Customer Shopping Behavior Analysis

1. Project Overview

This project analyzes customer shopping behavior using transactional data from 3.900 purchase across various product categories. The goal is to uncover the insights into spending patterns, customer segments, product preferences, and subscription behavior to guide strategic business decisions.

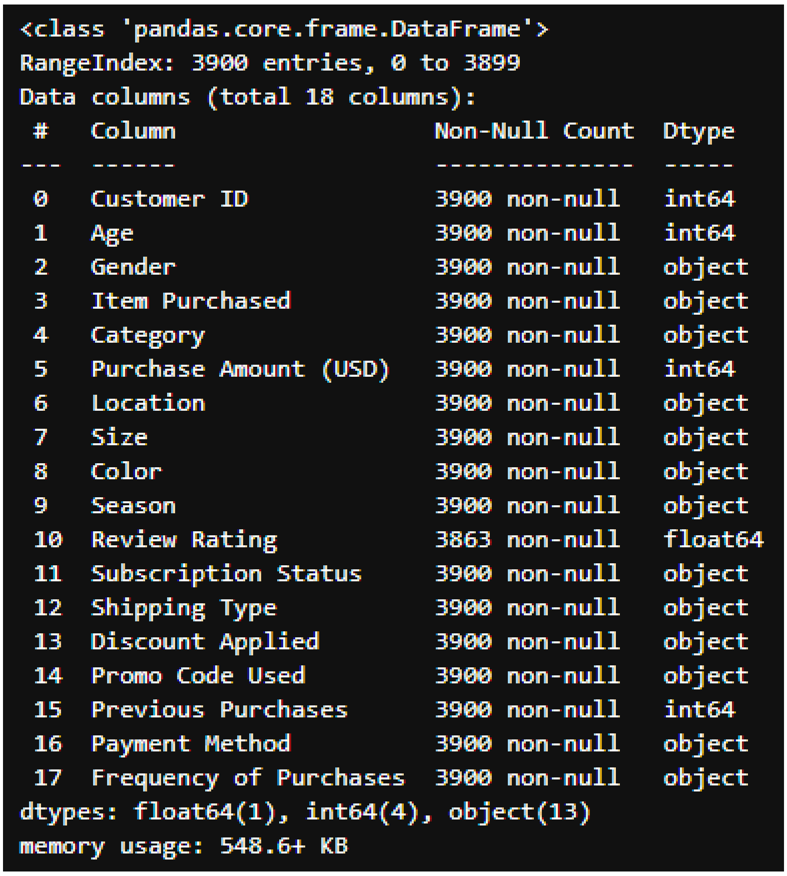
2. Dataset Summary

- Rows: 3,900
- Columns: 18
- Key Features:
  - Customer demographics (Age, Gender, Location, Subscription Status)
  - Purchase details (Item Purchased, Category, Purchase Amount, Season, Size, Color)]
- Shopping behavior (Discount Applied, Promo Code Used, Previous Purchases, Frequency of Purchases, Review Rating, Shipping Type)
- Missing Data: 37 values in Review Rating Column

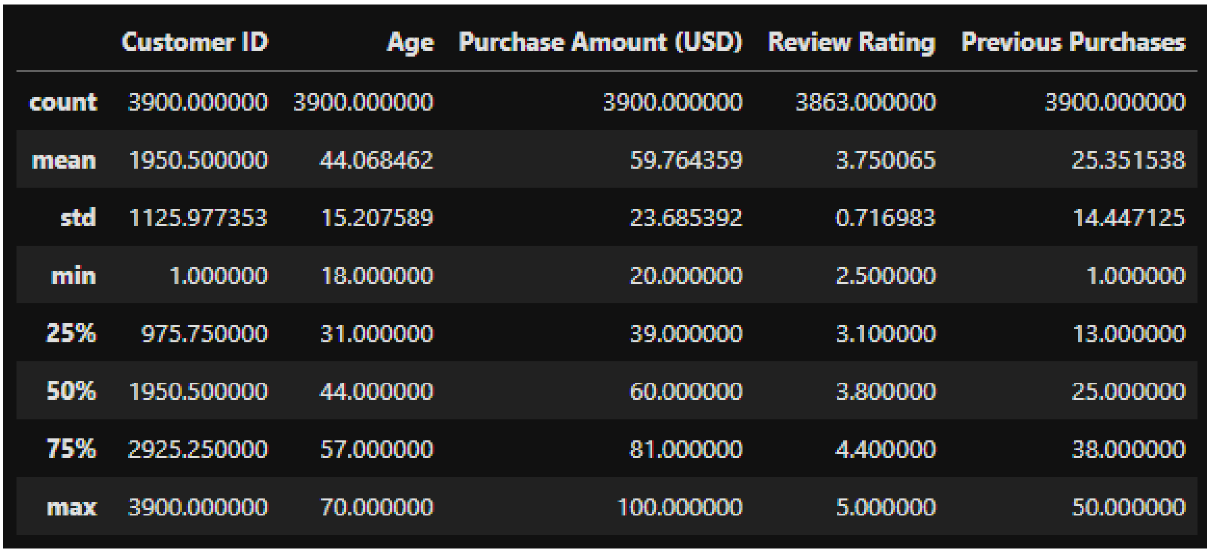
3. Exploratory Data Analysis using Python

We began with data cleaning and preparation in Python:

- **Data Loading:** Imported the dataset using pandas.
