Product Line: The category or type of product purchased.
7. Unit Price: The price of a single unit of the product.
8. Quantity: The number of units of the product purchased.
9. Tax 5%: The amount of tax (5% of the total cost) applied to the transaction.
10. Total: The total cost of the transaction, including tax.
11. Date: The date when the transaction took place.
12. Time: The time of day when the transaction occurred.
13. Payment: The payment method used (e.g., credit card, cash).
14. COGS (Cost of Goods Sold): The direct costs associated with producing or purchasing the products sold.

15. Gross Margin Percentage: The profit margin percentage for the transaction.
16. Gross Income: The total profit earned from the transaction.
17. Rating: Customer satisfaction rating or feedback on the transaction.

For instance, if you were interested in predicting customer satisfaction, Rating might be a suitable label. If you were trying to predict sales or revenue, Total or Gross Income could be a potential label.

2. Initial Data Exploration

```
df = pd.read_csv("/kaggle/input/super-market-sales/supermarket_sales.csv")
```

```
df.head(10)
```

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quant
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7
5	699-14-3026	C	Naypyitaw	Normal	Male	Electronic accessories	85.39	7
6	355-53-5943	A	Yangon	Member	Female	Electronic accessories	68.84	6
7	315-22-5665	C	Naypyitaw	Normal	Female	Home and lifestyle	73.56	10
8	665-32-9167	A	Yangon	Member	Female	Health and beauty	36.26	2
9	692-92-5582	B	Mandalay	Member	Female	Food and beverages	54.84	3

```
df.columns
```

```
Index(['Invoice ID', 'Branch', 'City', 'Customer type', 'Gender',
       'Product line', 'Unit price', 'Quantity', 'Tax 5%', 'Total', 'Date',
       'Time', 'Payment', 'cogs', 'gross margin percentage', 'gross income',
       'Rating'],
      dtype='object')
```

```
df.dtypes
```

```
Invoice ID                 object
Branch                     object
City                       object
Customer type              object
```

```
Gender                      object
Product line                object
Unit price                 float64
Quantity                     int64
Tax 5%                     float64
Total                      float64
Date                        object
Time                        object
Payment                     object
cogs                       float64
gross margin percentage    float64
gross income               float64
Rating                     float64
dtype: object
```

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

```
df.dtypes
```

```
Invoice ID                         object
Branch                             object
City                               object
Customer type                      object
Gender                             object
Product line                       object
Unit price                        float64
Quantity                            int64
Tax 5%                            float64
Total                             float64
Date                       datetime64[ns]
Time                               object
Payment                            object
cogs                              float64
gross margin percentage           float64
gross income                      float64
Rating                            float64
dtype: object
```

```
df.set_index("Date", inplace=True)
df.describe()
```

