



ALLIANCE
UNIVERSITY

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Recognized by the University Grants Commission (UGC), New Delhi*

Project Report

Introduction To Data Science

Semester — II

Zudio Sales Analysis

By

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April 2025

Introduction

This project focuses on analyzing and modeling sales data from **Zudio**, a fashion retail brand. The dataset includes transactional and operational records from one or more Zudio outlets.

The objective of the project is to understand key patterns in the sales data and develop a machine learning model to predict or classify important outcomes, such as high or low-performing transactions or product categories.

Tasks performed:

- Data Cleaning & Preprocessing
- Exploratory Data Analysis (EDA)
- Machine Learning Model Building & Evaluation
- Visualization for insights

Conclusion / Insights

- The model trained was a **Logistic Regression model**.
- Data was successfully cleaned, scaled, and prepared for training.
- The accuracy and F1 scores suggest a decent prediction performance (exact values can be quoted here).
- Confusion matrix helped to visually evaluate model correctness.

- ```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import confusion_matrix,
classification_report, accuracy_score, precision_score,
recall_score, f1_score
```

- ```
df = pd.read_csv(r"C:\Users\91628\Downloads\Zudio_sales_data
(1).csv")
```

- ```
df
```

- |         | Store | Country | State         | City       | Category | Clothing |
|---------|-------|---------|---------------|------------|----------|----------|
| Type \  |       |         |               |            |          |          |
| 0       | Zudio | India   | Karnataka     | Jalna      | Women    |          |
| Dresses |       |         |               |            |          |          |
| 1       | Zudio | India   | Gujarat       | Patna      | Kids     |          |
| Skirts  |       |         |               |            |          |          |
| 2       | Zudio | India   | Uttar Pradesh | Kolkata    | Men      |          |
| Hoodies |       |         |               |            |          |          |
| 3       | Zudio | India   | West Bengal   | Kolkata    | Women    |          |
| Dresses |       |         |               |            |          |          |
| 4       | Zudio | India   | West Bengal   | Guwahati   | Men      |          |
| Dresses |       |         |               |            |          |          |
| ...     | ...   | ...     | ...           | ...        | ...      | ...      |
| ...     |       |         |               |            |          |          |
| 7894    | Zudio | India   | Uttar Pradesh | Chandigarh | Kids     |          |
| Jeans   |       |         |               |            |          |          |

|      |         |       |               |            |       |          |
|------|---------|-------|---------------|------------|-------|----------|
| 7895 | Zudio   | India | Uttar Pradesh | Aurangabad | Kids  |          |
|      | Jackets |       |               |            |       |          |
| 7896 | Zudio   | India | Tamil Nadu    | Pune       | Kids  | T-shirts |
| 7897 | Zudio   | India | Delhi         | Madurai    | Men   |          |
|      | Shoes   |       |               |            |       |          |
| 7898 | Zudio   | India | Gujarat       | Bengaluru  | Women |          |
|      | Shirts  |       |               |            |       |          |

|      | Store Number | Postal Code | Store Type | Store Open Date | ... |
|------|--------------|-------------|------------|-----------------|-----|
| \    |              |             |            |                 |     |
| 0    | 30           | 411084      | Owned      | 2022-06-04      | ... |
| 1    | 48           | 404562      | Owned      | 2020-12-19      | ... |
| 2    | 97           | 437773      | Rented     | 2023-09-04      | ... |
| 3    | 93           | 431725      | Owned      | 2024-04-11      | ... |
| 4    | 51           | 415370      | Owned      | 2022-05-29      | ... |
| ...  | ...          | ...         | ...        | ...             | ... |
| 7894 | 32           | 431437      | Owned      | 2024-04-24      | ... |
| 7895 | 52           | 424643      | Owned      | 2024-02-03      | ... |
| 7896 | 81           | 412057      | Owned      | 2021-04-11      | ... |
| 7897 | 58           | 405203      | Rented     | 2022-06-17      | ... |
| 7898 | 20           | 429823      | Owned      | 2023-02-08      | ... |

|        | Security Features | Order ID | Order Date | Month     | Customer |
|--------|-------------------|----------|------------|-----------|----------|
| ID \   |                   |          |            |           |          |
| 0      | Alarm             | 88240    | 2024-11-06 | November  |          |
| 233084 |                   |          |            |           |          |
| 1      | Alarm             | 78145    | 2024-06-17 | June      |          |
| 926472 |                   |          |            |           |          |
| 2      | CCTV              | 33363    | 2024-08-17 | August    |          |
| 853255 |                   |          |            |           |          |
| 3      | CCTV              | 46682    | 2024-03-27 | March     |          |
| 106146 |                   |          |            |           |          |
| 4      | CCTV, Alarm       | 58242    | 2024-04-08 | April     |          |
| 264070 |                   |          |            |           |          |
| ...    | ...               | ...      | ...        | ...       |          |
| ...    |                   |          |            |           |          |
| 7894   | CCTV, Alarm       | 39056    | 2024-09-27 | September |          |
| 591993 |                   |          |            |           |          |
| 7895   | Alarm             | 85486    | 2024-03-16 | March     |          |
| 822244 |                   |          |            |           |          |
| 7896   | CCTV, Alarm       | 78200    | 2024-12-02 | December  |          |
| 268376 |                   |          |            |           |          |
| 7897   | CCTV              | 19883    | 2024-07-29 | July      |          |
| 766283 |                   |          |            |           |          |
| 7898   | CCTV, Alarm       | 91451    | 2024-04-08 | April     |          |
| 541226 |                   |          |            |           |          |

|      | Customer Name  | Product ID | Price | Quantity | Sales | Profit |
|------|----------------|------------|-------|----------|-------|--------|
| 0    | Michele Ochoa  | 354        | 1958  | 5        |       | 3916.0 |
| 1    | Daniel Jimenez | 741        | 2078  | 1        |       | 831.2  |
| 2    | Steven Davis   | 607        | 1445  | 2        |       | 1156.0 |
| 3    | Derek Orozco   | 991        | 2469  | 6        |       | 5925.6 |
| 4    | Victor Arnold  | 479        | 1105  | 6        |       | 2652.0 |
| ...  | ...            | ...        | ...   | ...      |       | ...    |
| 7894 | Tracey Andrews | 262        | 2838  | 1        |       | 1135.2 |
| 7895 | Linda Wallace  | 537        | 1814  | 2        |       | 1451.2 |
| 7896 | Brandon Baker  | 457        | 1961  | 1        |       | 784.4  |

|      |                  |     |      |   |        |
|------|------------------|-----|------|---|--------|
| 7897 | John Lewis       | 608 | 1017 | 8 | 3254.4 |
| 7898 | Nicholas Salazar | 583 | 2773 | 5 | 5546.0 |

[7899 rows x 28 columns]

- df.head()

|   | Store | Country | State         | City     | Category | Clothing Type |
|---|-------|---------|---------------|----------|----------|---------------|
| \ |       |         |               |          |          |               |
| 0 | Zudio | India   | Karnataka     | Jalna    | Women    | Dresses       |
| 1 | Zudio | India   | Gujarat       | Patna    | Kids     | Skirts        |
| 2 | Zudio | India   | Uttar Pradesh | Kolkata  | Men      | Hoodies       |
| 3 | Zudio | India   | West Bengal   | Kolkata  | Women    | Dresses       |
| 4 | Zudio | India   | West Bengal   | Guwahati | Men      | Dresses       |

|   | Store Number | Postal Code | Store Type | Store Open Date | ... | \ |
|---|--------------|-------------|------------|-----------------|-----|---|
| 0 | 30           | 411084      | Owned      | 2022-06-04      | ... |   |
| 1 | 48           | 404562      | Owned      | 2020-12-19      | ... |   |
| 2 | 97           | 437773      | Rented     | 2023-09-04      | ... |   |
| 3 | 93           | 431725      | Owned      | 2024-04-11      | ... |   |
| 4 | 51           | 415370      | Owned      | 2022-05-29      | ... |   |

|   | Security Features | Order ID | Order Date | Month    | Customer ID |
|---|-------------------|----------|------------|----------|-------------|
| \ |                   |          |            |          |             |
| 0 | Alarm             | 88240    | 2024-11-06 | November | 233084      |
| 1 | Alarm             | 78145    | 2024-06-17 | June     | 926472      |
| 2 | CCTV              | 33363    | 2024-08-17 | August   | 853255      |
| 3 | CCTV              | 46682    | 2024-03-27 | March    | 106146      |
| 4 | CCTV, Alarm       | 58242    | 2024-04-08 | April    | 264070      |

|   | Customer Name  | Product ID | Price | Quantity | Sales  | Profit |
|---|----------------|------------|-------|----------|--------|--------|
| 0 | Michele Ochoa  | 354        | 1958  | 5        | 3916.0 |        |
| 1 | Daniel Jimenez | 741        | 2078  | 1        | 831.2  |        |
| 2 | Steven Davis   | 607        | 1445  | 2        | 1156.0 |        |
| 3 | Derek Orozco   | 991        | 2469  | 6        | 5925.6 |        |
| 4 | Victor Arnold  | 479        | 1105  | 6        | 2652.0 |        |

[5 rows x 28 columns]

- df.tail()

|      | Store | Country | State         | City       | Category | Clothing Type |
|------|-------|---------|---------------|------------|----------|---------------|
| \    |       |         |               |            |          |               |
| 7894 | Zudio | India   | Uttar Pradesh | Chandigarh | Kids     | Jeans         |
| 7895 | Zudio | India   | Uttar Pradesh | Aurangabad | Kids     | Jackets       |
| 7896 | Zudio | India   | Tamil Nadu    | Pune       | Kids     | T-shirts      |
| 7897 | Zudio | India   | Delhi         | Madurai    | Men      | Shoes         |
| 7898 | Zudio | India   | Gujarat       | Bengaluru  | Women    | Shirts        |

|      | Store Number | Postal Code | Store Type | Store Open Date | ... | \ |
|------|--------------|-------------|------------|-----------------|-----|---|
| 7894 | 32           | 431437      | Owned      | 2024-04-24      | ... |   |
| 7895 | 52           | 424643      | Owned      | 2024-02-03      | ... |   |
| 7896 | 81           | 412057      | Owned      | 2021-04-11      | ... |   |

|      |    |        |        |            |     |
|------|----|--------|--------|------------|-----|
| 7897 | 58 | 405203 | Rented | 2022-06-17 | ... |
| 7898 | 20 | 429823 | Owned  | 2023-02-08 | ... |

| ID \   | Security Features | Order ID | Order Date | Month     | Customer |
|--------|-------------------|----------|------------|-----------|----------|
| 7894   | CCTV, Alarm       | 39056    | 2024-09-27 | September |          |
| 591993 |                   |          |            |           |          |
| 7895   | Alarm             | 85486    | 2024-03-16 | March     |          |
| 822244 |                   |          |            |           |          |
| 7896   | CCTV, Alarm       | 78200    | 2024-12-02 | December  |          |
| 268376 |                   |          |            |           |          |
| 7897   | CCTV              | 19883    | 2024-07-29 | July      |          |
| 766283 |                   |          |            |           |          |
| 7898   | CCTV, Alarm       | 91451    | 2024-04-08 | April     |          |
| 541226 |                   |          |            |           |          |

|      | Customer Name    | Product ID | Price | Quantity | Sales | Profit |
|------|------------------|------------|-------|----------|-------|--------|
| 7894 | Tracey Andrews   | 262        | 2838  | 1        |       | 1135.2 |
| 7895 | Linda Wallace    | 537        | 1814  | 2        |       | 1451.2 |
| 7896 | Brandon Baker    | 457        | 1961  | 1        |       | 784.4  |
| 7897 | John Lewis       | 608        | 1017  | 8        |       | 3254.4 |
| 7898 | Nicholas Salazar | 583        | 2773  | 5        |       | 5546.0 |