- **Initial Exploration:** Used df.info() to check structure and .describe() for summary statistics.



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3900 entries, 0 to 3899
Data columns (total 18 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Customer ID             3900 non-null   int64  
 1   Age                     3900 non-null   int64  
 2   Gender                  3900 non-null   object 
 3   Item Purchased          3900 non-null   object 
 4   Category                3900 non-null   object 
 5   Purchase Amount (USD)   3900 non-null   int64  
 6   Location                3900 non-null   object 
 7   Size                    3900 non-null   object 
 8   Color                   3900 non-null   object 
 9   Season                  3900 non-null   object 
 10  Review Rating           3863 non-null   float64
 11  Subscription Status     3900 non-null   object 
 12  Shipping Type           3900 non-null   object 
 13  Discount Applied        3900 non-null   object 
 14  Promo Code Used         3900 non-null   object 
 15  Previous Purchases      3900 non-null   int64  
 16  Payment Method          3900 non-null   object 
 17  Frequency of Purchases  3900 non-null   object 
dtypes: float64(1), int64(4), object(13)
memory usage: 548.6+ KB
```



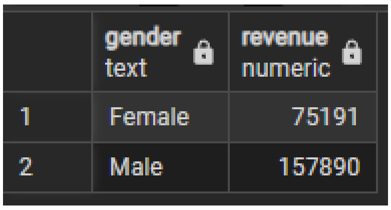
	Customer ID	Age	Purchase Amount (USD)	Review Rating	Previous Purchases
count	3900.000000	3900.000000	3900.000000	3863.000000	3900.000000
mean	1950.500000	44.068462	59.764359	3.750065	25.351538
std	1125.977353	15.207589	23.685392	0.716983	14.447125
min	1.000000	18.000000	20.000000	2.500000	1.000000
25%	975.750000	31.000000	39.000000	3.100000	13.000000
50%	1950.500000	44.000000	60.000000	3.800000	25.000000
75%	2925.250000	57.000000	81.000000	4.400000	38.000000
max	3900.000000	70.000000	100.000000	5.000000	50.000000

- **Missing Data Handling:** Checked for null values and imputed missing values in the Review Rating column using the median rating of each product category.
- **Column Standardization:** Renamed columns to snake case for better readability and documentation.
- **Feature Engineering:**
  Created age_group column by binning customer ages.
  Created purchase_frequency_days column from purchase data.
- **Data Consistency Check:** Verified if discount_applied and promo_code_used were redundant; dropped promo_code.
- **Database Integration:** Connected Python script to PostgreSQL and loaded the cleaned DataFrame into the database for SQL analysis.