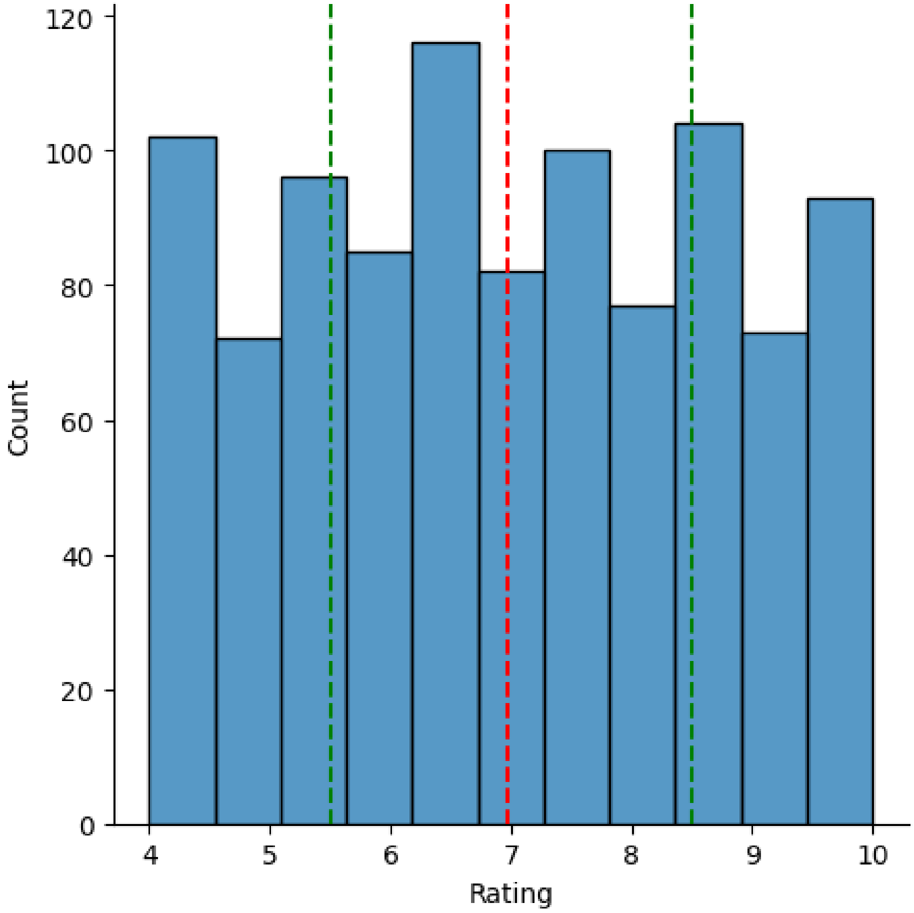
	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gross
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.00000	1000.000000	1000
mean	55.672130	5.510000	15.379369	322.966749	307.58738	4.761905	15.37
std	26.494628	2.923431	11.708825	245.885335	234.17651	0.000000	11.70
min	10.080000	1.000000	0.508500	10.678500	10.17000	4.761905	0.508
25%	32.875000	3.000000	5.924875	124.422375	118.49750	4.761905	5.924
50%	55.230000	5.000000	12.088000	253.848000	241.76000	4.761905	12.08
75%	77.935000	8.000000	22.445250	471.350250	448.90500	4.761905	22.44
max	99.960000	10.000000	49.650000	1042.650000	993.00000	4.761905	49.65

3. Univariate Analysis

Q1 What does the disribution of customer rating looks like? Is it skewed?