[5 rows x 28 columns]

- 

df.describe()

- |               | Store Number | Postal Code   | Selling Area | Size (sq ft) |
|---------------|--------------|---------------|--------------|--------------|
| Staff Count \ |              |               |              |              |
| count         | 7899.000000  | 7899.000000   |              | 7899.000000  |
| 7899.000000   |              |               |              |              |
| mean          | 50.666034    | 419982.374984 |              | 1112.077478  |
| 11.504747     |              |               |              |              |
| std           | 29.095274    | 11695.237817  |              | 193.239371   |
| 5.194722      |              |               |              |              |
| min           | 1.000000     | 400006.000000 |              | 800.000000   |
| 3.000000      |              |               |              |              |
| 25%           | 25.000000    | 409841.000000 |              | 950.000000   |
| 7.000000      |              |               |              |              |
| 50%           | 51.000000    | 419988.000000 |              | 1100.000000  |
| 12.000000     |              |               |              |              |
| 75%           | 76.000000    | 430258.000000 |              | 1300.000000  |
| 16.000000     |              |               |              |              |
| max           | 100.000000   | 439985.000000 |              | 1400.000000  |
| 20.000000     |              |               |              |              |

|             | Order ID     | Customer ID   | Product ID  | Price       |
|-------------|--------------|---------------|-------------|-------------|
| Quantity \  |              |               |             |             |
| count       | 7899.000000  | 7899.000000   | 7899.000000 | 7899.000000 |
| 7899.000000 |              |               |             |             |
| mean        | 54920.719965 | 549440.714521 | 602.069376  | 1761.113432 |
| 4.519433    |              |               |             |             |
| std         | 25894.206850 | 262418.912565 | 232.066189  | 716.269447  |
| 2.292373    |              |               |             |             |
| min         | 10008.000000 | 100153.000000 | 204.000000  | 499.000000  |

```

1.000000
25% 33192.000000 318516.500000 398.000000 1136.000000
3.000000
50% 54873.000000 546012.000000 602.000000 1782.000000
5.000000
75% 77285.000000 780304.000000 803.500000 2373.000000
7.000000
max 99999.000000 999858.000000 999.000000 2999.000000
8.000000

```

```

 Sales Profit
count 7899.000000
mean 3170.671376
std 2141.249886
min 200.400000
25% 1411.200000
50% 2681.600000
75% 4570.400000
max 9596.800000

```

- `df.info()`
- `<class 'pandas.core.frame.DataFrame'>`  
RangeIndex: 7899 entries, 0 to 7898  
Data columns (total 28 columns):  

| #  | Column                    | Non-Null Count | Dtype   |
|----|---------------------------|----------------|---------|
| 0  | Store                     | 7899 non-null  | object  |
| 1  | Country                   | 7899 non-null  | object  |
| 2  | State                     | 7899 non-null  | object  |
| 3  | City                      | 7899 non-null  | object  |
| 4  | Category                  | 7899 non-null  | object  |
| 5  | Clothing Type             | 7899 non-null  | object  |
| 6  | Store Number              | 7899 non-null  | int64   |
| 7  | Postal Code               | 7899 non-null  | int64   |
| 8  | Store Type                | 7899 non-null  | object  |
| 9  | Store Open Date           | 7899 non-null  | object  |
| 10 | Selling Area Size (sq ft) | 7899 non-null  | int64   |
| 11 | Store Manager             | 7899 non-null  | object  |
| 12 | Manager ID                | 7899 non-null  | object  |
| 13 | Store Address             | 7899 non-null  | object  |
| 14 | Contact Information       | 7899 non-null  | object  |
| 15 | Operating Hours           | 7899 non-null  | object  |
| 16 | Staff Count               | 7899 non-null  | int64   |
| 17 | Parking Availability      | 7899 non-null  | object  |
| 18 | Security Features         | 5861 non-null  | object  |
| 19 | Order ID                  | 7899 non-null  | int64   |
| 20 | Order Date                | 7899 non-null  | object  |
| 21 | Month                     | 7899 non-null  | object  |
| 22 | Customer ID               | 7899 non-null  | int64   |
| 23 | Customer Name             | 7899 non-null  | object  |
| 24 | Product ID                | 7899 non-null  | int64   |
| 25 | Price                     | 7899 non-null  | int64   |
| 26 | Quantity                  | 7899 non-null  | int64   |
| 27 | Sales Profit              | 7899 non-null  | float64 |

  
dtypes: float64(1), int64(9), object(18)  
memory usage: 1.7+ MB
- `df.isnull().sum()`

- Store 0  
Country 0  
State 0  
City 0  
Category 0  
Clothing Type 0  
Store Number 0  
Postal Code 0  
Store Type 0  
Store Open Date 0  
Selling Area Size (sq ft) 0  
Store Manager 0  
Manager ID 0  
Store Address 0  
Contact Information 0  
Operating Hours 0  
Staff Count 0  
Parking Availability 0  
Security Features 2038  
Order ID 0  
Order Date 0  
Month 0  
Customer ID 0  
Customer Name 0  
Product ID 0  
Price 0  
Quantity 0  
Sales Profit 0  
dtype: int64

- df.nunique()

- Store 1  
Country 1  
State 8  
City 42  
Category 3  
Clothing Type 11  
Store Number 100  
Postal Code 7131  
Store Type 2  
Store Open Date 1774  
Selling Area Size (sq ft) 7  
Store Manager 7476  
Manager ID 100  
Store Address 7899  
Contact Information 7899  
Operating Hours 4  
Staff Count 18  
Parking Availability 2  
Security Features 3  
Order ID 7559  
Order Date 338  
Month 12  
Customer ID 7870  
Customer Name 7499  
Product ID 796  
Price 2404  
Quantity 8

```

Sales Profit
dtype: int64
5458

• df

•
Store Country State City Category Clothing
Type \
0 Zudio India Karnataka Jalna Women
Dresses
1 Zudio India Gujarat Patna Kids
Skirts
2 Zudio India Uttar Pradesh Kolkata Men
Hoodies
3 Zudio India West Bengal Kolkata Women
Dresses
4 Zudio India West Bengal Guwahati Men
Dresses
...
...
7894 Zudio India Uttar Pradesh Chandigarh Kids
Jeans
7895 Zudio India Uttar Pradesh Aurangabad Kids
Jackets
7896 Zudio India Tamil Nadu Pune Kids T-
shirts
7897 Zudio India Delhi Madurai Men
Shoes
7898 Zudio India Gujarat Bengaluru Women
Shirts

Store Number Postal Code Store Type Store Open Date ...
\
0 30 411084 Owned 2022-06-04 ...
1 48 404562 Owned 2020-12-19 ...
2 97 437773 Rented 2023-09-04 ...
3 93 431725 Owned 2024-04-11 ...
4 51 415370 Owned 2022-05-29 ...
...
7894 32 431437 Owned 2024-04-24 ...
7895 52 424643 Owned 2024-02-03 ...
7896 81 412057 Owned 2021-04-11 ...
7897 58 405203 Rented 2022-06-17 ...
7898 20 429823 Owned 2023-02-08 ...

Security Features Order ID Order Date Month Customer
ID \
0 Alarm 88240 2024-11-06 November
233084
1 Alarm 78145 2024-06-17 June
926472
2 CCTV 33363 2024-08-17 August
853255
3 CCTV 46682 2024-03-27 March
106146
4 CCTV, Alarm 58242 2024-04-08 April
264070
...
...
7894 CCTV, Alarm 39056 2024-09-27 September

```



|        |             |       |            |          |  |
|--------|-------------|-------|------------|----------|--|
| 591993 |             |       |            |          |  |
| 7895   | Alarm       | 85486 | 2024-03-16 | March    |  |
| 822244 |             |       |            |          |  |
| 7896   | CCTV, Alarm | 78200 | 2024-12-02 | December |  |
| 268376 |             |       |            |          |  |
| 7897   | CCTV        | 19883 | 2024-07-29 | July     |  |
| 766283 |             |       |            |          |  |
| 7898   | CCTV, Alarm | 91451 | 2024-04-08 | April    |  |
| 541226 |             |       |            |          |  |

|      | Customer Name    | Product ID | Price | Quantity | Sales | Profit |
|------|------------------|------------|-------|----------|-------|--------|
| 0    | Michele Ochoa    | 354        | 1958  | 5        |       | 3916.0 |
| 1    | Daniel Jimenez   | 741        | 2078  | 1        |       | 831.2  |
| 2    | Steven Davis     | 607        | 1445  | 2        |       | 1156.0 |
| 3    | Derek Orozco     | 991        | 2469  | 6        |       | 5925.6 |
| 4    | Victor Arnold    | 479        | 1105  | 6        |       | 2652.0 |
| ...  | ...              | ...        | ...   | ...      |       | ...    |
| 7894 | Tracey Andrews   | 262        | 2838  | 1        |       | 1135.2 |
| 7895 | Linda Wallace    | 537        | 1814  | 2        |       | 1451.2 |
| 7896 | Brandon Baker    | 457        | 1961  | 1        |       | 784.4  |
| 7897 | John Lewis       | 608        | 1017  | 8        |       | 3254.4 |
| 7898 | Nicholas Salazar | 583        | 2773  | 5        |       | 5546.0 |

[7899 rows x 28 columns]

- `df[['State', 'City', 'Category', 'Clothing Type', 'Order ID', 'Customer ID', 'Product ID', 'Price', 'Quantity', 'Sales Profit']]`

