Customer Shopping Behavior Analysis

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.

Dataset Summary

This data has 3,900 rows and 18 columns.

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.

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	Promo Code Used	Previous Purchases
0	1	55	Male	Blouse	Clothing	53	Kentucky	L	Gray	Winter	3.1	Yes	Express	Yes	Yes	14
1	2	19	Male	Sweater	Clothing	64	Maine	L	Maroon	Winter	3.1	Yes	Express	Yes	Yes	2
2	3	50	Male	Jeans	Clothing	73	Massachusetts	S	Maroon	Spring	3.1	Yes	Free Shipping	Yes	Yes	23
3	4	21	Male	Sandals	Footwear	90	Rhode Island	M	Maroon	Spring	3.5	Yes	Next Day Air	Yes	Yes	49
4	5	45	Male	Blouse	Clothing	49	Oregon	M	Turquoise	Spring	2.7	Yes	Free Shipping	Yes	Yes	31

Payment Method	Frequency of Purchases
Venmo	Fortnightly
Cash	Fortnightly
Credit Card	Weekly
PayPal	Weekly
PayPal	Annually

- 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.

Data Analysis using SQL (Business Transactions)

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

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

	gender text	revenue numeric
1	Female	75191
2	Male	157890

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

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

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

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

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

	item_purchased text	discount_rate numeric
1	Hat	5000.00
2	Sneakers	4900.00
3	Coat	4900.00
4	Sweater	4800.00
5	Pants	4700.00

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

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

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

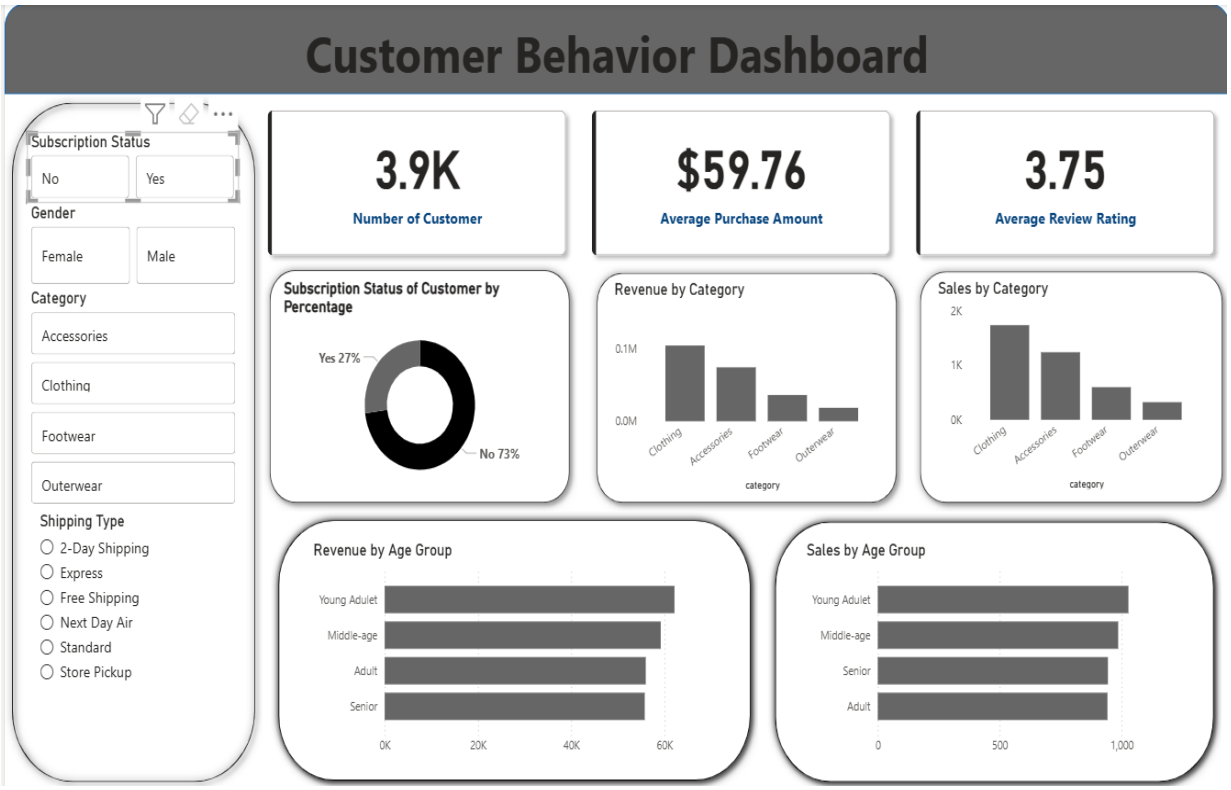
	subscription_status text	repeat_buyers bigint
1	No	2518
2	Yes	958

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

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

Dashboard in Power BI

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



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.