4. Data Analysis using SQL (Business Transactions)

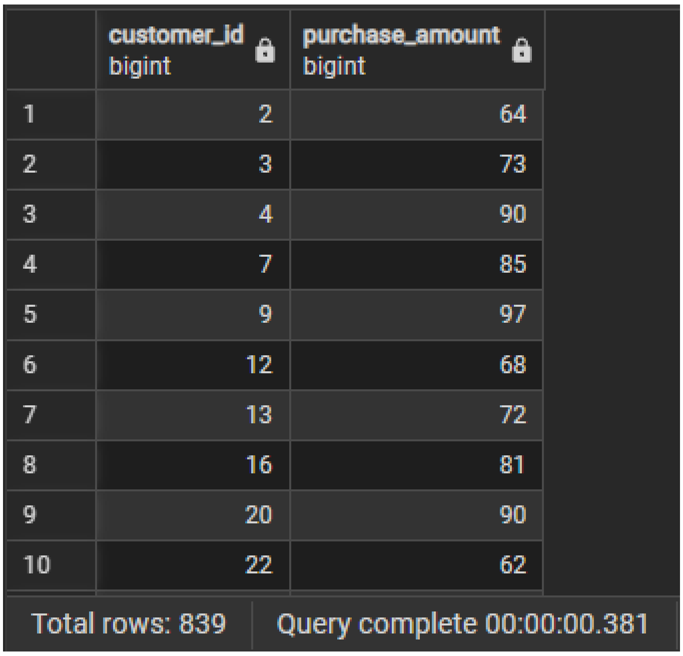
We performed structured analysis in PostgreSQL to answer key business questions:

1. **Revenue by Gender –** Compared total revenue generated by male vs. female customers.



	gender text	revenue numeric
1	Female	75191
2	Male	157890

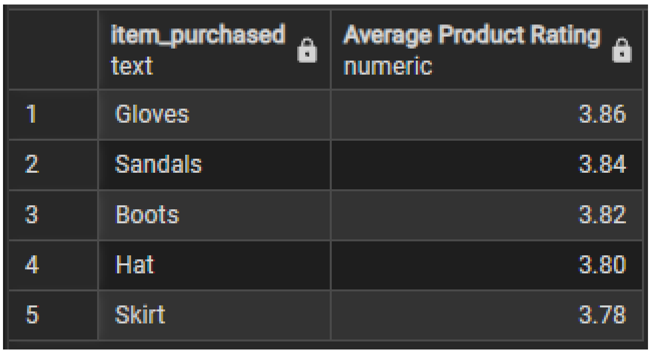
2. **High-Spending Discount Users –** Identified customers who used discounts but still spent above the average purchase amount.



	customer_id bigint	purchase_amount bigint
1	2	64
2	3	73
3	4	90
4	7	85
5	9	97
6	12	68
7	13	72
8	16	81
9	20	90
10	22	62

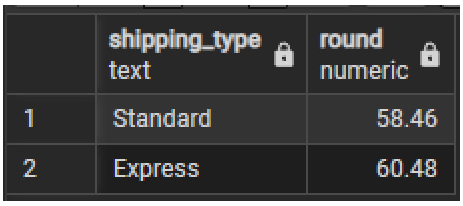
Total rows: 839 Query complete 00:00:00.381

3. **Top 5 Products by Rating –** Found products with the highest average review ratings.



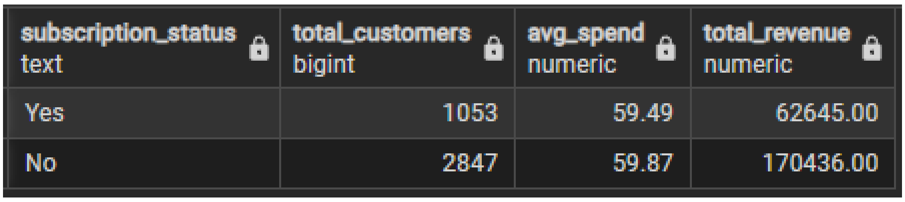
	item_purchased text	Average Product Rating numeric
1	Gloves	3.86
2	Sandals	3.84
3	Boots	3.82
4	Hat	3.80
5	Skirt	3.78

4. **Shipping Type Comparison –** Compared average purchase amounts between Standard and Express Shipping.



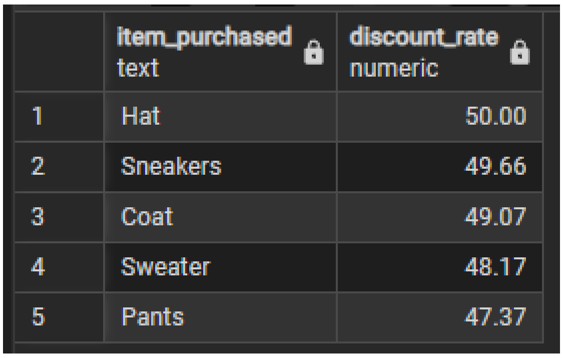
	shipping_type text	round numeric
1	Standard	58.46
2	Express	60.48

5. **Subscribers vs. Non-Subscribers –** Compared average speed and total revenue across subscription status.