- |               | State         | City       | Category | Clothing Type | Order ID |
|---------------|---------------|------------|----------|---------------|----------|
| Customer ID \ |               |            |          |               |          |
| 0             | Karnataka     | Jalna      | Women    | Dresses       | 88240    |
| 233084        |               |            |          |               |          |
| 1             | Gujarat       | Patna      | Kids     | Skirts        | 78145    |
| 926472        |               |            |          |               |          |
| 2             | Uttar Pradesh | Kolkata    | Men      | Hoodies       | 33363    |
| 853255        |               |            |          |               |          |
| 3             | West Bengal   | Kolkata    | Women    | Dresses       | 46682    |
| 106146        |               |            |          |               |          |
| 4             | West Bengal   | Guwahati   | Men      | Dresses       | 58242    |
| 264070        |               |            |          |               |          |
| ...           | ...           | ...        | ...      | ...           | ...      |
| ...           |               |            |          |               |          |
| 7894          | Uttar Pradesh | Chandigarh | Kids     | Jeans         | 39056    |
| 591993        |               |            |          |               |          |
| 7895          | Uttar Pradesh | Aurangabad | Kids     | Jackets       | 85486    |
| 822244        |               |            |          |               |          |
| 7896          | Tamil Nadu    | Pune       | Kids     | T-shirts      | 78200    |
| 268376        |               |            |          |               |          |
| 7897          | Delhi         | Madurai    | Men      | Shoes         | 19883    |
| 766283        |               |            |          |               |          |
| 7898          | Gujarat       | Bengaluru  | Women    | Shirts        | 91451    |
| 541226        |               |            |          |               |          |

|   | Product ID | Price | Quantity | Sales | Profit |
|---|------------|-------|----------|-------|--------|
| 0 | 354        | 1958  | 5        |       | 3916.0 |
| 1 | 741        | 2078  | 1        |       | 831.2  |
| 2 | 607        | 1445  | 2        |       | 1156.0 |

|      |     |      |     |        |
|------|-----|------|-----|--------|
| 3    | 991 | 2469 | 6   | 5925.6 |
| 4    | 479 | 1105 | 6   | 2652.0 |
| ...  | ... | ...  | ... | ...    |
| 7894 | 262 | 2838 | 1   | 1135.2 |
| 7895 | 537 | 1814 | 2   | 1451.2 |
| 7896 | 457 | 1961 | 1   | 784.4  |
| 7897 | 608 | 1017 | 8   | 3254.4 |
| 7898 | 583 | 2773 | 5   | 5546.0 |

[7899 rows x 10 columns]

- `df[['Order ID','Customer ID','State','City','Category','Clothing Type','Product ID','Price','Quantity','Sales Profit']]`

|                 | Order ID | Customer ID | State         | City       | Category |
|-----------------|----------|-------------|---------------|------------|----------|
| Clothing Type \ |          |             |               |            |          |
| 0 Dresses       | 88240    | 233084      | Karnataka     | Jalna      | Women    |
| 1 Skirts        | 78145    | 926472      | Gujarat       | Patna      | Kids     |
| 2 Hoodies       | 33363    | 853255      | Uttar Pradesh | Kolkata    | Men      |
| 3 Dresses       | 46682    | 106146      | West Bengal   | Kolkata    | Women    |
| 4 Dresses       | 58242    | 264070      | West Bengal   | Guwahati   | Men      |
| ...             | ...      | ...         | ...           | ...        | ...      |
| ...             |          |             |               |            |          |
| 7894 Jeans      | 39056    | 591993      | Uttar Pradesh | Chandigarh | Kids     |
| 7895 Jackets    | 85486    | 822244      | Uttar Pradesh | Aurangabad | Kids     |
| 7896 T-shirts   | 78200    | 268376      | Tamil Nadu    | Pune       | Kids     |
| 7897 Shoes      | 19883    | 766283      | Delhi         | Madurai    | Men      |
| 7898 Shirts     | 91451    | 541226      | Gujarat       | Bengaluru  | Women    |

|      | Product ID | Price | Quantity | Sales  | Profit |
|------|------------|-------|----------|--------|--------|
| 0    | 354        | 1958  | 5        | 3916.0 |        |
| 1    | 741        | 2078  | 1        | 831.2  |        |
| 2    | 607        | 1445  | 2        | 1156.0 |        |
| 3    | 991        | 2469  | 6        | 5925.6 |        |
| 4    | 479        | 1105  | 6        | 2652.0 |        |
| ...  | ...        | ...   | ...      | ...    |        |
| 7894 | 262        | 2838  | 1        | 1135.2 |        |
| 7895 | 537        | 1814  | 2        | 1451.2 |        |
| 7896 | 457        | 1961  | 1        | 784.4  |        |
| 7897 | 608        | 1017  | 8        | 3254.4 |        |
| 7898 | 583        | 2773  | 5        | 5546.0 |        |

[7899 rows x 10 columns]

- `df['Discounted price']=df['Price']*0.7`
- `df`

|         | Store Type \ | Country | State         | City       | Category | Clothing |
|---------|--------------|---------|---------------|------------|----------|----------|
| 0       | Zudio        | India   | Karnataka     | Jalna      | Women    |          |
| Dresses |              |         |               |            |          |          |
| 1       | Zudio        | India   | Gujarat       | Patna      | Kids     |          |
| Skirts  |              |         |               |            |          |          |
| 2       | Zudio        | India   | Uttar Pradesh | Kolkata    | Men      |          |
| Hoodies |              |         |               |            |          |          |
| 3       | Zudio        | India   | West Bengal   | Kolkata    | Women    |          |
| Dresses |              |         |               |            |          |          |
| 4       | Zudio        | India   | West Bengal   | Guwahati   | Men      |          |
| Dresses |              |         |               |            |          |          |
| ...     | ...          | ...     | ...           | ...        | ...      |          |
| ...     |              |         |               |            |          |          |
| 7894    | Zudio        | India   | Uttar Pradesh | Chandigarh | Kids     |          |
| Jeans   |              |         |               |            |          |          |
| 7895    | Zudio        | India   | Uttar Pradesh | Aurangabad | Kids     |          |
| Jackets |              |         |               |            |          |          |
| 7896    | Zudio        | India   | Tamil Nadu    | Pune       | Kids     | T-       |
| shirts  |              |         |               |            |          |          |
| 7897    | Zudio        | India   | Delhi         | Madurai    | Men      |          |
| Shoes   |              |         |               |            |          |          |
| 7898    | Zudio        | India   | Gujarat       | Bengaluru  | Women    |          |
| Shirts  |              |         |               |            |          |          |

|            | Store Number | Postal Code | Store Type | Store Open Date | ... |
|------------|--------------|-------------|------------|-----------------|-----|
| Order ID \ |              |             |            |                 |     |
| 0          | 30           | 411084      | Owned      | 2022-06-04      | ... |
| 88240      |              |             |            |                 |     |
| 1          | 48           | 404562      | Owned      | 2020-12-19      | ... |
| 78145      |              |             |            |                 |     |
| 2          | 97           | 437773      | Rented     | 2023-09-04      | ... |
| 33363      |              |             |            |                 |     |
| 3          | 93           | 431725      | Owned      | 2024-04-11      | ... |
| 46682      |              |             |            |                 |     |
| 4          | 51           | 415370      | Owned      | 2022-05-29      | ... |
| 58242      |              |             |            |                 |     |
| ...        | ...          | ...         | ...        | ...             | ... |
| ...        |              |             |            |                 |     |
| 7894       | 32           | 431437      | Owned      | 2024-04-24      | ... |
| 39056      |              |             |            |                 |     |
| 7895       | 52           | 424643      | Owned      | 2024-02-03      | ... |
| 85486      |              |             |            |                 |     |
| 7896       | 81           | 412057      | Owned      | 2021-04-11      | ... |
| 78200      |              |             |            |                 |     |
| 7897       | 58           | 405203      | Rented     | 2022-06-17      | ... |
| 19883      |              |             |            |                 |     |
| 7898       | 20           | 429823      | Owned      | 2023-02-08      | ... |
| 91451      |              |             |            |                 |     |

|              | Order Date | Month    | Customer ID | Customer Name  |
|--------------|------------|----------|-------------|----------------|
| Product ID \ | Price      |          |             |                |
| 0            | 2024-11-06 | November | 233084      | Michele Ochoa  |
| 354          | 1958       |          |             |                |
| 1            | 2024-06-17 | June     | 926472      | Daniel Jimenez |
| 741          | 2078       |          |             |                |
| 2            | 2024-08-17 | August   | 853255      | Steven Davis   |
| 607          | 1445       |          |             |                |

|      |            |           |        |                  |
|------|------------|-----------|--------|------------------|
| 3    | 2024-03-27 | March     | 106146 | Derek Orozco     |
| 991  | 2469       |           |        |                  |
| 4    | 2024-04-08 | April     | 264070 | Victor Arnold    |
| 479  | 1105       |           |        |                  |
| ...  | ...        | ...       | ...    | ...              |
| ...  | ...        |           |        |                  |
| 7894 | 2024-09-27 | September | 591993 | Tracey Andrews   |
| 262  | 2838       |           |        |                  |
| 7895 | 2024-03-16 | March     | 822244 | Linda Wallace    |
| 537  | 1814       |           |        |                  |
| 7896 | 2024-12-02 | December  | 268376 | Brandon Baker    |
| 457  | 1961       |           |        |                  |
| 7897 | 2024-07-29 | July      | 766283 | John Lewis       |
| 608  | 1017       |           |        |                  |
| 7898 | 2024-04-08 | April     | 541226 | Nicholas Salazar |
| 583  | 2773       |           |        |                  |

|      | Quantity | Sales | Profit | Discounted price |
|------|----------|-------|--------|------------------|
| 0    | 5        |       | 3916.0 | 1370.6           |
| 1    | 1        |       | 831.2  | 1454.6           |
| 2    | 2        |       | 1156.0 | 1011.5           |
| 3    | 6        |       | 5925.6 | 1728.3           |
| 4    | 6        |       | 2652.0 | 773.5            |
| ...  | ...      |       | ...    | ...              |
| 7894 | 1        |       | 1135.2 | 1986.6           |
| 7895 | 2        |       | 1451.2 | 1269.8           |
| 7896 | 1        |       | 784.4  | 1372.7           |
| 7897 | 8        |       | 3254.4 | 711.9            |
| 7898 | 5        |       | 5546.0 | 1941.1           |

[7899 rows x 29 columns]

