Online Shopping Analysis

1.Project Overview

This project analyzes 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 .describe() for summary statistics.

	customer_id	age	purchase_amount	review_rating	previous_purchases	purchase_frequency_days
count	3900.000000	3900.000000	3900.000000	3900.000000	3900.000000	3900.000000
mean	1950.500000	44.068462	59.764359	3.757179	25.351538	89.133077
std	1125.977353	15.207589	23.685392	0.717268	14.447125	119.037566
min	1.000000	18.000000	20.000000	2.500000	1.000000	7.000000
25%	975.750000	31.000000	39.000000	3.100000	13.000000	14.000000
50%	1950.500000	44.000000	60.000000	3.800000	25.000000	30.000000
75%	2925.250000	57.000000	81.000000	4.400000	38.000000	90.000000
max	3900.000000	70.000000	100.000000	5.000000	50.000000	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 purchase_frequency_days column from purchase data.

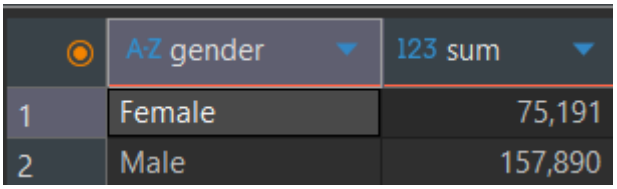
● **Data Consistency Check**: Verified if discount_applied and promo_code_used were redundant; dropped promo_code_used.

● 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)

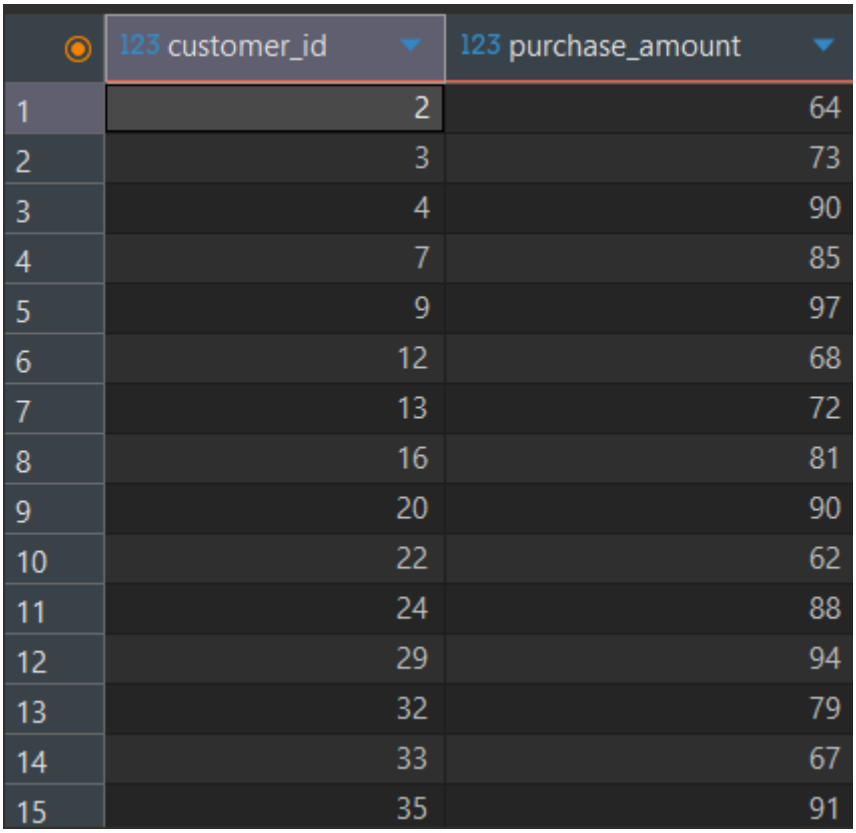
We performed structured analysis in PostgreSQL to answer key business questions:

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



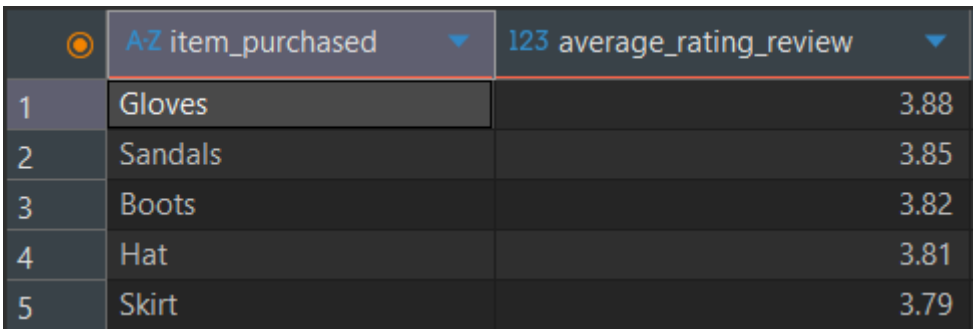
	gender	sum
1	Female	75,191
2	Male	157,890

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



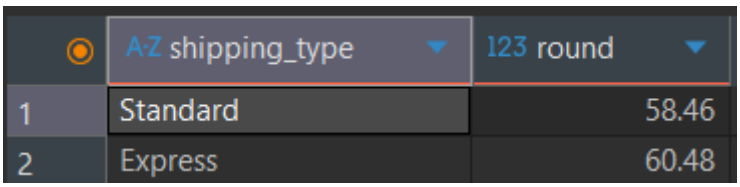
	customer_id	purchase_amount
1	2	64
2	3	73
3	4	90
4	7	85
5	9	97
6	12	68
7	13	72
8	16	81
9	20	90
10	22	62
11	24	88
12	29	94
13	32	79
14	33	67
15	35	91

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



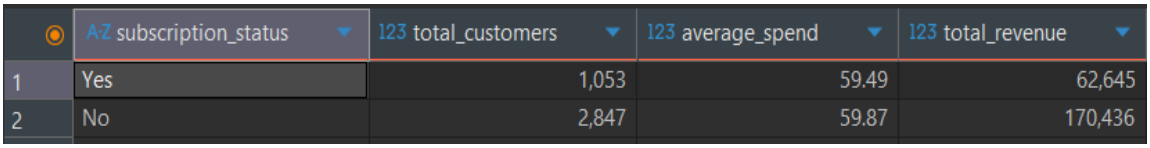
	item_purchased	average_rating_review
1	Gloves	3.88
2	Sandals	3.85
3	Boots	3.82
4	Hat	3.81
5	Skirt	3.79

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



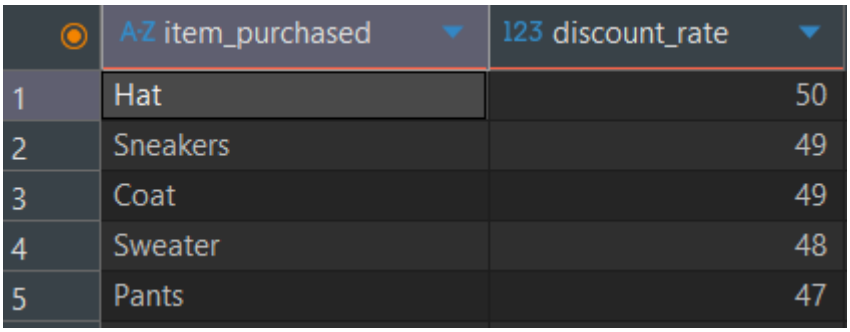
	shipping_type	round
1	Standard	58.46
2	Express	60.48