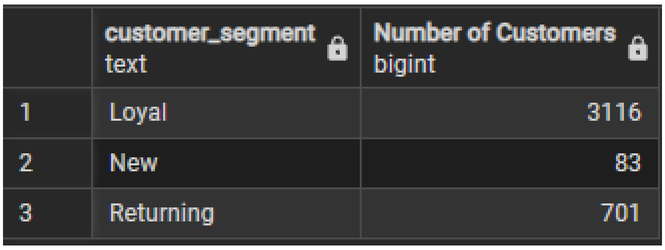
subscription_status text	total_customers bigint	avg_spend numeric	total_revenue numeric
Yes	1053	59.49	62645.00
No	2847	59.87	170436.00

6. **Discount-Dependent Products –** Identified 5 products with the highest percentage of discounted purchases.



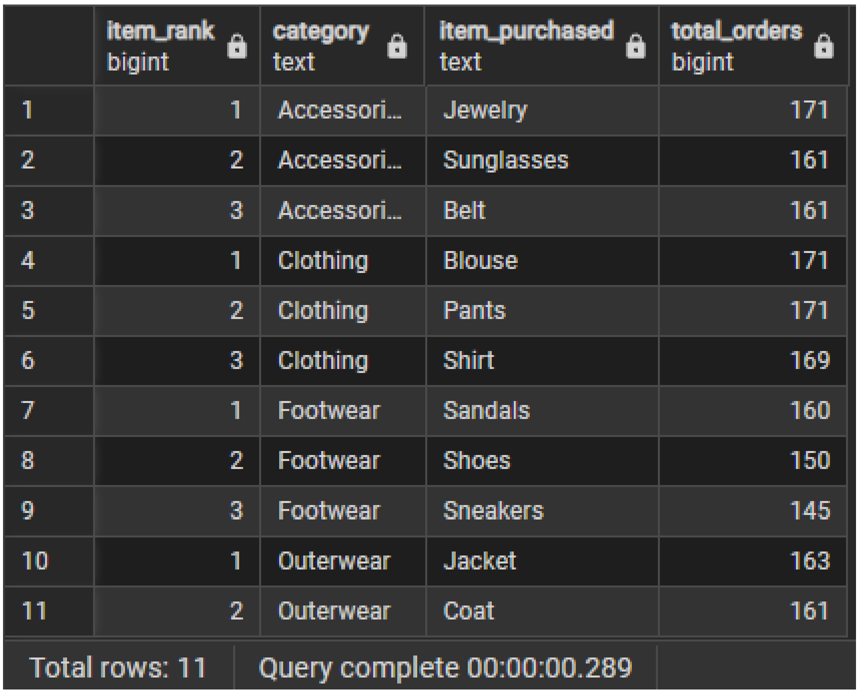
	item_purchased text	discount_rate numeric
1	Hat	50.00
2	Sneakers	49.66
3	Coat	49.07
4	Sweater	48.17
5	Pants	47.37

7. **Customer Segmentation –** Classified customers into New, Returning, and Loyal segments based on purchase history.



	customer_segment text	Number of Customers bigint
1	Loyal	3116
2	New	83
3	Returning	701

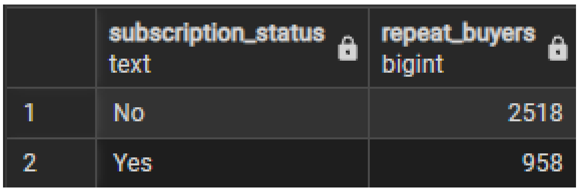
8. **Top 3 Products per Category –** Listed the most purchased products within each category.