- `df.drop(columns='Discounted price',inplace=True)`

- 

df

- |         | Store | Country | State         | City       | Category | Clothing |
|---------|-------|---------|---------------|------------|----------|----------|
| Type \  |       |         |               |            |          |          |
| 0       | Zudio | India   | Karnataka     | Jalna      | Women    |          |
| Dresses |       |         |               |            |          |          |
| 1       | Zudio | India   | Gujarat       | Patna      | Kids     |          |
| Skirts  |       |         |               |            |          |          |
| 2       | Zudio | India   | Uttar Pradesh | Kolkata    | Men      |          |
| Hoodies |       |         |               |            |          |          |
| 3       | Zudio | India   | West Bengal   | Kolkata    | Women    |          |
| Dresses |       |         |               |            |          |          |
| 4       | Zudio | India   | West Bengal   | Guwahati   | Men      |          |
| Dresses |       |         |               |            |          |          |
| ...     | ...   | ...     | ...           | ...        | ...      | ...      |
| ...     |       |         |               |            |          |          |
| 7894    | Zudio | India   | Uttar Pradesh | Chandigarh | Kids     |          |
| Jeans   |       |         |               |            |          |          |
| 7895    | Zudio | India   | Uttar Pradesh | Aurangabad | Kids     |          |
| Jackets |       |         |               |            |          |          |
| 7896    | Zudio | India   | Tamil Nadu    | Pune       | Kids     | T-       |
| shirts  |       |         |               |            |          |          |
| 7897    | Zudio | India   | Delhi         | Madurai    | Men      |          |

Shoes  
7898 Zudio India Gujarat Bengaluru Women  
Shirts

|      | Store Number | Postal Code | Store Type | Store Open Date | ... |
|------|--------------|-------------|------------|-----------------|-----|
| \    |              |             |            |                 |     |
| 0    | 30           | 411084      | Owned      | 2022-06-04      | ... |
| 1    | 48           | 404562      | Owned      | 2020-12-19      | ... |
| 2    | 97           | 437773      | Rented     | 2023-09-04      | ... |
| 3    | 93           | 431725      | Owned      | 2024-04-11      | ... |
| 4    | 51           | 415370      | Owned      | 2022-05-29      | ... |
| ...  | ...          | ...         | ...        | ...             | ... |
| 7894 | 32           | 431437      | Owned      | 2024-04-24      | ... |
| 7895 | 52           | 424643      | Owned      | 2024-02-03      | ... |
| 7896 | 81           | 412057      | Owned      | 2021-04-11      | ... |
| 7897 | 58           | 405203      | Rented     | 2022-06-17      | ... |
| 7898 | 20           | 429823      | Owned      | 2023-02-08      | ... |

| ID     | Security Features | Order ID | Order Date | Month     | Customer |
|--------|-------------------|----------|------------|-----------|----------|
| \      |                   |          |            |           |          |
| 0      | Alarm             | 88240    | 2024-11-06 | November  |          |
| 233084 |                   |          |            |           |          |
| 1      | Alarm             | 78145    | 2024-06-17 | June      |          |
| 926472 |                   |          |            |           |          |
| 2      | CCTV              | 33363    | 2024-08-17 | August    |          |
| 853255 |                   |          |            |           |          |
| 3      | CCTV              | 46682    | 2024-03-27 | March     |          |
| 106146 |                   |          |            |           |          |
| 4      | CCTV, Alarm       | 58242    | 2024-04-08 | April     |          |
| 264070 |                   |          |            |           |          |
| ...    | ...               | ...      | ...        | ...       |          |
| ...    |                   |          |            |           |          |
| 7894   | CCTV, Alarm       | 39056    | 2024-09-27 | September |          |
| 591993 |                   |          |            |           |          |
| 7895   | Alarm             | 85486    | 2024-03-16 | March     |          |
| 822244 |                   |          |            |           |          |
| 7896   | CCTV, Alarm       | 78200    | 2024-12-02 | December  |          |
| 268376 |                   |          |            |           |          |
| 7897   | CCTV              | 19883    | 2024-07-29 | July      |          |
| 766283 |                   |          |            |           |          |
| 7898   | CCTV, Alarm       | 91451    | 2024-04-08 | April     |          |
| 541226 |                   |          |            |           |          |

|      | Customer Name    | Product ID | Price | Quantity | Sales | Profit |
|------|------------------|------------|-------|----------|-------|--------|
| 0    | Michele Ochoa    | 354        | 1958  | 5        |       | 3916.0 |
| 1    | Daniel Jimenez   | 741        | 2078  | 1        |       | 831.2  |
| 2    | Steven Davis     | 607        | 1445  | 2        |       | 1156.0 |
| 3    | Derek Orozco     | 991        | 2469  | 6        |       | 5925.6 |
| 4    | Victor Arnold    | 479        | 1105  | 6        |       | 2652.0 |
| ...  | ...              | ...        | ...   | ...      |       | ...    |
| 7894 | Tracey Andrews   | 262        | 2838  | 1        |       | 1135.2 |
| 7895 | Linda Wallace    | 537        | 1814  | 2        |       | 1451.2 |
| 7896 | Brandon Baker    | 457        | 1961  | 1        |       | 784.4  |
| 7897 | John Lewis       | 608        | 1017  | 8        |       | 3254.4 |
| 7898 | Nicholas Salazar | 583        | 2773  | 5        |       | 5546.0 |

[7899 rows x 28 columns]

- `df.set_index(['Order ID','Category'],inplace=True)`

- `df`

|                                   | Store                     | Country     | State         | City       |
|-----------------------------------|---------------------------|-------------|---------------|------------|
| Clothing Type \ Order ID Category |                           |             |               |            |
| 88240 Women Dresses               | Zudio                     | India       | Karnataka     | Jalna      |
| 78145 Kids Skirts                 | Zudio                     | India       | Gujarat       | Patna      |
| 33363 Men Hoodies                 | Zudio                     | India       | Uttar Pradesh | Kolkata    |
| 46682 Women Dresses               | Zudio                     | India       | West Bengal   | Kolkata    |
| 58242 Men Dresses                 | Zudio                     | India       | West Bengal   | Guwahati   |
| ...                               | ...                       | ...         | ...           | ...        |
| ...                               |                           |             |               |            |
| 39056 Kids Jeans                  | Zudio                     | India       | Uttar Pradesh | Chandigarh |
| 85486 Kids Jackets                | Zudio                     | India       | Uttar Pradesh | Aurangabad |
| 78200 Kids T-shirts               | Zudio                     | India       | Tamil Nadu    | Pune       |
| 19883 Men Shoes                   | Zudio                     | India       | Delhi         | Madurai    |
| 91451 Women Shirts                | Zudio                     | India       | Gujarat       | Bengaluru  |
|                                   |                           |             |               |            |
|                                   | Store Number              | Postal Code | Store Type    | Store      |
| Open Date \ Order ID Category     |                           |             |               |            |
| 88240 Women 2022-06-04            | 30                        | 411084      | Owned         |            |
| 78145 Kids 2020-12-19             | 48                        | 404562      | Owned         |            |
| 33363 Men 2023-09-04              | 97                        | 437773      | Rented        |            |
| 46682 Women 2024-04-11            | 93                        | 431725      | Owned         |            |
| 58242 Men 2022-05-29              | 51                        | 415370      | Owned         |            |
| ...                               | ...                       | ...         | ...           |            |
| ...                               |                           |             |               |            |
| 39056 Kids 2024-04-24             | 32                        | 431437      | Owned         |            |
| 85486 Kids 2024-02-03             | 52                        | 424643      | Owned         |            |
| 78200 Kids 2021-04-11             | 81                        | 412057      | Owned         |            |
| 19883 Men 2022-06-17              | 58                        | 405203      | Rented        |            |
| 91451 Women 2023-02-08            | 20                        | 429823      | Owned         |            |
|                                   |                           |             |               |            |
|                                   | Selling Area Size (sq ft) | ...         | Parking       |            |
| Availability \ Order ID Category  |                           |             | ...           |            |

|           |       |      |     |     |
|-----------|-------|------|-----|-----|
| 88240     | Women | 950  | ... | Not |
| Available |       |      |     |     |
| 78145     | Kids  | 1200 | ... | Not |
| Available |       |      |     |     |
| 33363     | Men   | 1100 | ... | Not |
| Available |       |      |     |     |
| 46682     | Women | 1400 | ... | Not |
| Available |       |      |     |     |
| 58242     | Men   | 1400 | ... | Not |
| Available |       |      |     |     |
| ...       |       | ...  | ... |     |
| ...       |       |      |     |     |
| 39056     | Kids  | 1200 | ... | Not |
| Available |       |      |     |     |
| 85486     | Kids  | 950  | ... | Not |
| Available |       |      |     |     |
| 78200     | Kids  | 800  | ... | Not |
| Available |       |      |     |     |
| 19883     | Men   | 1400 | ... | Not |
| Available |       |      |     |     |
| 91451     | Women | 950  | ... | Not |
| Available |       |      |     |     |

| Customer ID \ Order ID | Category | Security Features | Order Date | Month     |
|------------------------|----------|-------------------|------------|-----------|
| 88240                  | Women    | Alarm             | 2024-11-06 | November  |
| 233084                 |          |                   |            |           |
| 78145                  | Kids     | Alarm             | 2024-06-17 | June      |
| 926472                 |          |                   |            |           |
| 33363                  | Men      | CCTV              | 2024-08-17 | August    |
| 853255                 |          |                   |            |           |
| 46682                  | Women    | CCTV              | 2024-03-27 | March     |
| 106146                 |          |                   |            |           |
| 58242                  | Men      | CCTV, Alarm       | 2024-04-08 | April     |
| 264070                 |          |                   |            |           |
| ...                    |          | ...               | ...        | ...       |
| ...                    |          |                   |            |           |
| 39056                  | Kids     | CCTV, Alarm       | 2024-09-27 | September |
| 591993                 |          |                   |            |           |
| 85486                  | Kids     | Alarm             | 2024-03-16 | March     |
| 822244                 |          |                   |            |           |
| 78200                  | Kids     | CCTV, Alarm       | 2024-12-02 | December  |
| 268376                 |          |                   |            |           |
| 19883                  | Men      | CCTV              | 2024-07-29 | July      |
| 766283                 |          |                   |            |           |
| 91451                  | Women    | CCTV, Alarm       | 2024-04-08 | April     |
| 541226                 |          |                   |            |           |

| Sales Profit | Order ID | Category       | Customer Name | Product ID | Price | Quantity |
|--------------|----------|----------------|---------------|------------|-------|----------|
| 88240        | Women    | Michele Ochoa  | 354           | 1958       | 5     |          |
| 3916.0       |          |                |               |            |       |          |
| 78145        | Kids     | Daniel Jimenez | 741           | 2078       | 1     |          |
| 831.2        |          |                |               |            |       |          |
| 33363        | Men      | Steven Davis   | 607           | 1445       | 2     |          |
| 1156.0       |          |                |               |            |       |          |

```
[7899 rows x 26 columns]
```

