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. 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	Gender	Item Purchased	Category	Purchase Amount (USD)	Location	Size	Color	Season	Review Rating	Subscription Status	Shipping Type	Discou Appli
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3863.000000	3900	3900	39
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	22
mean	1950.500000	44.068462	NaN	NaN	NaN	59.764359	NaN	NaN	NaN	NaN	3.750065	NaN	NaN	Ni
std	1125.977353	15.207589	NaN	NaN	NaN	23.685392	NaN	NaN	NaN	NaN	0.716983	NaN	NaN	Ni
min	1.000000	18.000000	NaN	NaN	NaN	20.000000	NaN	NaN	NaN	NaN	2.500000	NaN	NaN	Ni
25%	975.750000	31.000000	NaN	NaN	NaN	39.000000	NaN	NaN	NaN	NaN	3.100000	NaN	NaN	Ni
50%	1950.500000	44.000000	NaN	NaN	NaN	60.000000	NaN	NaN	NaN	NaN	3.800000	NaN	NaN	Ni
75%	2925.250000	57.000000	NaN	NaN	NaN	81.000000	NaN	NaN	NaN	NaN	4.400000	NaN	NaN	Ni
max	3900.000000	70.000000	NaN	NaN	NaN	100.000000	NaN	NaN	NaN	NaN	5.000000	NaN	NaN	Ni

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

- **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 MySQL and loaded the cleaned DataFrame into the database for SQL analysis.

4. Data Analysis using SQL (Business Transactions)

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

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

	gender	total_revenue
▶	Male	157890
	Female	75191

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
	7	85
	9	97
	12	68
	13	72
	16	81
	20	90
	22	62
	24	88
	29	94
	32	79
	33	67
	35	91
	37	69
	40	60

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

item_purchased	avg_review
Gloves	3.861428571
Sandals	3.844375000
Boots	3.818750000
Hat	3.801298701
Skirt	3.784810126

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

shipping_type	avg(purchase_amount)
Express	60.4752
Standard	58.4602

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

subscription_status	total_customers	Average_Sepend	Total_reveniue
Yes	1053	59.4919	62645
No	2847	59.8651	170436

item_purchased	total_purchases
Pants	81
Sweater	79
Coat	79
Hat	77
Jewelry	76

6. **Discount-Dependent Products** – Identified 5 products with the Puchases on discounted purchases.

item_purchased	total_purchases
Pants	81
Sweater	79
Coat	79
Hat	77
Jewelry	76

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

Customer_type	customer_count
loyal	3116
Returning	701
New	83

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

category	item_purchased	total_purchases
Accessories	Jewelry	171
Accessories	Sunglasses	161
Accessories	Belt	161
Clothing	Blouse	171
Clothing	Pants	171
Clothing	Shirt	169
Footwear	Sandals	160
Footwear	Shoes	150
Footwear	Sneakers	145
Outerwear	Jacket	163
Outerwear	Coat	161

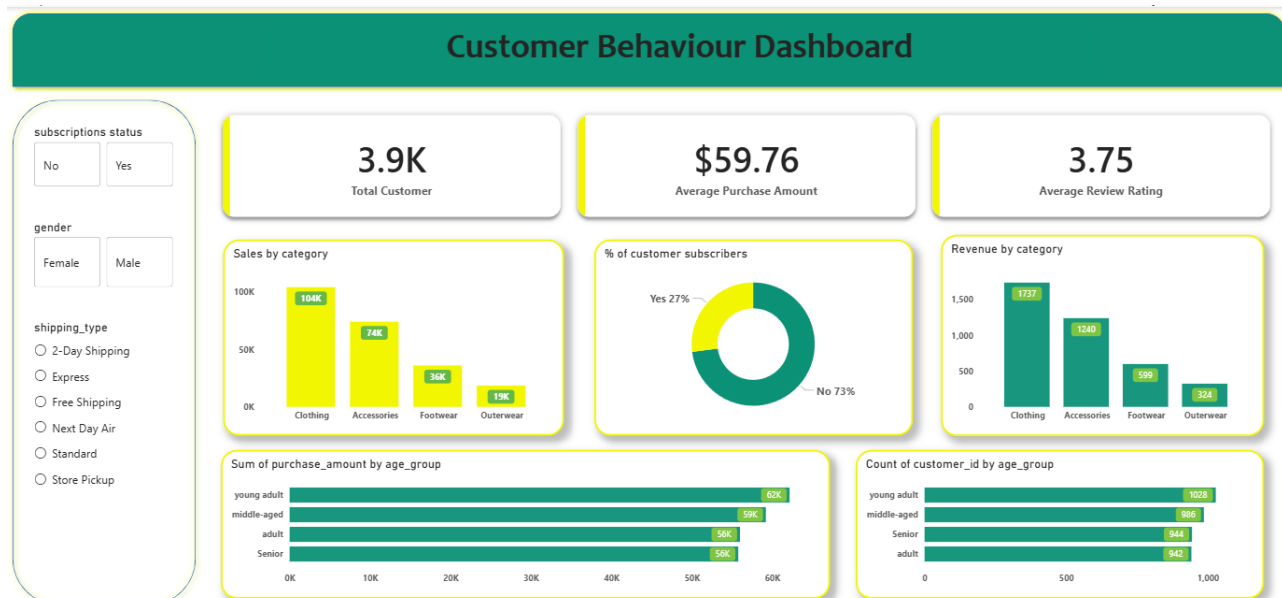9. **Repeat Buyers & Subscriptions** – Checked whether customers with >5 purchases are more likely to subscribe.

subscription_status	Repeat_Buyers
Yes	958
No	2518

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

	age_group	Revenue_Contribution
▶	middle-aged	59197
	young adult	62143
	Senior	55763
	adult	55978

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.