Customer Shopping Behavior Analysis

1. Project Overview

This project analyze customer shopping behavior using transactional data from 3,900 purchases across various product categories. The goal is to uncover insights into spending patterns, customer segments, product preferences, and subscription behavior to guide strategic business decisions.

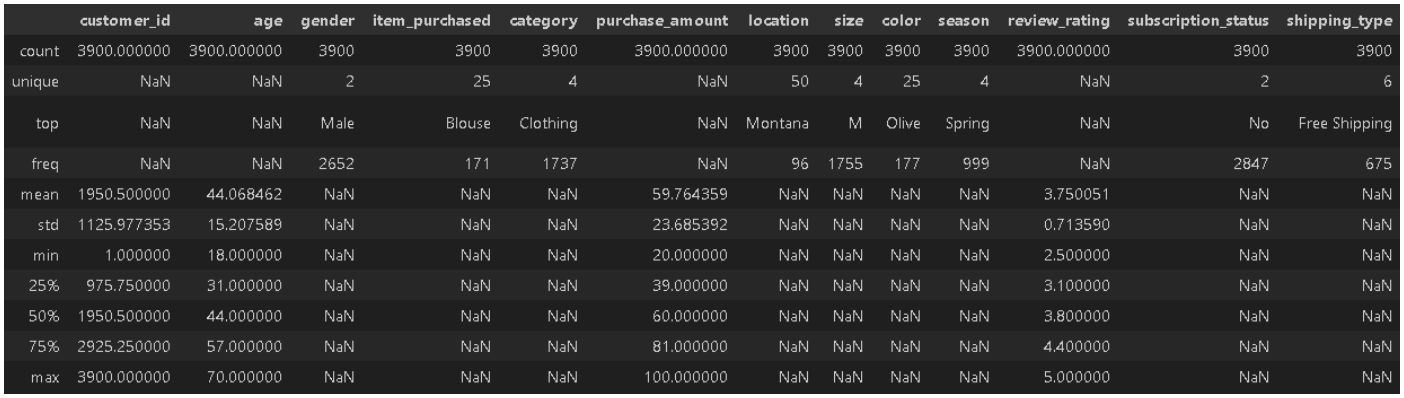
2. Dataset Summary

- 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

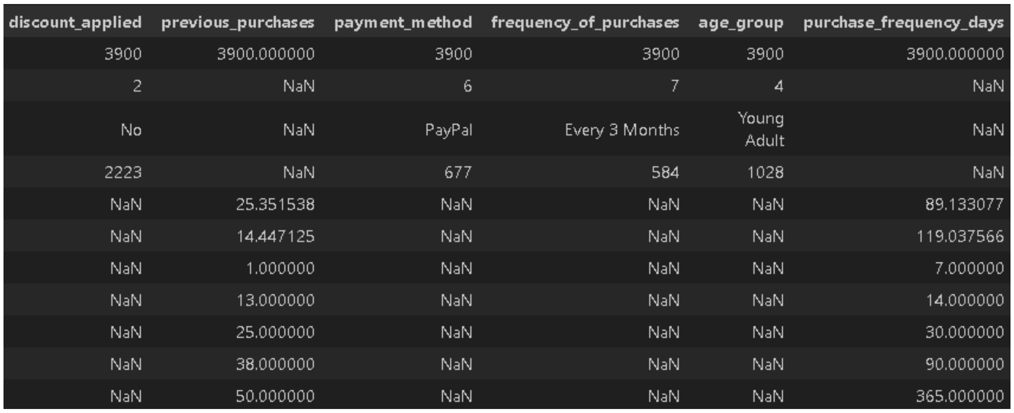
3. Exploratory Data Analysis using Python

We began with data preparation and cleaning in Python:

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



	customer_id	age	gender	item_purchased	category	purchase_amount	location	size	color	season	review_rating	subscription_status	shipping_type
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3900.000000	3900	3900
unique	NaN	NaN	2	25	4	NaN	50	4	25	4	NaN	2	6
top	NaN	NaN	Male	Blouse	Clothing	NaN	Montana	M	Olive	Spring	NaN	No	Free Shipping
freq	NaN	NaN	2652	171	1737	NaN	96	1755	177	999	NaN	2847	675
mean	1950.500000	44.068462	NaN	NaN	NaN	59.764359	NaN	NaN	NaN	NaN	3.750051	NaN	NaN
std	1125.977353	15.207589	NaN	NaN	NaN	23.685392	NaN	NaN	NaN	NaN	0.713590	NaN	NaN
min	1.000000	18.000000	NaN	NaN	NaN	20.000000	NaN	NaN	NaN	NaN	2.500000	NaN	NaN
25%	975.750000	31.000000	NaN	NaN	NaN	39.000000	NaN	NaN	NaN	NaN	3.100000	NaN	NaN
50%	1950.500000	44.000000	NaN	NaN	NaN	60.000000	NaN	NaN	NaN	NaN	3.800000	NaN	NaN
75%	2925.250000	57.000000	NaN	NaN	NaN	81.000000	NaN	NaN	NaN	NaN	4.400000	NaN	NaN
max	3900.000000	70.000000	NaN	NaN	NaN	100.000000	NaN	NaN	NaN	NaN	5.000000	NaN	NaN



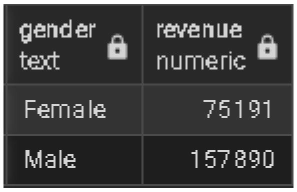
discount_applied	previous_purchases	payment_method	frequency_of_purchases	age_group	purchase_frequency_days
3900	3900.000000	3900	3900	3900	3900.000000
2	NaN	6	7	4	NaN
No	NaN	PayPal	Every 3 Months	Young Adult	NaN
2223	NaN	677	584	1028	NaN
NaN	25.351538	NaN	NaN	NaN	89.133077
NaN	14.447125	NaN	NaN	NaN	119.037566
NaN	1.000000	NaN	NaN	NaN	7.000000
NaN	13.000000	NaN	NaN	NaN	14.000000
NaN	25.000000	NaN	NaN	NaN	30.000000
NaN	38.000000	NaN	NaN	NaN	90.000000
NaN	50.000000	NaN	NaN	NaN	365.000000

- **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 **purchased_frequency_days** column from purchase data.
- **Data Consistency Check:** Verified if discount_applied and promo_code_used were redundant; dropped promo_code_used.
- **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)

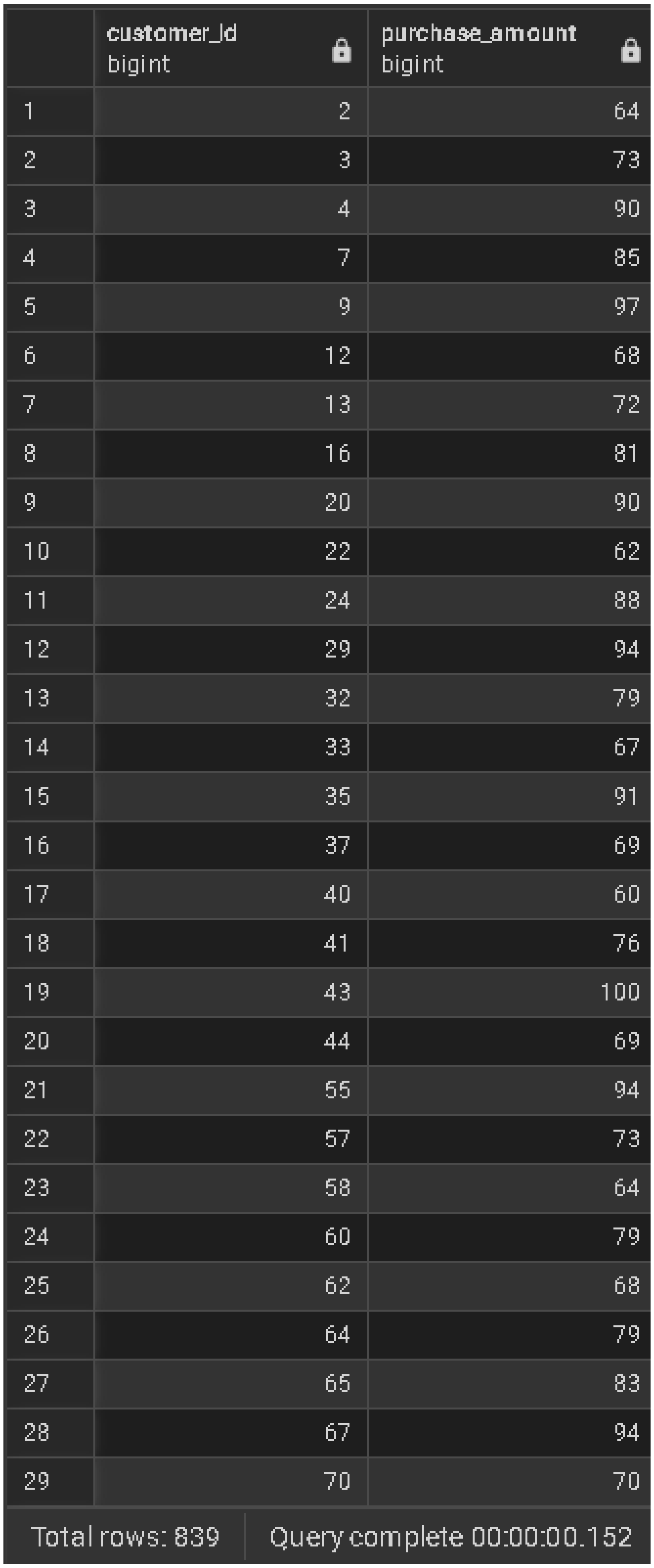
We performed structured analysis in PostgreSQL to answer key business questions:

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



gender text	revenue numeric
Female	75191
Male	157890

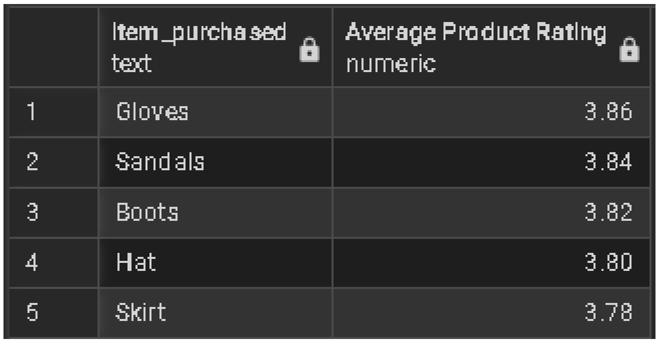
2. **High-Spending Discount Users –** Identified customers who used discounts but still spend above the average purchase amount.



	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
11	24	88
12	29	94
13	32	79
14	33	67
15	35	91
16	37	69
17	40	60
18	41	76
19	43	100
20	44	69
21	55	94
22	57	73
23	58	64
24	60	79
25	62	68
26	64	79
27	65	83
28	67	94
29	70	70

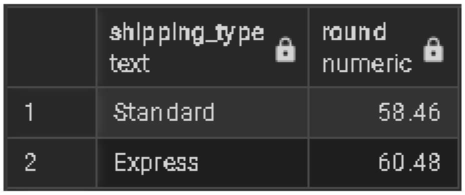
Total rows: 839 Query complete 00:00:00.152

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



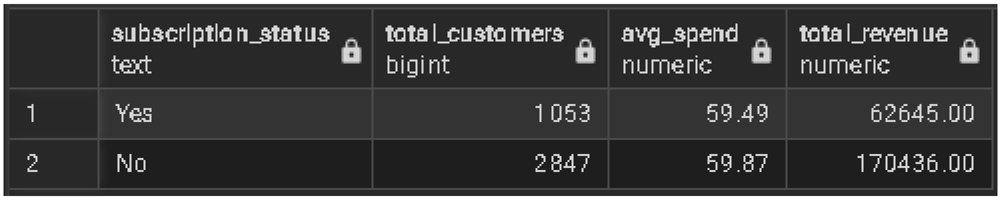
	item_purchased text	Average Product Rating numeric
1	Gloves	3.86
2	Sandals	3.84
3	Boots	3.82
4	Hat	3.80
5	Skirt	3.78