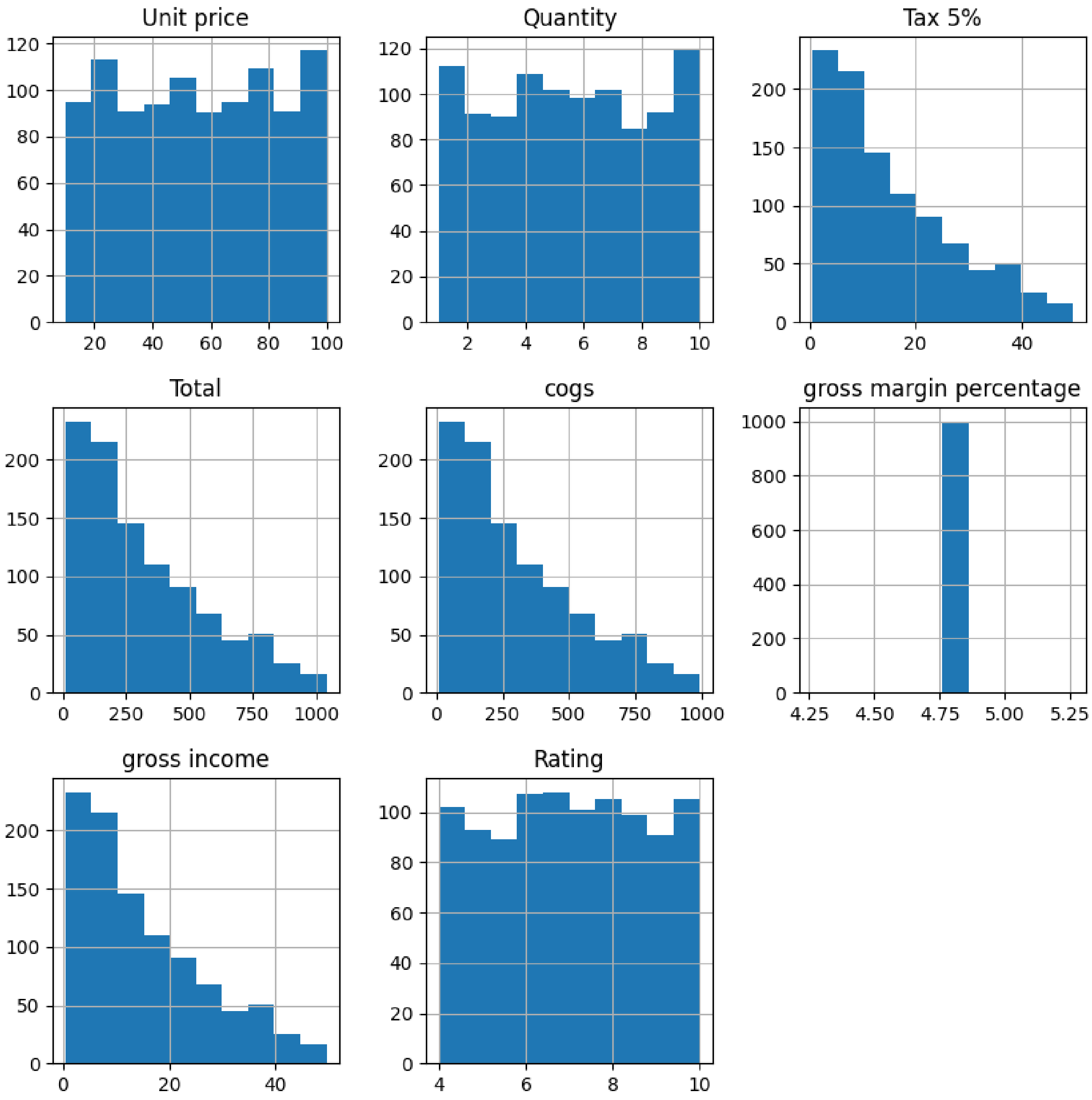
```
sns.displot(df["Rating"])
plt.axvline(x=np.mean(df["Rating"]), c='red', ls= "--")
plt.axvline(x=np.percentile(df["Rating"],25), c='green', ls= "--")
plt.axvline(x=np.percentile(df["Rating"],75), c='green', ls= "--")
```

```
<matplotlib.lines.Line2D at 0x7fa762ae94b0>
```



```
df.hist(figsize=(10,10))
```

```
array([[<Axes: title={'center': 'Unit price'}>,
        <Axes: title={'center': 'Quantity'}>,
        <Axes: title={'center': 'Tax 5%'}>],
       [<Axes: title={'center': 'Total'}>,
        <Axes: title={'center': 'cogs'}>,
        <Axes: title={'center': 'gross margin percentage'}>],
       [<Axes: title={'center': 'gross income'}>,
        <Axes: title={'center': 'Rating'}>, <Axes: >]], dtype=object)
```



```
df['Branch'].value_counts()
```

