Customer Shopping Behavior 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. Data Summary

- **Rows:** 3,900
- **Columns:** 18
- **Key Features:**
    - Customer demographics: *(Age, Gender, Location, Subscription Status)*
    - Purchase details: (*Item Purchased, Category, Purchase Amount (USD), Size, Color, Season)*
    - Shopping behavior: (*Discount Applied, Promo Code Used, Previous Purchases, Frequency of Purchases, Review Rating, Payment Method, Shipping Type)*
- **Missing Data:** 37 missing 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	Gender	Item Purchased	Category	Purchase Amount (USD)	Location	Size	Color	Season	Review Rating	Subscription Status	Shipping Type	Discount Applied
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3863.000000	3900	3900	3900
unique	NaN	NaN	2	25	4	NaN	50	4	25	4	NaN	2	6	2
top	NaN	NaN	Male	Blouse	Clothing	NaN	Montana	M	Olive	Spring	NaN	No	Free Shipping	No
freq	NaN	NaN	2652	171	1737	NaN	96	1755	177	999	NaN	2847	675	2223
mean	1950.500000	44.068462	NaN	NaN	NaN	59.764359	NaN	NaN	NaN	NaN	3.750065	NaN	NaN	NaN
std	1125.977353	15.207589	NaN	NaN	NaN	23.685392	NaN	NaN	NaN	NaN	0.716983	NaN	NaN	NaN
min	1.000000	18.000000	NaN	NaN	NaN	20.000000	NaN	NaN	NaN	NaN	2.500000	NaN	NaN	NaN
25%	975.750000	31.000000	NaN	NaN	NaN	39.000000	NaN	NaN	NaN	NaN	3.100000	NaN	NaN	NaN
50%	1950.500000	44.000000	NaN	NaN	NaN	60.000000	NaN	NaN	NaN	NaN	3.800000	NaN	NaN	NaN
75%	2925.250000	57.000000	NaN	NaN	NaN	81.000000	NaN	NaN	NaN	NaN	4.400000	NaN	NaN	NaN
max	3900.000000	70.000000	NaN	NaN	NaN	100.000000	NaN	NaN	NaN	NaN	5.000000	NaN	NaN	NaN

Promo Code Used	Previous Purchases	Payment Method	Frequency of Purchases
3900	3900.000000	3900	3900
2	NaN	6	7
No	NaN	PayPal	Every 3 Months
2223	NaN	677	584
NaN	25.351538	NaN	NaN
NaN	14.447125	NaN	NaN
NaN	1.000000	NaN	NaN
NaN	13.000000	NaN	NaN
NaN	25.000000	NaN	NaN
NaN	38.000000	NaN	NaN
NaN	50.000000	NaN	NaN

- **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)

Performed structured analysis in PostgreSQL to answer key business questions:

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

Gender	Revenue
Male	134587
Female	64723

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

customer_id	purchase_amount
2	64
3	73
4	90
9	97
12	68
13	72
16	81
20	90
24	88
29	94
32	79
33	67
37	69
40	60
43	100
44	69
55	94

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

item_purchased	Average Product Rating
Boots	3.9
Gloves	3.89
Sandals	3.83
T-shirt	3.82
Hat	3.81

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

shipping_type	Avg Purchase Amount
Express	60.34
Standard	58.18

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

subscription_status	total_customers	avg_purchase_amount	total_revenue
No	2424	59.90	145200
Yes	913	59.27	54110

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

item_purchased	discount_rate
Sneakers	53.13
Coat	51.49
Sweater	50.69
Boots	49.56
Hat	48.80

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

customer_segment	Number_of_customers
Loyal	2659
Returning	605
New	73

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

item_rank	category	item_purchased	total_orders
1	Accessories	Jewelry	148
2	Accessories	Belt	139
3	Accessories	Scarf	137
1	Clothing	Dress	149
2	Clothing	Shirt	147
3	Clothing	Blouse	146
1	Footwear	Sandals	143
2	Footwear	Shoes	132
3	Footwear	Sneakers	128
1	Outerwear	Jacket	138
2	Outerwear	Coat	134