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



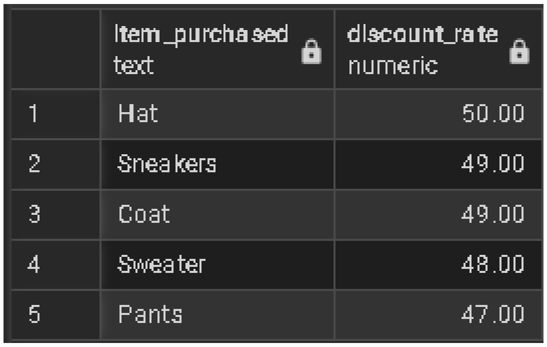
	shipping_type text	round numeric
1	Standard	58.46
2	Express	60.48

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



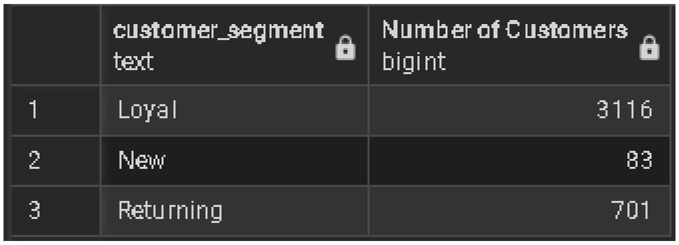
	subscription_status text	total_customers bigint	avg_spend numeric	total_revenue numeric
1	Yes	1053	59.49	62645.00
2	No	2847	59.87	170436.00

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



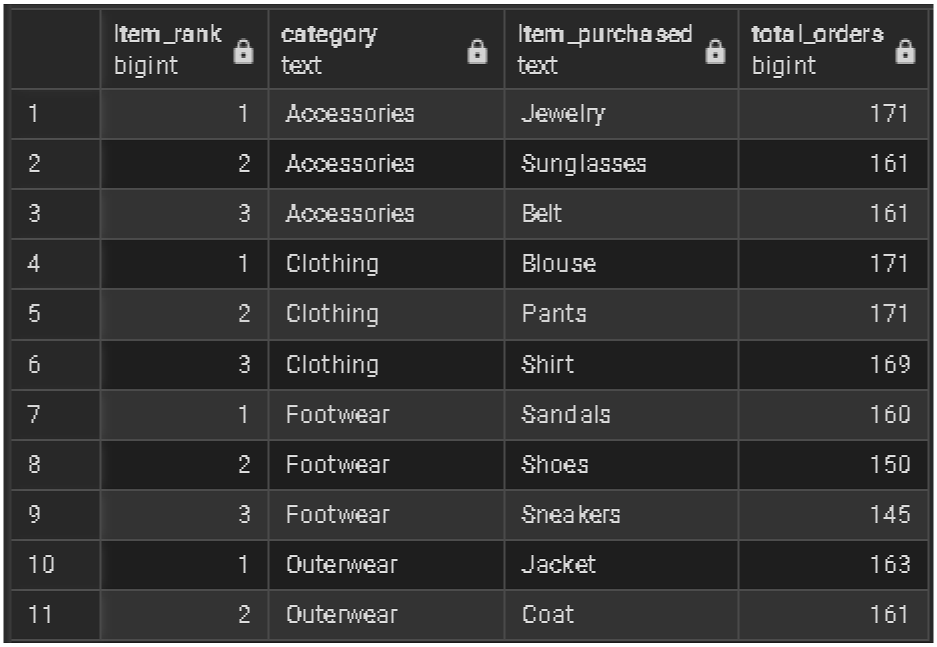
	item_purchased text	discount_rate numeric
1	Hat	50.00
2	Sneakers	49.00
3	Coat	49.00
4	Sweater	48.00
5	Pants	47.00

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



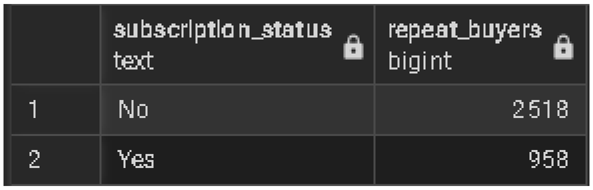
	customer_segment	Number of Customers
	text	bigint
1	Loyal	3116
2	New	83
3	Returning	701