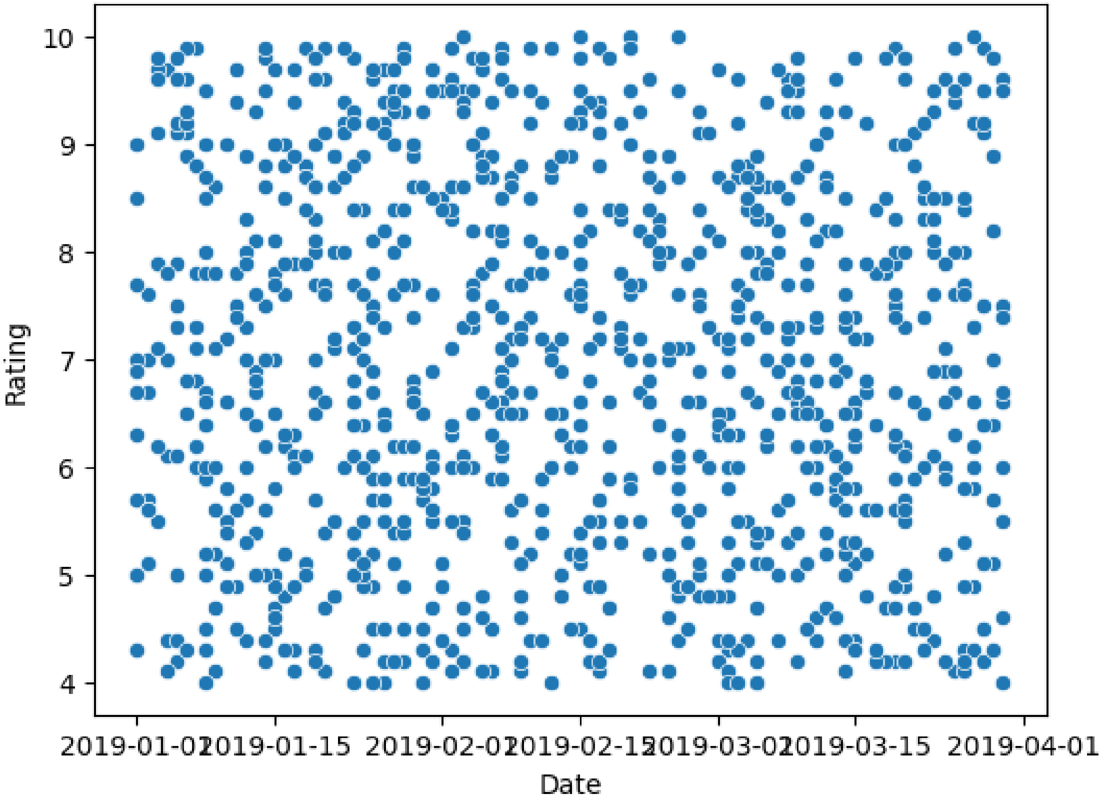
```
Branch
A    340
B    332
C    328
Name: count, dtype: int64
```

4. Bivariate analysis

```
#sns.countplot(df['Payment'])
```

```
# comparison between two columns
sns.scatterplot(df['Rating'])
```

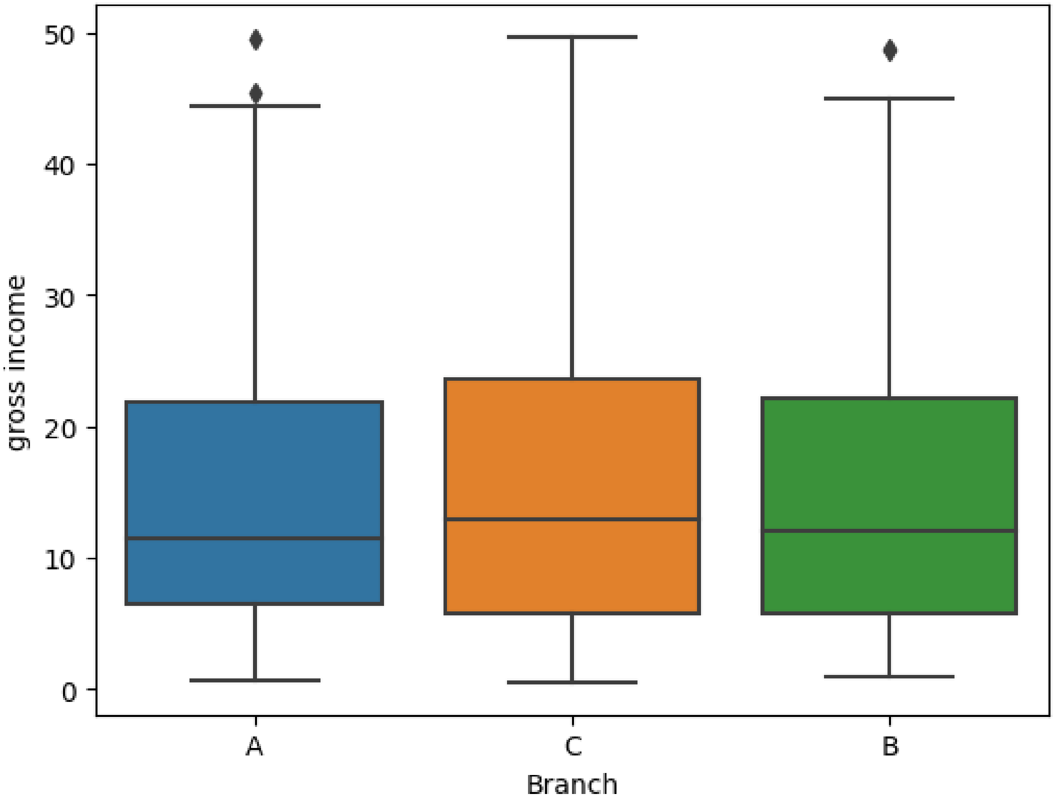
```
<Axes: xlabel='Date', ylabel='Rating'>
```