- | Order ID | Category Type \ | Store       | Country    | State           | City       |
|----------|-----------------|-------------|------------|-----------------|------------|
| 88240    | Women           | Zudio       | India      | Karnataka       | Jalna      |
| 78145    | Kids            | Zudio       | India      | Gujarat         | Patna      |
| 33363    | Men             | Zudio       | India      | Uttar Pradesh   | Kolkata    |
| 46682    | Women           | Zudio       | India      | West Bengal     | Kolkata    |
| 58242    | Men             | Zudio       | India      | West Bengal     | Guwahati   |
| ...      | ...             | ...         | ...        | ...             | ...        |
| 39056    | Kids            | Zudio       | India      | Uttar Pradesh   | Chandigarh |
| 85486    | Kids            | Zudio       | India      | Uttar Pradesh   | Aurangabad |
| 78200    | Kids            | Zudio       | India      | Tamil Nadu      | Pune       |
| 19883    | Men             | Zudio       | India      | Delhi           | Madurai    |
| 91451    | Women           | Zudio       | India      | Gujarat         | Bengaluru  |
| Order ID | Store Number    | Postal Code | Store Type | Store Open Date |            |
| ...      |                 |             |            |                 |            |
| 88240    | 30              | 411084      | Owned      | 2022-06-04      |            |
| ...      |                 |             |            |                 |            |
| 78145    | 48              | 404562      | Owned      | 2020-12-19      |            |
| ...      |                 |             |            |                 |            |
| 33363    | 97              | 437773      | Rented     | 2023-09-04      |            |
| ...      |                 |             |            |                 |            |



|       |     |        |        |            |
|-------|-----|--------|--------|------------|
| 46682 | 93  | 431725 | Owned  | 2024-04-11 |
| ...   |     |        |        |            |
| 58242 | 51  | 415370 | Owned  | 2022-05-29 |
| ...   |     |        |        |            |
| ...   | ... | ...    | ...    | ...        |
| ...   |     |        |        |            |
| 39056 | 32  | 431437 | Owned  | 2024-04-24 |
| ...   |     |        |        |            |
| 85486 | 52  | 424643 | Owned  | 2024-02-03 |
| ...   |     |        |        |            |
| 78200 | 81  | 412057 | Owned  | 2021-04-11 |
| ...   |     |        |        |            |
| 19883 | 58  | 405203 | Rented | 2022-06-17 |
| ...   |     |        |        |            |
| 91451 | 20  | 429823 | Owned  | 2023-02-08 |
| ...   |     |        |        |            |

| Month \ Order ID   | Parking Availability | Security Features | Order Date |
|--------------------|----------------------|-------------------|------------|
| 88240<br>November  | Not Available        | Alarm             | 2024-11-06 |
| 78145<br>June      | Not Available        | Alarm             | 2024-06-17 |
| 33363<br>August    | Not Available        | CCTV              | 2024-08-17 |
| 46682<br>March     | Not Available        | CCTV              | 2024-03-27 |
| 58242<br>April     | Not Available        | CCTV, Alarm       | 2024-04-08 |
| ...                | ...                  | ...               | ...        |
| ...                |                      |                   |            |
| 39056<br>September | Not Available        | CCTV, Alarm       | 2024-09-27 |
| 85486<br>March     | Not Available        | Alarm             | 2024-03-16 |
| 78200<br>December  | Not Available        | CCTV, Alarm       | 2024-12-02 |
| 19883<br>July      | Not Available        | CCTV              | 2024-07-29 |
| 91451<br>April     | Not Available        | CCTV, Alarm       | 2024-04-08 |

| Quantity   | Customer ID Sales Profit | Customer Name  | Product ID | Price |
|------------|--------------------------|----------------|------------|-------|
| 88240<br>5 | 233084<br>3916.0         | Michele Ochoa  | 354        | 1958  |
| 78145<br>1 | 926472<br>831.2          | Daniel Jimenez | 741        | 2078  |
| 33363<br>2 | 853255<br>1156.0         | Steven Davis   | 607        | 1445  |
| 46682<br>6 | 106146<br>5925.6         | Derek Orozco   | 991        | 2469  |
| 58242<br>6 | 264070<br>2652.0         | Victor Arnold  | 479        | 1105  |
| ...        | ...                      | ...            | ...        | ...   |
| ...        | ...                      |                |            |       |

|       |        |                  |     |      |
|-------|--------|------------------|-----|------|
| 39056 | 591993 | Tracey Andrews   | 262 | 2838 |
| 1     | 1135.2 |                  |     |      |
| 85486 | 822244 | Linda Wallace    | 537 | 1814 |
| 2     | 1451.2 |                  |     |      |
| 78200 | 268376 | Brandon Baker    | 457 | 1961 |
| 1     | 784.4  |                  |     |      |
| 19883 | 766283 | John Lewis       | 608 | 1017 |
| 8     | 3254.4 |                  |     |      |
| 91451 | 541226 | Nicholas Salazar | 583 | 2773 |
| 5     | 5546.0 |                  |     |      |

[7899 rows x 27 columns]

- `df.loc[df['Quantity']>3,'Quantity']=6`
- `df`

|                          | Category | Store | Country | State         | City       |
|--------------------------|----------|-------|---------|---------------|------------|
| Clothing Type \ Order ID |          |       |         |               |            |
| 88240                    | Women    | Zudio | India   | Karnataka     | Jalna      |
| Dresses                  |          |       |         |               |            |
| 78145                    | Kids     | Zudio | India   | Gujarat       | Patna      |
| Skirts                   |          |       |         |               |            |
| 33363                    | Men      | Zudio | India   | Uttar Pradesh | Kolkata    |
| Hoodies                  |          |       |         |               |            |
| 46682                    | Women    | Zudio | India   | West Bengal   | Kolkata    |
| Dresses                  |          |       |         |               |            |
| 58242                    | Men      | Zudio | India   | West Bengal   | Guwahati   |
| Dresses                  |          |       |         |               |            |
| ...                      | ...      | ...   | ...     | ...           | ...        |
| ...                      |          |       |         |               |            |
| 39056                    | Kids     | Zudio | India   | Uttar Pradesh | Chandigarh |
| Jeans                    |          |       |         |               |            |
| 85486                    | Kids     | Zudio | India   | Uttar Pradesh | Aurangabad |
| Jackets                  |          |       |         |               |            |
| 78200                    | Kids     | Zudio | India   | Tamil Nadu    | Pune       |
| T-shirts                 |          |       |         |               |            |
| 19883                    | Men      | Zudio | India   | Delhi         | Madurai    |
| Shoes                    |          |       |         |               |            |
| 91451                    | Women    | Zudio | India   | Gujarat       | Bengaluru  |
| Shirts                   |          |       |         |               |            |

|                | Store Number | Postal Code | Store Type | Store Open Date |
|----------------|--------------|-------------|------------|-----------------|
| ... \ Order ID |              |             |            |                 |
| ...            |              |             |            |                 |
| 88240          | 30           | 411084      | Owned      | 2022-06-04      |
| ...            |              |             |            |                 |
| 78145          | 48           | 404562      | Owned      | 2020-12-19      |
| ...            |              |             |            |                 |
| 33363          | 97           | 437773      | Rented     | 2023-09-04      |
| ...            |              |             |            |                 |
| 46682          | 93           | 431725      | Owned      | 2024-04-11      |
| ...            |              |             |            |                 |
| 58242          | 51           | 415370      | Owned      | 2022-05-29      |
| ...            |              |             |            |                 |
| ...            | ...          | ...         | ...        | ...             |
| ...            |              |             |            |                 |

|       |    |        |        |            |
|-------|----|--------|--------|------------|
| 39056 | 32 | 431437 | Owned  | 2024-04-24 |
| ...   |    |        |        |            |
| 85486 | 52 | 424643 | Owned  | 2024-02-03 |
| ...   |    |        |        |            |
| 78200 | 81 | 412057 | Owned  | 2021-04-11 |
| ...   |    |        |        |            |
| 19883 | 58 | 405203 | Rented | 2022-06-17 |
| ...   |    |        |        |            |
| 91451 | 20 | 429823 | Owned  | 2023-02-08 |
| ...   |    |        |        |            |

| Month \ Order ID   | Parking Availability | Security Features | Order Date |
|--------------------|----------------------|-------------------|------------|
| 88240<br>November  | Not Available        | Alarm             | 2024-11-06 |
| 78145<br>June      | Not Available        | Alarm             | 2024-06-17 |
| 33363<br>August    | Not Available        | CCTV              | 2024-08-17 |
| 46682<br>March     | Not Available        | CCTV              | 2024-03-27 |
| 58242<br>April     | Not Available        | CCTV, Alarm       | 2024-04-08 |
| ...                | ...                  | ...               | ...        |
| ...                |                      |                   |            |
| 39056<br>September | Not Available        | CCTV, Alarm       | 2024-09-27 |
| 85486<br>March     | Not Available        | Alarm             | 2024-03-16 |
| 78200<br>December  | Not Available        | CCTV, Alarm       | 2024-12-02 |
| 19883<br>July      | Not Available        | CCTV              | 2024-07-29 |
| 91451<br>April     | Not Available        | CCTV, Alarm       | 2024-04-08 |

| Quantity   | Customer ID      | Customer Name  | Product ID | Price |
|------------|------------------|----------------|------------|-------|
| Order ID   | Sales            | Profit         |            |       |
| 88240<br>6 | 233084<br>3916.0 | Michele Ochoa  | 354        | 1958  |
| 78145<br>1 | 926472<br>831.2  | Daniel Jimenez | 741        | 2078  |
| 33363<br>2 | 853255<br>1156.0 | Steven Davis   | 607        | 1445  |
| 46682<br>6 | 106146<br>5925.6 | Derek Orozco   | 991        | 2469  |
| 58242<br>6 | 264070<br>2652.0 | Victor Arnold  | 479        | 1105  |
| ...        | ...              | ...            | ...        | ...   |
| ...        | ...              |                |            |       |
| 39056<br>1 | 591993<br>1135.2 | Tracey Andrews | 262        | 2838  |
| 85486<br>2 | 822244<br>1451.2 | Linda Wallace  | 537        | 1814  |
| 78200<br>1 | 268376<br>784.4  | Brandon Baker  | 457        | 1961  |

|       |        |                  |     |      |
|-------|--------|------------------|-----|------|
| 19883 | 766283 | John Lewis       | 608 | 1017 |
| 6     | 3254.4 |                  |     |      |
| 91451 | 541226 | Nicholas Salazar | 583 | 2773 |
| 6     | 5546.0 |                  |     |      |

[7899 rows x 27 columns]

- `df.iloc[[19,1],[1,3]]`

- |          | Store | State     |
|----------|-------|-----------|
| Order ID |       |           |
| 14350    | Zudio | Rajasthan |
| 78145    | Zudio | Gujarat   |