	item_rank bigint	category text	item_purchased text	total_orders bigint
1	1	Accessori…	Jewelry	171
2	2	Accessori…	Sunglasses	161
3	3	Accessori…	Belt	161
4	1	Clothing	Blouse	171
5	2	Clothing	Pants	171
6	3	Clothing	Shirt	169
7	1	Footwear	Sandals	160
8	2	Footwear	Shoes	150
9	3	Footwear	Sneakers	145
10	1	Outerwear	Jacket	163
11	2	Outerwear	Coat	161

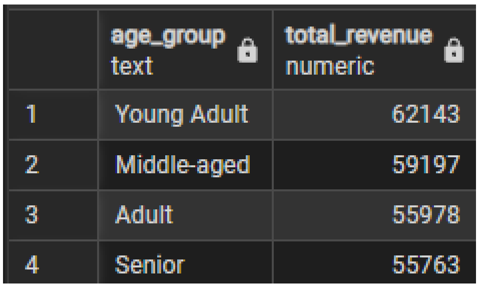
Total rows: 11 Query complete 00:00:00.289

9. **Repeat Buyers & Subscriptions –** Checked whether customers with >5 purchases are more likely to subscribe.



	subscription_status text	repeat_buyers bigint
1	No	2518
2	Yes	958

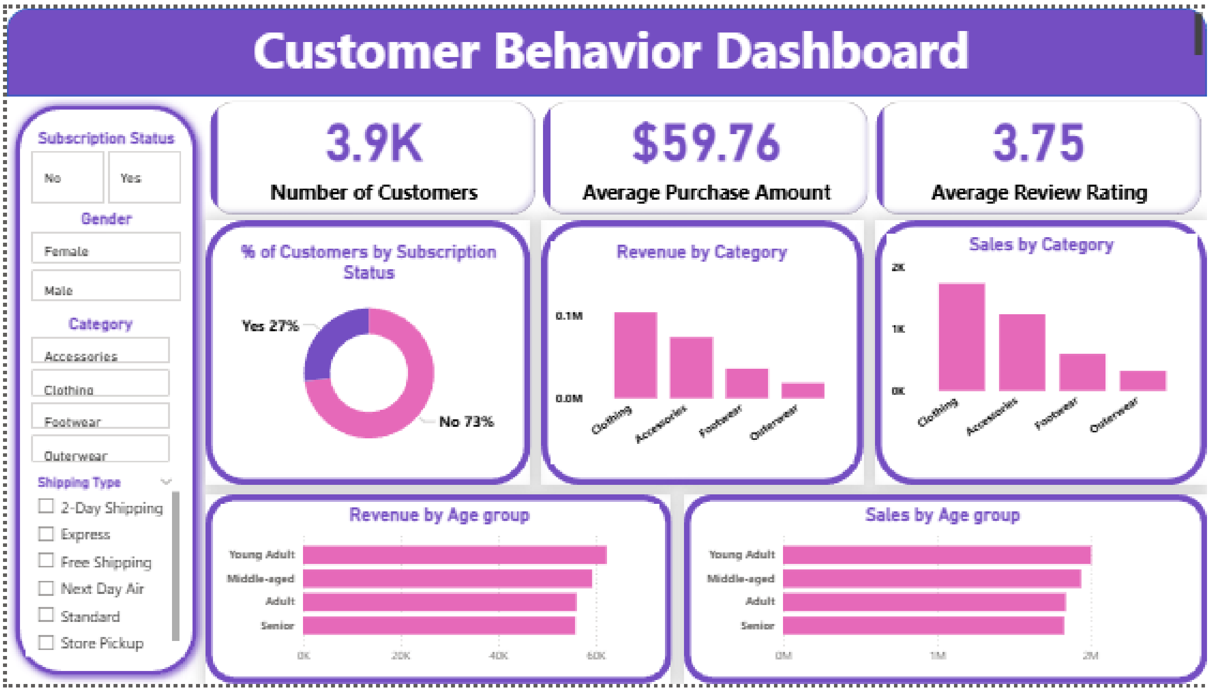
10. **Revenue by Age Group –** Calculated total revenue contribution of each age group.



	age_group text	total_revenue numeric
1	Young Adult	62143
2	Middle-aged	59197
3	Adult	55978
4	Senior	55763

5. Dashboard in Power Bi

Finally, built an interactive dashboard in **Power BI** to present insights visually.



6. Business Recommendations

- **Boost Subscriptions –** Promote exclusive benefits for subscribers.
- **Customer Loyalty Programs –** Reward repeated buyers to move them into the "Loyal" segment.
- **Review Discount Policy –** Balance sales boosts with margin control.
- **Product Positioning –** Highlight top-rated and best-selling products in campaigns.
- **Targeted Marketing –** Focus efforts on high-revenue age groups and express-shipping users.