

CUSTOMER SHOPPING BEHAVIOR ANALYSIS

PROJECT REPORT

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1. Project Overview:

This project examines customer shopping behavior using transactional data from 3,900 purchases across multiple product categories. Its aim is to identify insights into spending habits, customer segmentation, product preferences, and subscription trends to support strategic business decision-making.

2. Dataset Summary:

- **Total Rows:** 3,900
- **Total Columns:** 18
- **Main Attributes Included:**
 - Customer demographics such as age, gender, location, and subscription status
 - Purchase-related information like item bought, product category, amount spent, season, size, and color
 - Behavioral indicators including discount usage, promo codes applied, past purchases, purchase frequency, review ratings, and shipping method
- **Missing Values:** 37 entries are missing in the *Review Rating* field

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	1
top	NaN	NaN	Male	Blouse	Clothing	NaN	Montana	M	Olive	Spring	NaN	No	Free Shipping	1
freq	NaN	NaN	2652	171	1737	NaN	96	1755	177	999	NaN	2847	675	22
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



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

- **Handling Missing Data:** Identified null values and filled the missing entries in the *Review Rating* column using the median rating for each product category.
- **Column Standardization:** Updated all column names to snake_case to improve clarity and maintain consistent documentation.
- **Feature Engineering:**
 - Generated an age_group feature by grouping customer ages into bins.
 - Derived purchase_frequency_days based on purchase timestamps.
- **Consistency Validation:** Checked whether *discount_applied* and *promo_code_used* conveyed duplicate information and removed *promo_code_used* after confirming redundancy.
- **Database Integration:** Linked the Python workflow to a PostgreSQL database and imported the cleaned DataFrame for downstream SQL-based 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 	revenue 
	text	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 	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
Total rows: 839		Query complete 00:00:00

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

	item_purchased 	Average Product Rating 
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	49.66
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	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.

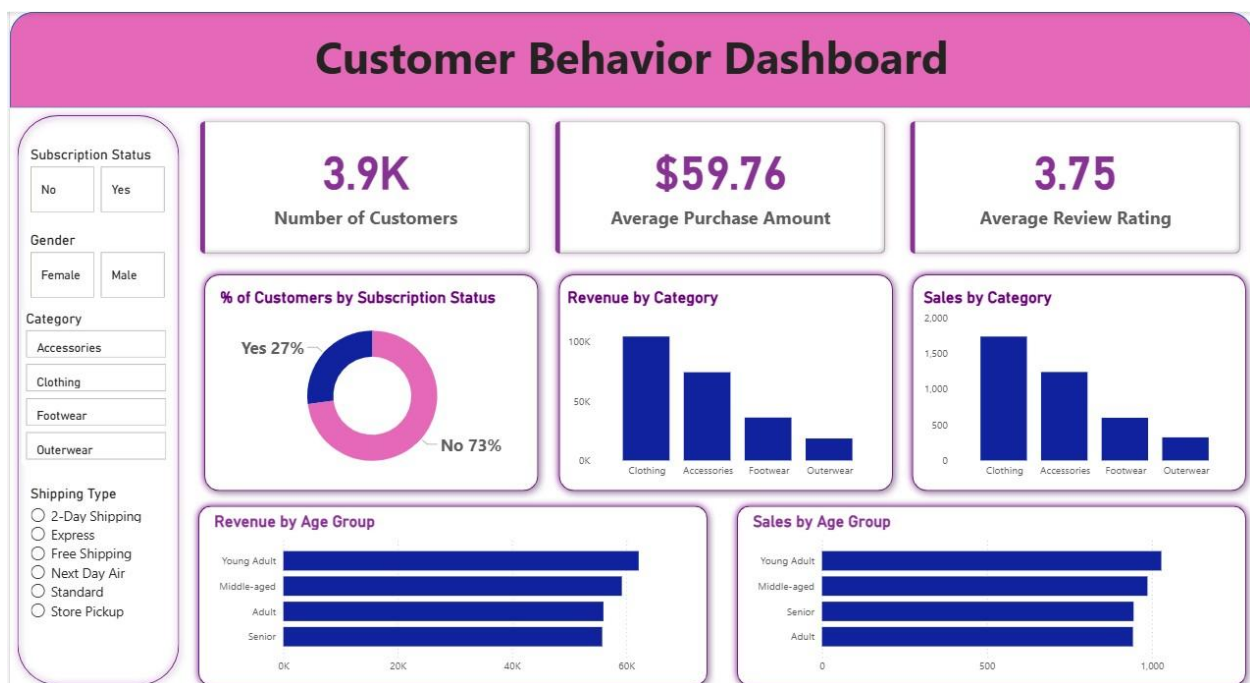
	subscription_status text	repeat_buyers bigint
1	No	2518
2	Yes	958

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



6. Business Recommendations:

- **Increase Subscriptions:** Market exclusive perks more effectively to encourage customers to subscribe.
- **Enhance Loyalty Programs:** Offer rewards to frequent shoppers to transition them into the “Loyal” customer segment.
- **Optimize Discount Strategy:** Reassess discount usage to maintain a balance between increased sales and profit margins.
- **Improve Product Positioning:** Feature top-rated and best-selling items prominently in marketing campaigns.
- **Implement Targeted Marketing:** Direct promotional efforts toward high-spending age groups and customers who prefer express shipping.