- `df_dropped=df.dropna()`  
`df_dropped`

- |                          | Category | Store | Country | State         | City       |
|--------------------------|----------|-------|---------|---------------|------------|
| Clothing Type \ Order ID |          |       |         |               |            |
| 88240 Dresses            | Women    | Zudio | India   | Karnataka     | Jalna      |
| 78145 Skirts             | Kids     | Zudio | India   | Gujarat       | Patna      |
| 33363 Hoodies            | Men      | Zudio | India   | Uttar Pradesh | Kolkata    |
| 46682 Dresses            | Women    | Zudio | India   | West Bengal   | Kolkata    |
| 58242 Dresses            | Men      | Zudio | India   | West Bengal   | Guwahati   |
| ...                      | ...      | ...   | ...     | ...           | ...        |
| ...                      |          |       |         |               |            |
| 39056 Jeans              | Kids     | Zudio | India   | Uttar Pradesh | Chandigarh |
| 85486 Jackets            | Kids     | Zudio | India   | Uttar Pradesh | Aurangabad |
| 78200 T-shirts           | Kids     | Zudio | India   | Tamil Nadu    | Pune       |
| 19883 Shoes              | Men      | Zudio | India   | Delhi         | Madurai    |
| 91451 Shirts             | Women    | Zudio | India   | Gujarat       | Bengaluru  |

|                | Store Number | Postal Code | Store Type | Store Open Date |
|----------------|--------------|-------------|------------|-----------------|
| ... \ Order ID |              |             |            |                 |
| ...            |              |             |            |                 |
| 88240          | 30           | 411084      | Owned      | 2022-06-04      |
| ...            |              |             |            |                 |
| 78145          | 48           | 404562      | Owned      | 2020-12-19      |
| ...            |              |             |            |                 |
| 33363          | 97           | 437773      | Rented     | 2023-09-04      |
| ...            |              |             |            |                 |
| 46682          | 93           | 431725      | Owned      | 2024-04-11      |
| ...            |              |             |            |                 |
| 58242          | 51           | 415370      | Owned      | 2022-05-29      |
| ...            |              |             |            |                 |
| ...            | ...          | ...         | ...        | ...             |
| ...            |              |             |            |                 |

|       |    |        |        |            |
|-------|----|--------|--------|------------|
| 39056 | 32 | 431437 | Owned  | 2024-04-24 |
| ...   |    |        |        |            |
| 85486 | 52 | 424643 | Owned  | 2024-02-03 |
| ...   |    |        |        |            |
| 78200 | 81 | 412057 | Owned  | 2021-04-11 |
| ...   |    |        |        |            |
| 19883 | 58 | 405203 | Rented | 2022-06-17 |
| ...   |    |        |        |            |
| 91451 | 20 | 429823 | Owned  | 2023-02-08 |
| ...   |    |        |        |            |

| Month \ Order ID | Parking Availability | Security Features | Order Date |
|------------------|----------------------|-------------------|------------|
| 88240            | Not Available        | Alarm             | 2024-11-06 |
| November         |                      |                   |            |
| 78145            | Not Available        | Alarm             | 2024-06-17 |
| June             |                      |                   |            |
| 33363            | Not Available        | CCTV              | 2024-08-17 |
| August           |                      |                   |            |
| 46682            | Not Available        | CCTV              | 2024-03-27 |
| March            |                      |                   |            |
| 58242            | Not Available        | CCTV, Alarm       | 2024-04-08 |
| April            |                      |                   |            |
| ...              | ...                  | ...               | ...        |
| ...              |                      |                   |            |
| 39056            | Not Available        | CCTV, Alarm       | 2024-09-27 |
| September        |                      |                   |            |
| 85486            | Not Available        | Alarm             | 2024-03-16 |
| March            |                      |                   |            |
| 78200            | Not Available        | CCTV, Alarm       | 2024-12-02 |
| December         |                      |                   |            |
| 19883            | Not Available        | CCTV              | 2024-07-29 |
| July             |                      |                   |            |
| 91451            | Not Available        | CCTV, Alarm       | 2024-04-08 |
| April            |                      |                   |            |

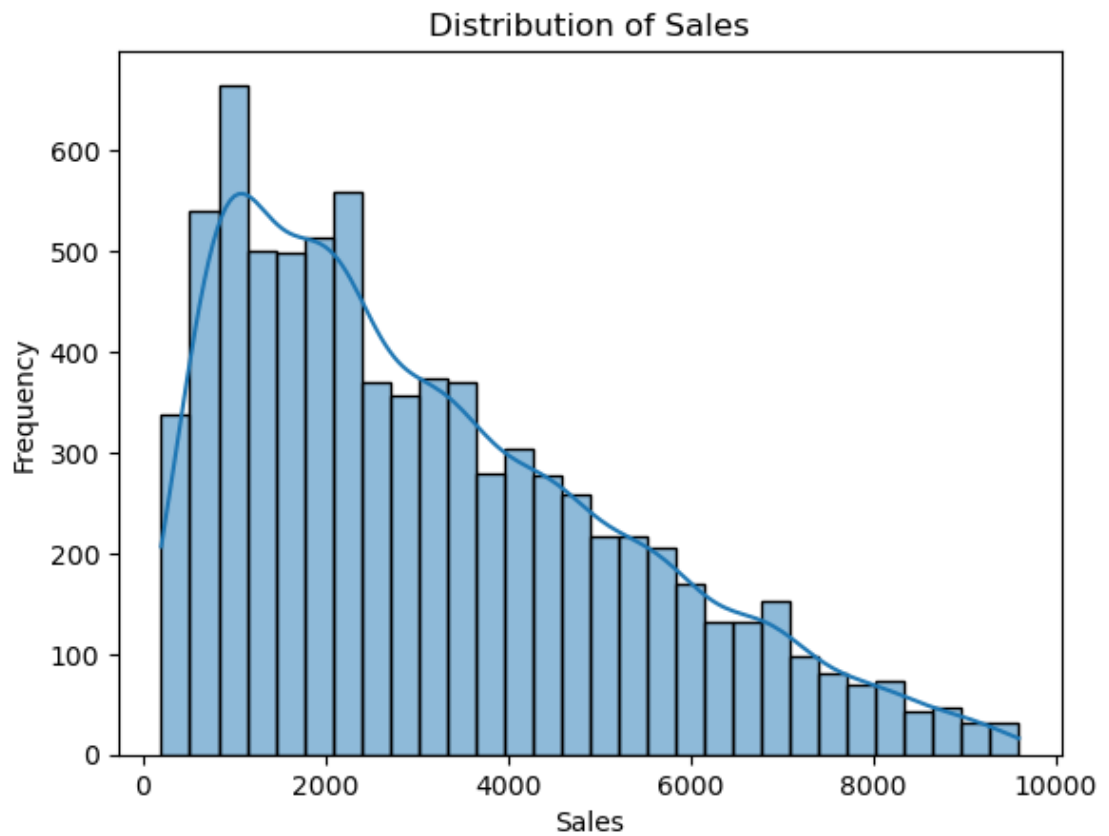
| Quantity | Customer ID | Customer Name  | Product ID | Price |
|----------|-------------|----------------|------------|-------|
| Order ID | Sales       | Profit         |            |       |
| 88240    | 233084      | Michele Ochoa  | 354        | 1958  |
| 6        | 3916.0      |                |            |       |
| 78145    | 926472      | Daniel Jimenez | 741        | 2078  |
| 1        | 831.2       |                |            |       |
| 33363    | 853255      | Steven Davis   | 607        | 1445  |
| 2        | 1156.0      |                |            |       |
| 46682    | 106146      | Derek Orozco   | 991        | 2469  |
| 6        | 5925.6      |                |            |       |
| 58242    | 264070      | Victor Arnold  | 479        | 1105  |
| 6        | 2652.0      |                |            |       |
| ...      | ...         | ...            | ...        | ...   |
| ...      | ...         |                |            |       |
| 39056    | 591993      | Tracey Andrews | 262        | 2838  |
| 1        | 1135.2      |                |            |       |
| 85486    | 822244      | Linda Wallace  | 537        | 1814  |
| 2        | 1451.2      |                |            |       |
| 78200    | 268376      | Brandon Baker  | 457        | 1961  |
| 1        | 784.4       |                |            |       |

|       |        |                  |     |      |
|-------|--------|------------------|-----|------|
| 19883 | 766283 | John Lewis       | 608 | 1017 |
| 6     | 3254.4 |                  |     |      |
| 91451 | 541226 | Nicholas Salazar | 583 | 2773 |
| 6     | 5546.0 |                  |     |      |

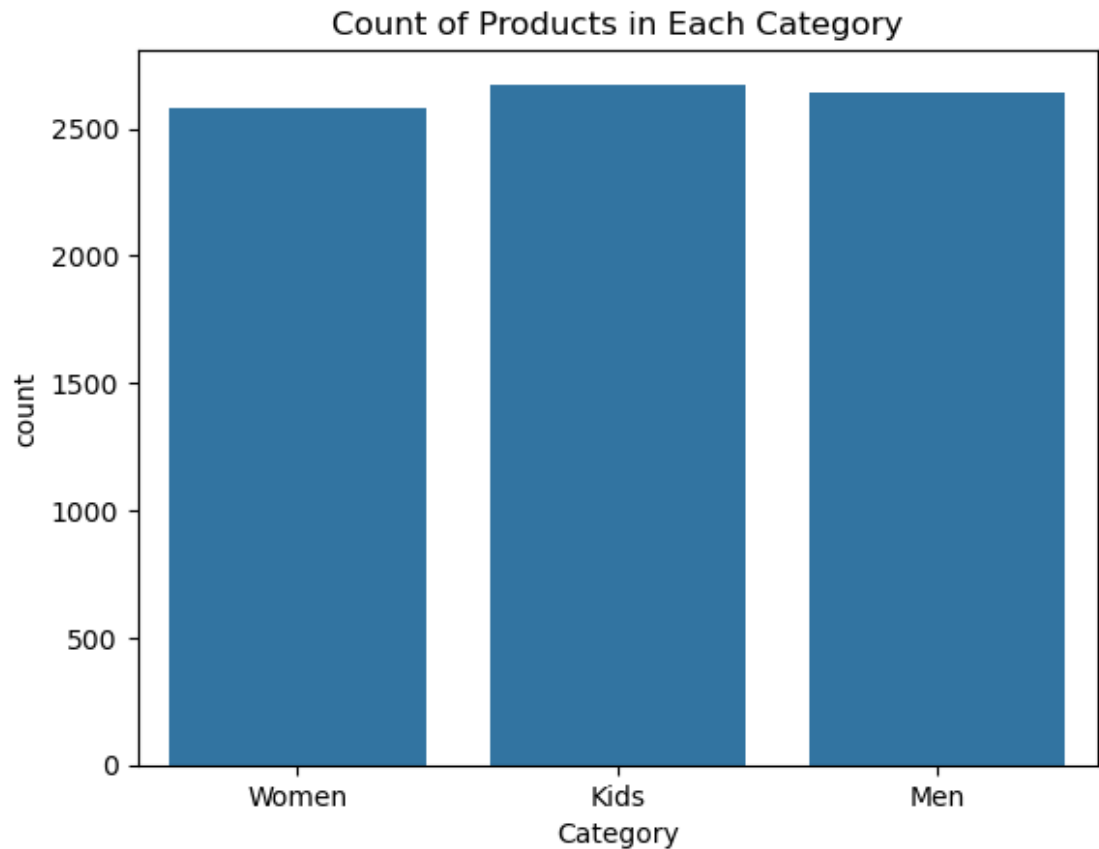
[5861 rows x 27 columns]