Q2: is there a noticiable time trend in gross income?

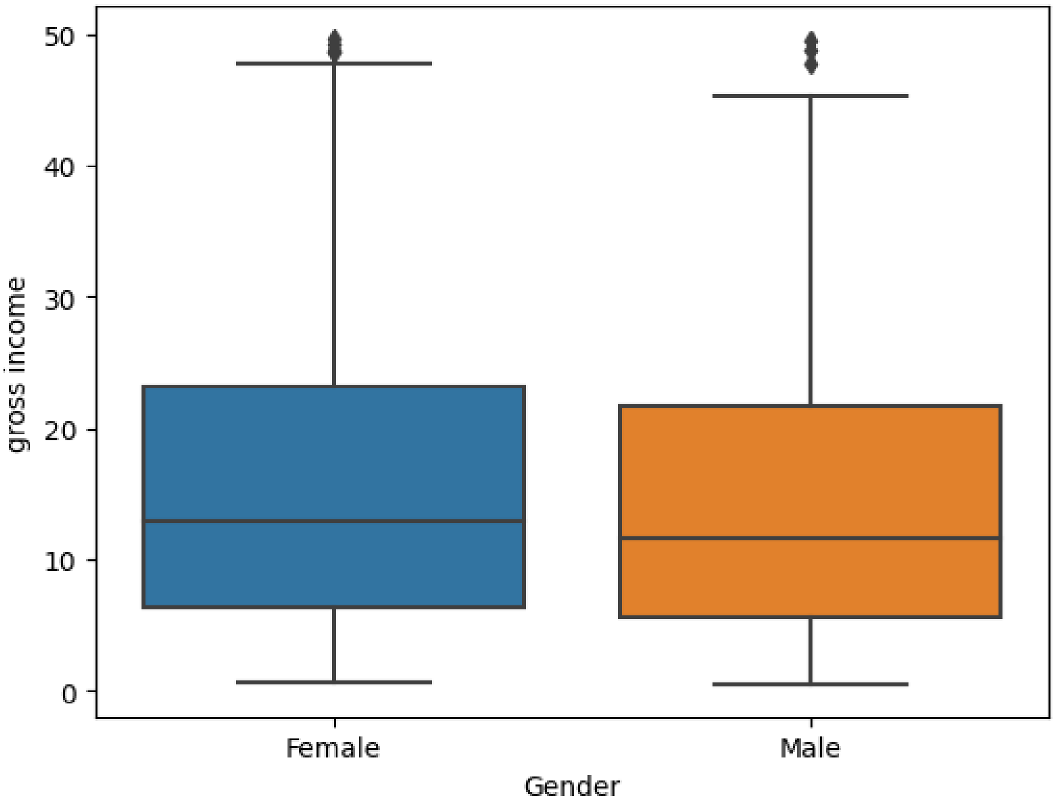
```
sns.boxplot(df, x='Branch', y='gross income')
```

```
<Axes: xlabel='Branch', ylabel='gross income'>
```



```
sns.boxplot(df, x="Gender", y="gross income")
```