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

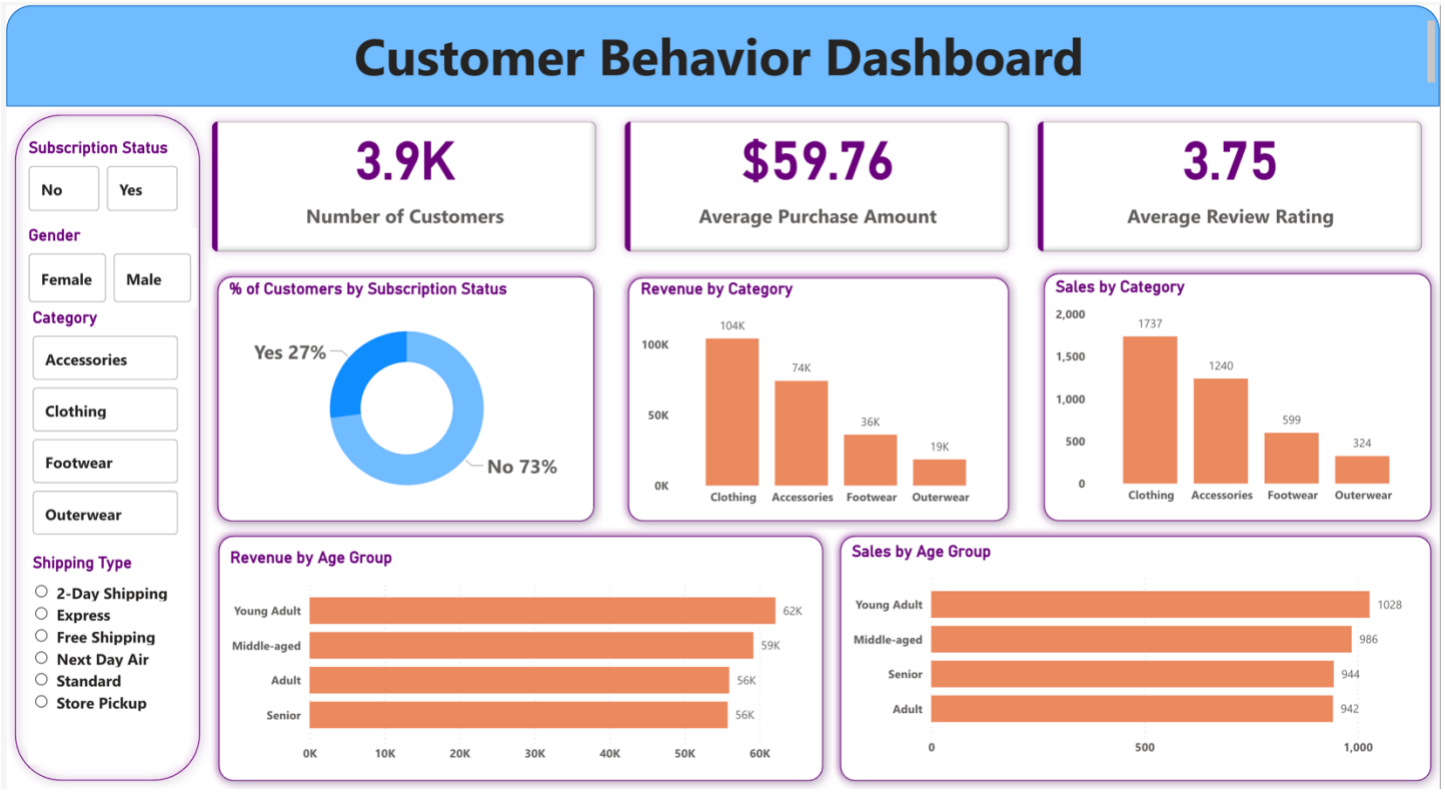
subscription_status	repeat_buyers
Yes	834
No	2139

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

age_group	total_revenue
Young Adult	52896
Middle-aged	50641
Adult	49015
Senior	46758

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 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.