- `import matplotlib.pyplot as plt`  
`import seaborn as sns`

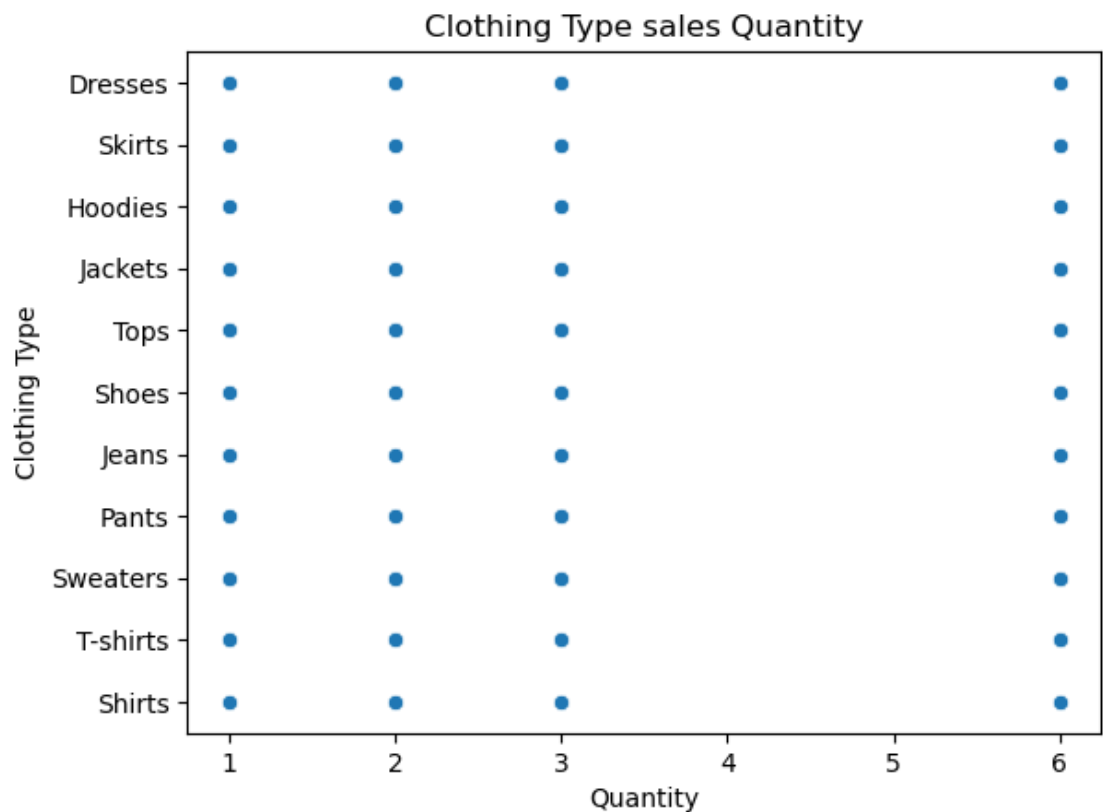
```
Histogram of Sales
sns.histplot(df['Sales Profit'], kde=True)
plt.title("Distribution of Sales")
plt.xlabel("Sales")
plt.ylabel("Frequency")
plt.show()
```



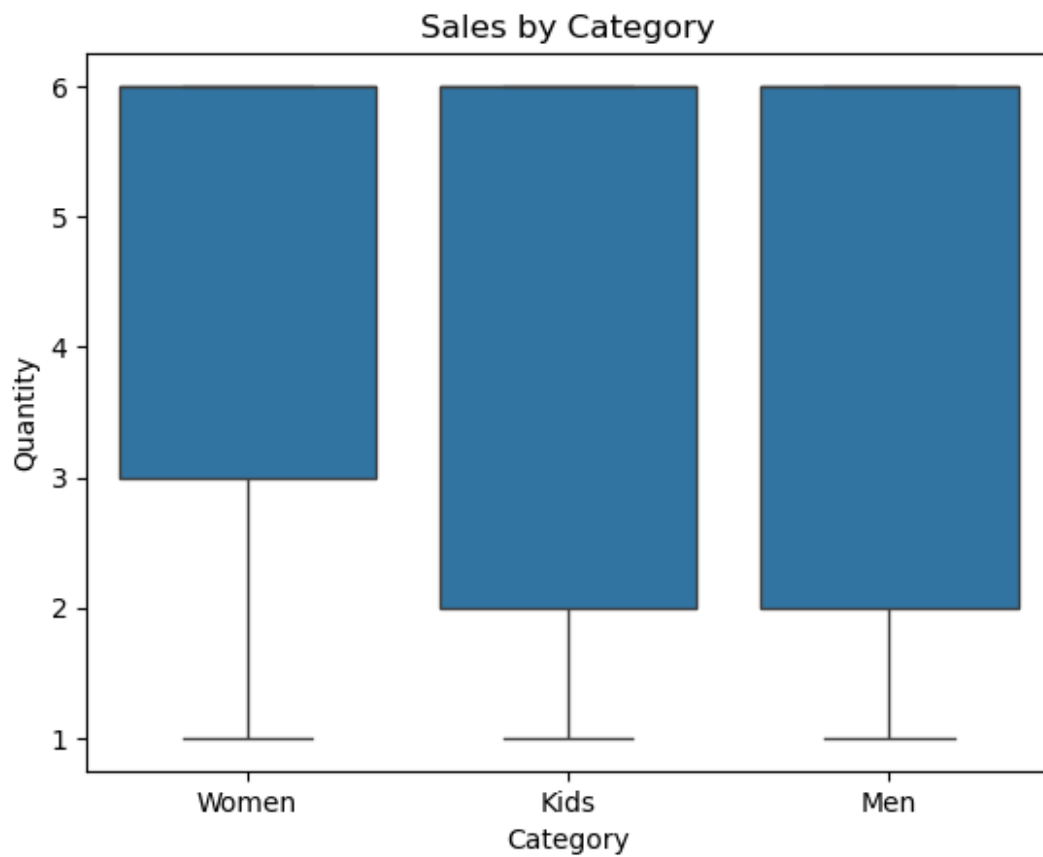
- 
- `sns.countplot(x='Category', data=df)`  
`plt.title("Count of Products in Each Category")`  
`plt.show()`



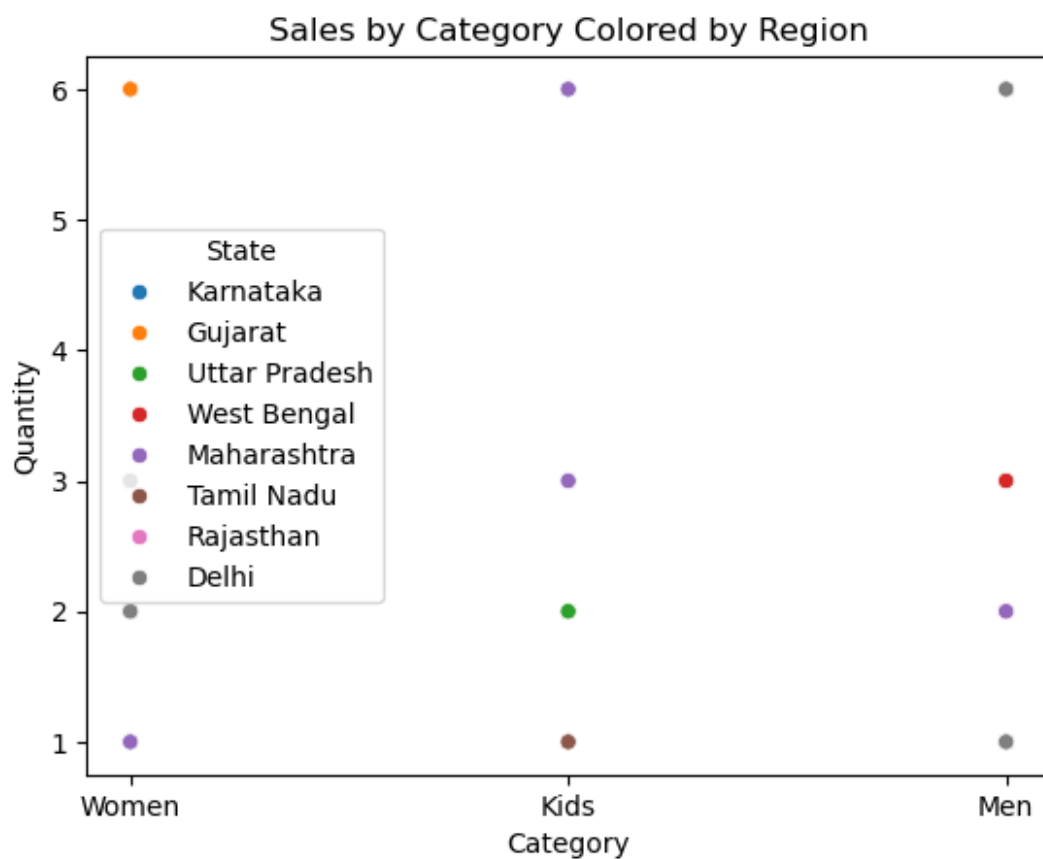
- 
- `sns.scatterplot(x='Quantity', y='Clothing Type', data=df)`  
`plt.title("Clothing Type sales Quantity")`  
`plt.show()`



- 
- `sns.boxplot(x='Category', y='Quantity', data=df)`  
`plt.title("Sales by Category")`  
`plt.show()`



- 
- `sns.scatterplot(x='Category', y='Quantity', hue='State', data=df)`  
`plt.title("Sales by Category Colored by Region")`  
`plt.show()`