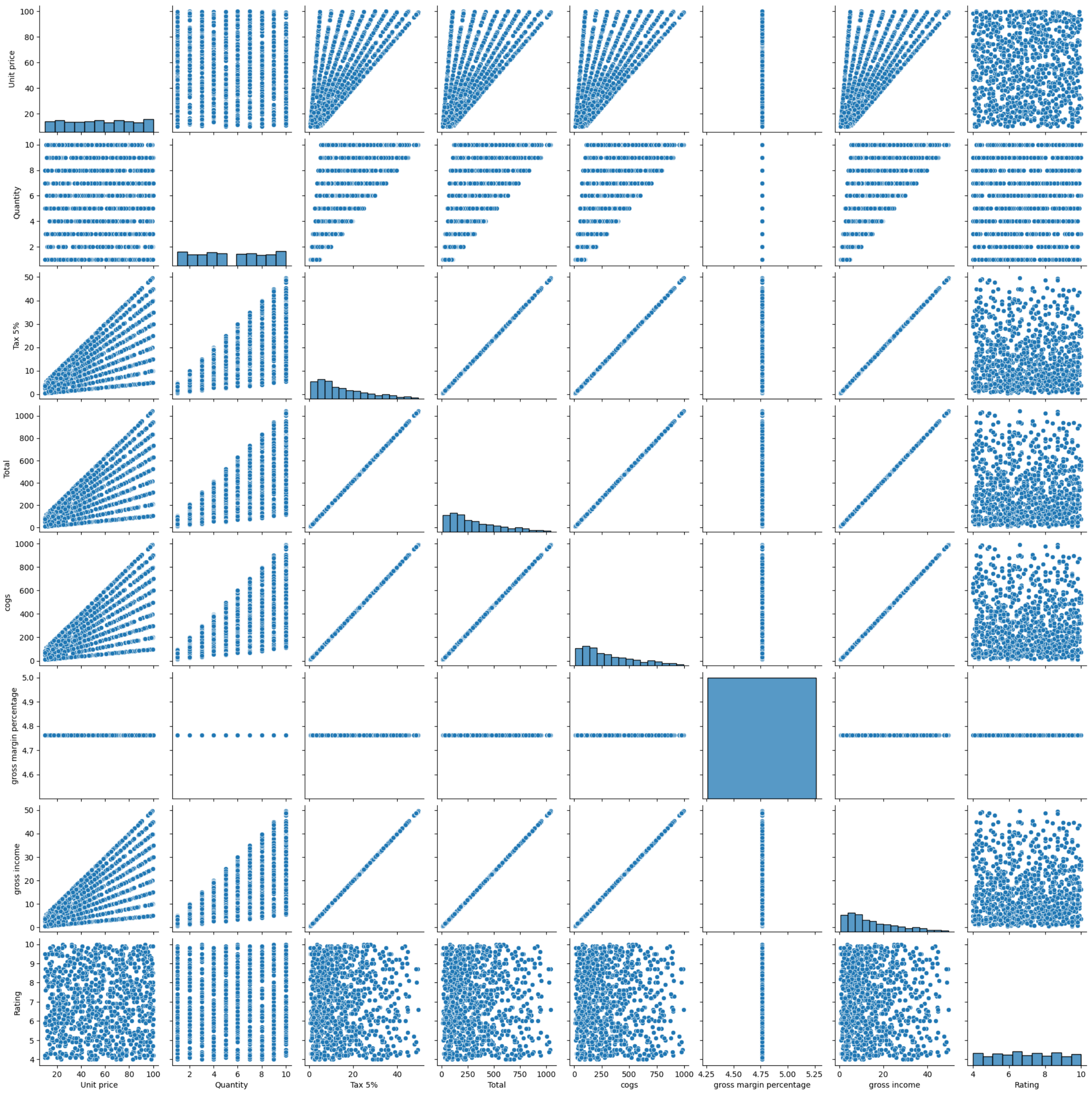
```
<Axes: xlabel='Gender', ylabel='gross income'>
```



```
df.groupby(by='gross income')
```

```
<pandas.core.groupby.generic.DataFrameGroupBy object at 0x7fa75e5eb910>
```

```
sns.pairplot(df)
```