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



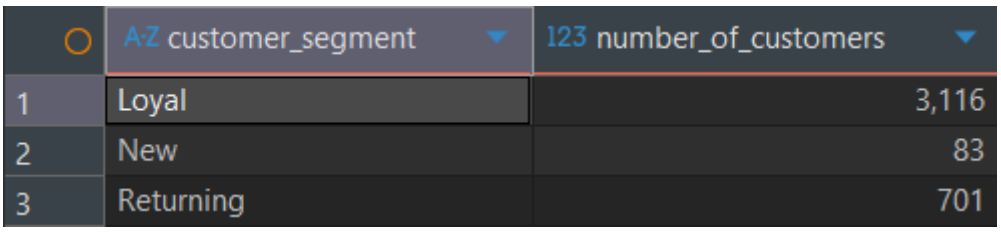
	subscription_status	total_customers	average_spend	total_revenue
1	Yes	1,053	59.49	62,645
2	No	2,847	59.87	170,436

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



	item_purchased	discount_rate
1	Hat	50
2	Sneakers	49
3	Coat	49
4	Sweater	48
5	Pants	47

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



	customer_segment	number_of_customers
1	Loyal	3,116
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
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.

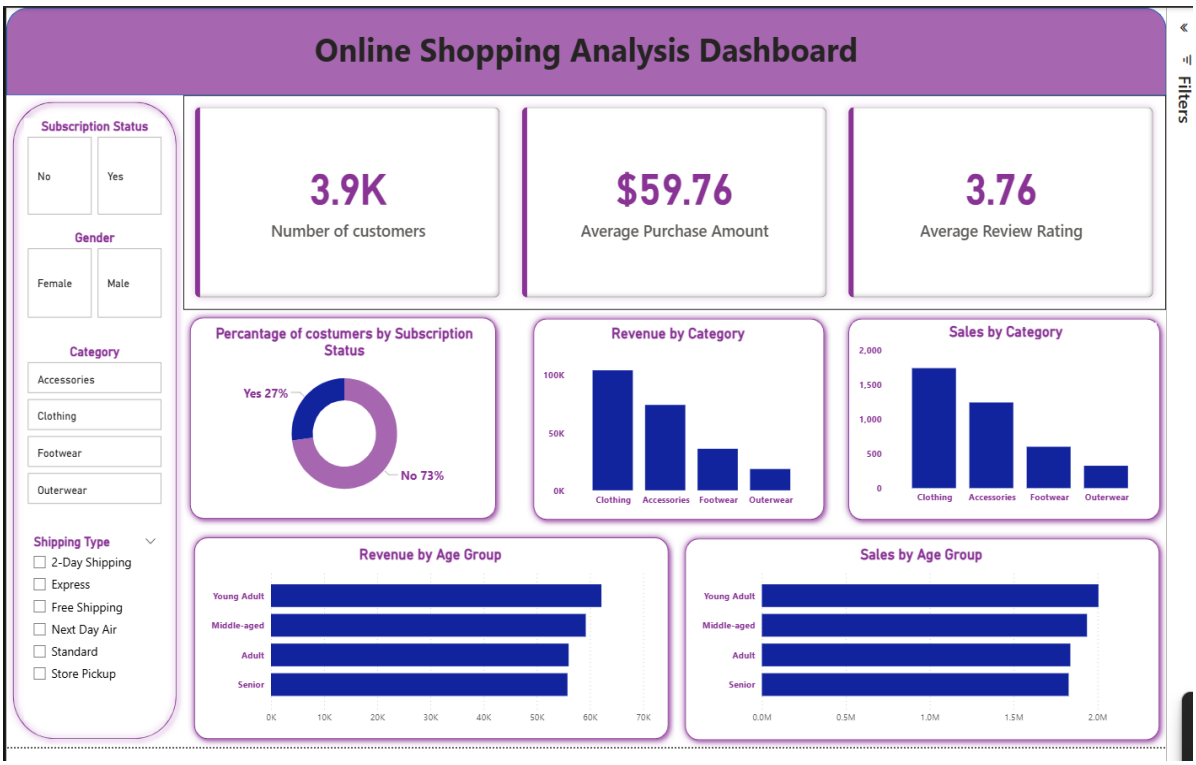
	subscription_status	repeat_buyers
1	No	2,518
2	Yes	958

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

	age_group	total_revenue
1	Young Adult	62,143
2	Middle-aged	59,197
3	Adult	55,978
4	Senior	55,763

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.