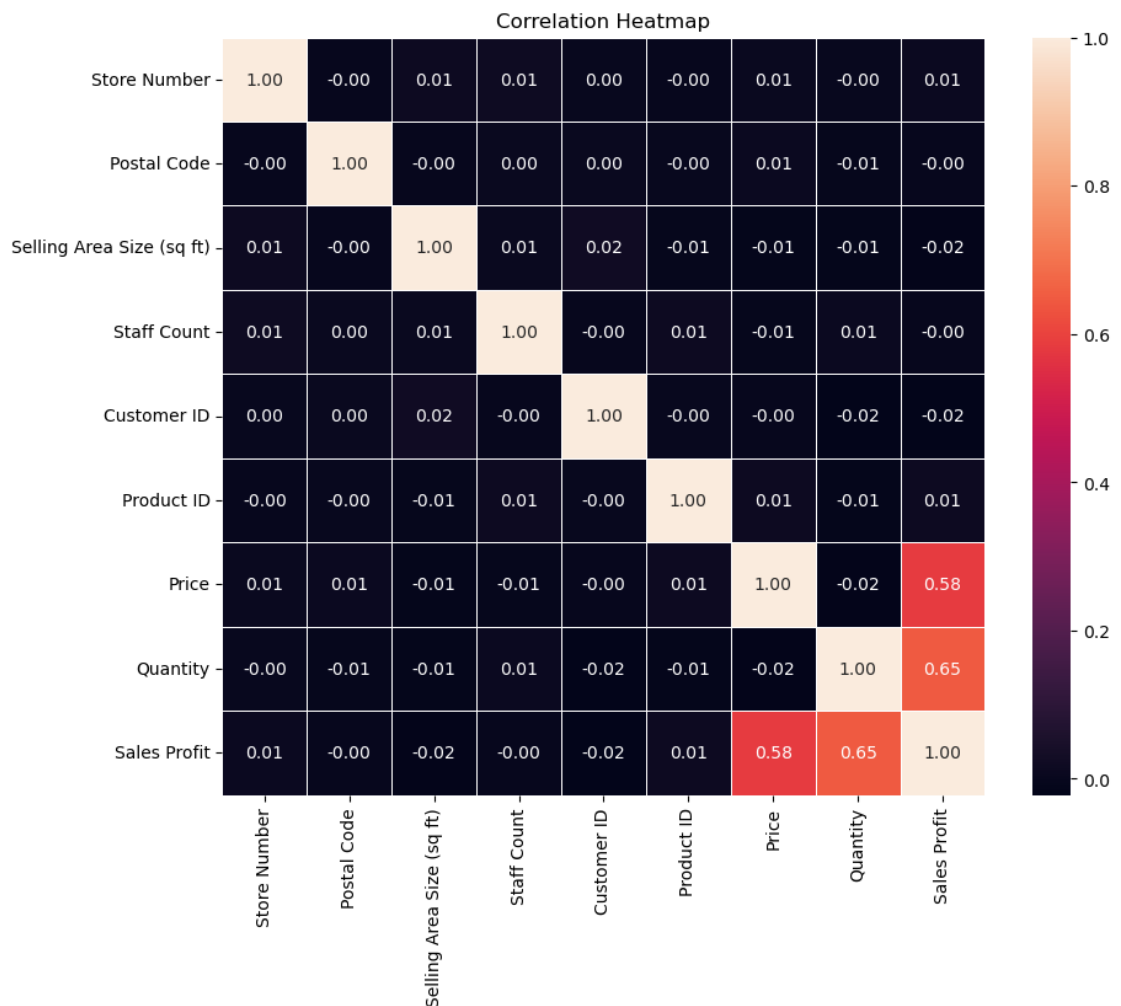
- ```
import seaborn as sns
import matplotlib.pyplot as plt

# Compute the correlation matrix
corr_matrix = df.corr(numeric_only=True) # only use numeric columns

# Set the figure size
plt.figure(figsize=(10, 8))

# Create the heatmap
sns.heatmap(corr_matrix, annot=True, linewidths=0.5, fmt=".2f")

# Add a title
plt.title("Correlation Heatmap")
plt.show()
```



-
- ```
X=df[['Price','Quantity']]
y=df[['Sales Profit']]
```
- X
- | Order ID | Price | Quantity |
|----------|-------|----------|
| 88240    | 1958  | 6        |
| 78145    | 2078  | 1        |
| 33363    | 1445  | 2        |
| 46682    | 2469  | 6        |

|       |      |     |
|-------|------|-----|
| 58242 | 1105 | 6   |
| ...   | ...  | ... |
| 39056 | 2838 | 1   |
| 85486 | 1814 | 2   |
| 78200 | 1961 | 1   |
| 19883 | 1017 | 6   |
| 91451 | 2773 | 6   |

[7899 rows x 2 columns]

- `X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)`
- `from sklearn.linear_model import LinearRegression`  
`model = LinearRegression()`  
`model.fit(X_train, y_train)`
- `LinearRegression()`
- `y_pred = model.predict(X_test)`
- `from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score`
- `mae=mean_absolute_error(y_test,y_pred)`  
`mse=mean_squared_error(y_test,y_pred)`  
`rmse=np.sqrt(mse)`  
`r2=r2_score(y_test,y_pred)`
- `print('mae',mae)`  
`print('mse',mse)`  
`print('rmse',rmse)`  
`print('r2',r2)`
- `mae 808.5041425003592`  
`mse 997028.3628041632`  
`rmse 998.5130759304874`  
`r2 0.7824154686278934`
- `y_pred1 = model.predict(X)`
- `df['y_pred']=y_pred1`
- `df`
- |                          | Category | Store | Country | State         | City       |
|--------------------------|----------|-------|---------|---------------|------------|
| Clothing Type \ Order ID |          |       |         |               |            |
| 88240                    | Women    | Zudio | India   | Karnataka     | Jalna      |
| Dresses                  |          |       |         |               |            |
| 78145                    | Kids     | Zudio | India   | Gujarat       | Patna      |
| Skirts                   |          |       |         |               |            |
| 33363                    | Men      | Zudio | India   | Uttar Pradesh | Kolkata    |
| Hoodies                  |          |       |         |               |            |
| 46682                    | Women    | Zudio | India   | West Bengal   | Kolkata    |
| Dresses                  |          |       |         |               |            |
| 58242                    | Men      | Zudio | India   | West Bengal   | Guwahati   |
| Dresses                  |          |       |         |               |            |
| ...                      | ...      | ...   | ...     | ...           | ...        |
| ...                      |          |       |         |               |            |
| 39056                    | Kids     | Zudio | India   | Uttar Pradesh | Chandigarh |

|          |       |       |       |               |            |  |
|----------|-------|-------|-------|---------------|------------|--|
| Jeans    |       |       |       |               |            |  |
| 85486    | Kids  | Zudio | India | Uttar Pradesh | Aurangabad |  |
| Jackets  |       |       |       |               |            |  |
| 78200    | Kids  | Zudio | India | Tamil Nadu    | Pune       |  |
| T-shirts |       |       |       |               |            |  |
| 19883    | Men   | Zudio | India | Delhi         | Madurai    |  |
| Shoes    |       |       |       |               |            |  |
| 91451    | Women | Zudio | India | Gujarat       | Bengaluru  |  |
| Shirts   |       |       |       |               |            |  |

|          | Store Number | Postal Code | Store Type | Store Open Date |
|----------|--------------|-------------|------------|-----------------|
| ... \    |              |             |            |                 |
| Order ID |              |             |            |                 |
| ...      |              |             |            |                 |
| 88240    | 30           | 411084      | Owned      | 2022-06-04      |
| ...      |              |             |            |                 |
| 78145    | 48           | 404562      | Owned      | 2020-12-19      |
| ...      |              |             |            |                 |
| 33363    | 97           | 437773      | Rented     | 2023-09-04      |
| ...      |              |             |            |                 |
| 46682    | 93           | 431725      | Owned      | 2024-04-11      |
| ...      |              |             |            |                 |
| 58242    | 51           | 415370      | Owned      | 2022-05-29      |
| ...      |              |             |            |                 |
| ...      | ...          | ...         | ...        | ...             |
| ...      |              |             |            |                 |
| 39056    | 32           | 431437      | Owned      | 2024-04-24      |
| ...      |              |             |            |                 |
| 85486    | 52           | 424643      | Owned      | 2024-02-03      |
| ...      |              |             |            |                 |
| 78200    | 81           | 412057      | Owned      | 2021-04-11      |
| ...      |              |             |            |                 |
| 19883    | 58           | 405203      | Rented     | 2022-06-17      |
| ...      |              |             |            |                 |
| 91451    | 20           | 429823      | Owned      | 2023-02-08      |
| ...      |              |             |            |                 |

|          | Security Features | Order Date | Month     | Customer ID |
|----------|-------------------|------------|-----------|-------------|
| \        |                   |            |           |             |
| Order ID |                   |            |           |             |
| 88240    | Alarm             | 2024-11-06 | November  | 233084      |
| 78145    | Alarm             | 2024-06-17 | June      | 926472      |
| 33363    | CCTV              | 2024-08-17 | August    | 853255      |
| 46682    | CCTV              | 2024-03-27 | March     | 106146      |
| 58242    | CCTV, Alarm       | 2024-04-08 | April     | 264070      |
| ...      | ...               | ...        | ...       | ...         |
| 39056    | CCTV, Alarm       | 2024-09-27 | September | 591993      |
| 85486    | Alarm             | 2024-03-16 | March     | 822244      |
| 78200    | CCTV, Alarm       | 2024-12-02 | December  | 268376      |
| 19883    | CCTV              | 2024-07-29 | July      | 766283      |
| 91451    | CCTV, Alarm       | 2024-04-08 | April     | 541226      |

|          | Customer Name  | Product ID | Price | Quantity | Sales |
|----------|----------------|------------|-------|----------|-------|
| Profit \ |                |            |       |          |       |
| Order ID |                |            |       |          |       |
| 88240    | Michele Ochoa  | 354        | 1958  | 6        |       |
| 3916.0   |                |            |       |          |       |
| 78145    | Daniel Jimenez | 741        | 2078  | 1        |       |

|        |                  |     |      |     |
|--------|------------------|-----|------|-----|
| 831.2  |                  |     |      |     |
| 33363  | Steven Davis     | 607 | 1445 | 2   |
| 1156.0 |                  |     |      |     |
| 46682  | Derek Orozco     | 991 | 2469 | 6   |
| 5925.6 |                  |     |      |     |
| 58242  | Victor Arnold    | 479 | 1105 | 6   |
| 2652.0 |                  |     |      |     |
| ...    | ...              | ... | ...  | ... |
| ...    |                  |     |      |     |
| 39056  | Tracey Andrews   | 262 | 2838 | 1   |
| 1135.2 |                  |     |      |     |
| 85486  | Linda Wallace    | 537 | 1814 | 2   |
| 1451.2 |                  |     |      |     |
| 78200  | Brandon Baker    | 457 | 1961 | 1   |
| 784.4  |                  |     |      |     |
| 19883  | John Lewis       | 608 | 1017 | 6   |
| 3254.4 |                  |     |      |     |
| 91451  | Nicholas Salazar | 583 | 2773 | 6   |
| 5546.0 |                  |     |      |     |

|          | y_pred      |
|----------|-------------|
| Order ID |             |
| 88240    | 4572.576201 |
| 78145    | 1241.858072 |
| 33363    | 821.779870  |
| 46682    | 5484.003712 |
| 58242    | 3051.152196 |
| ...      | ...         |
| 39056    | 2597.405837 |
| 85486    | 1479.933982 |
| 78200    | 1033.175061 |
| 19883    | 2894.194034 |
| 91451    | 6026.222818 |

[7899 rows x 28 columns]