Unit price
100
80
60
40
20
Quantity
10
8
6
4
2
Tax 5%
50
40
30
20
10
0
Total
1000
800
600
400
200
0
cogs
1000
800
600
400
200
0
gross margin percentage
5.0
4.9
4.8
4.7
4.6
gross income
50
40
30
20
10
0
Rating
10
9
8
7
6
5
4
20 40 60 80 100
Unit price
2 4 6 8 10
Quantity
0 20 40
Tax 5%
0 250 500 750 1000
Total
0 250 500 750 1000
cogs
4.25 4.50 4.75 5.00 5.25
gross margin percentage
0 20 40
gross income
4 6 8 10
Rating

5. Dealing with duplicate rows and missing values

```
df.duplicated()
```

```
Date
2019-01-05    False
2019-03-08    False
2019-03-03    False
2019-01-27    False
2019-02-08    False
              ...
2019-01-29    False
2019-03-02    False
2019-02-09    False
2019-02-22    False
2019-02-18    False
Length: 1000, dtype: bool
```

```
df.duplicated().sum()
```

```
0
```

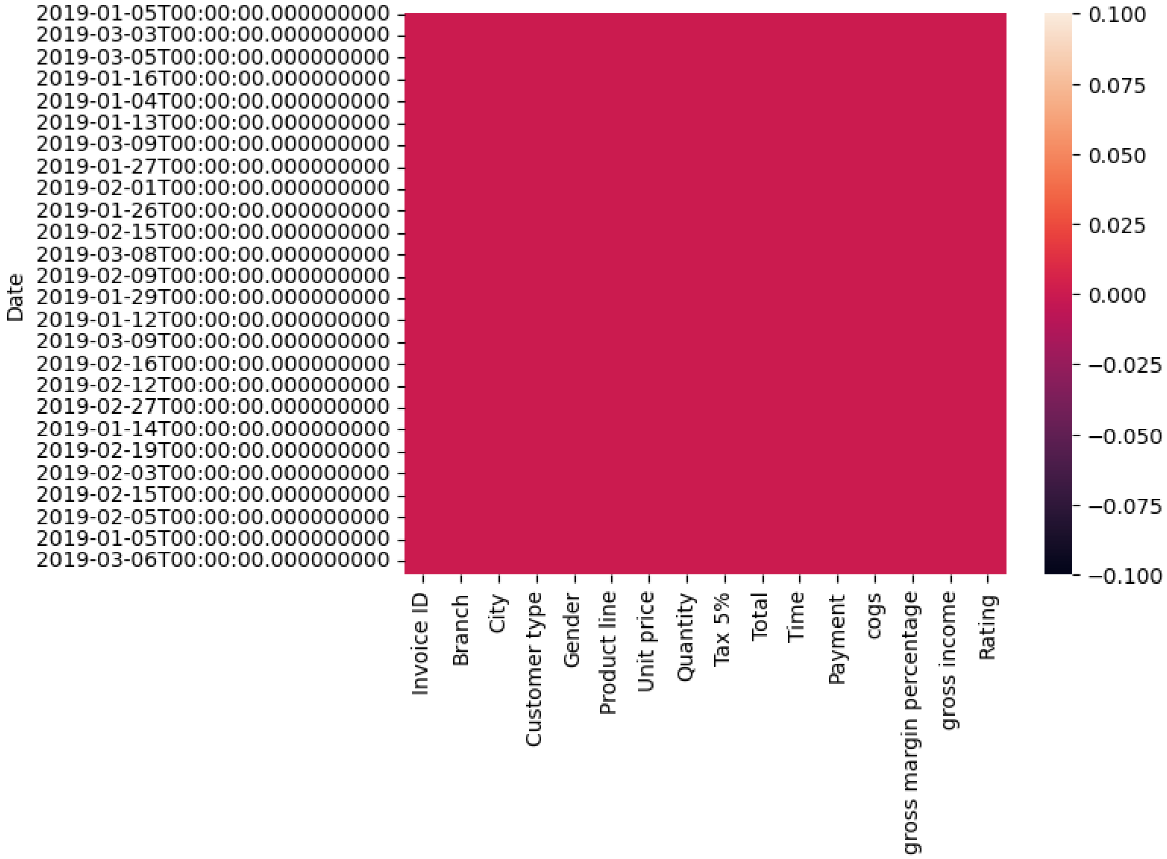
```
df.isna().sum()
```

```
Invoice ID                 0
Branch                     0
City                       0
Customer type              0
Gender                     0
Product line               0
Unit price                 0
```

```
Quantity                   0
Tax 5%                     0
Total                      0
Time                       0
Payment                    0
cogs                       0
gross margin percentage    0
gross income               0
Rating                     0
dtype: int64
```

```
sns.heatmap(df.isnull())
```

```
<Axes: ylabel='Date'>
```



```
df.mode()
```