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



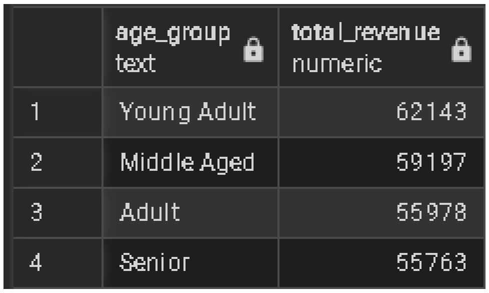
	item_rank	category	item_purchased	total_orders
	bigint	text	text	bigint
1	1	Accessories	Jewelry	171
2	2	Accessories	Sunglasses	161
3	3	Accessories	Belt	161
4	1	Clothing	Blouse	171
5	2	Clothing	Pants	171
6	3	Clothing	Shirt	169
7	1	Footwear	Sandals	160
8	2	Footwear	Shoes	150
9	3	Footwear	Sneakers	145
10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

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



	subscription_status	repeat_buyers
	text	bigint
1	No	2518
2	Yes	958

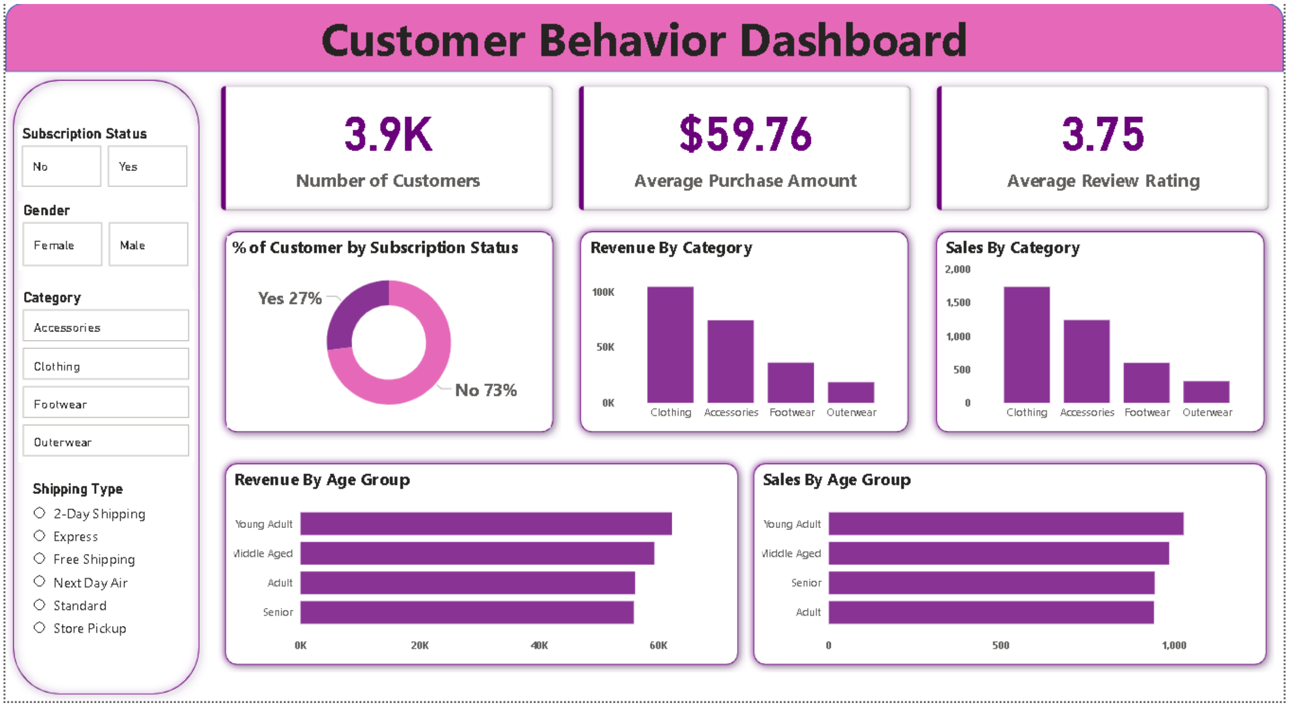
10. **Revenue by Age Group –** Calculate total revenue contribution of each age group.



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

5. Dashboard in Power BI

Finally, we 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 repeat 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.