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity
0	101-17-6199	A	Yangon	Member	Female	Fashion accessories	83.77	10.0
1	101-81-4070	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	102-06-2002	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	102-77-2261	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	105-10-6182	NaN	NaN	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...
995	894-41-5205	NaN	NaN	NaN	NaN	NaN	NaN	NaN
996	895-03-6665	NaN	NaN	NaN	NaN	NaN	NaN	NaN
997	895-66-0685	NaN	NaN	NaN	NaN	NaN	NaN	NaN
998	896-34-0956	NaN	NaN	NaN	NaN	NaN	NaN	NaN
999	898-04-2717	NaN	NaN	NaN	NaN	NaN	NaN	NaN

```
df.mode().iloc[0]
```

```
Invoice ID                         101-17-6199
Branch                                       A
City                                    Yangon
Customer type                           Member
Gender                                  Female
Product line               Fashion accessories
Unit price                               83.77
Quantity                                  10.0
Tax 5%                                   4.154
Total                                   87.234
Time                                     14:42
Payment                                Ewallet
cogs                                     83.08
gross margin percentage               4.761905
gross income                             4.154
Rating                                     6.0
Name: 0, dtype: object
```

6. Correlation analysis

```
np.corrcoef(df["gross income"], df['Rating'])
```

```
array([[ 1.        , -0.0364417],
       [-0.0364417,  1.        ]])
```

```
np.corrcoef(df["gross income"], df['Rating'])[1][0]
```

```
-0.036441704997018390
```

```
# rounding off
round(np.corrcoef(df['gross income'], df['Rating'])[1][0],2)
```

```
-0.04
```

7. Profiling

```
dataset = pd.read_csv("/kaggle/input/super-market-sales/supermarket_sales.csv")

from ydata_profiling import ProfileReport
profile = ProfileReport(dataset, title='Profiling Report')
profile
```

```
Summarize dataset:   0%|          | 0/5 [00:00<?, ?it/s]
```

```
Generate report structure:   0%|          | 0/1 [00:00<?, ?it/s]
```

```
Render HTML:   0%|          | 0/1 [00:00<?, ?it/s]
```

```
<IPython.core.display.HTML object>
```

8. Resources

1. https://www.data-to-viz.com/
2. https://seaborn.pydata.org/examples/index.html
3. https://pypi.org/project/pandas-profiling/