Project Report

Customer Shopping Behaviour Analysis

1. Project Overview

This project analyses customer shopping behaviour 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 behaviour to guide strategic business decisions.

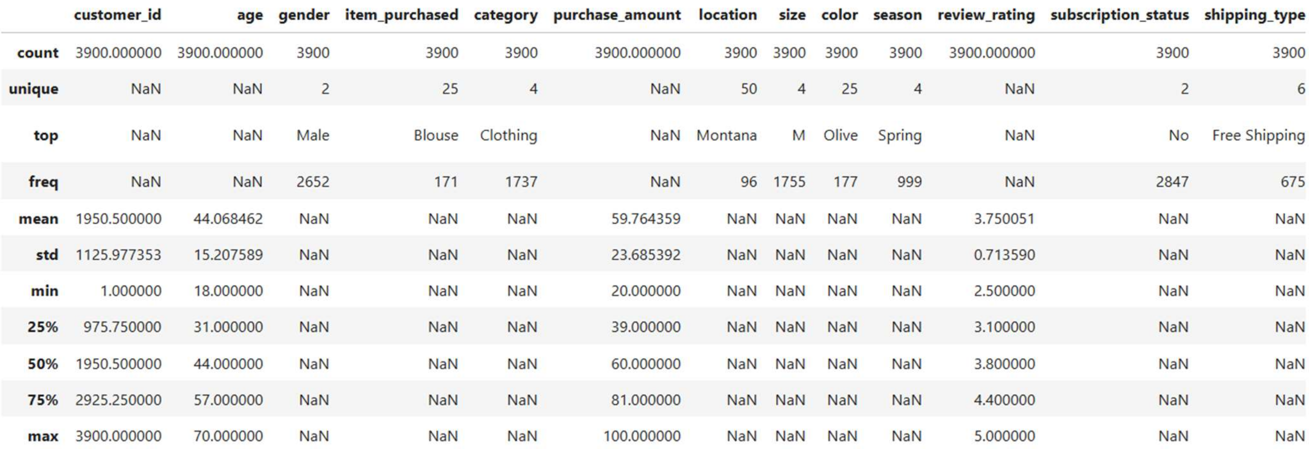
2. Dataset Summary

- Rows: 3,900 - Columns: 18
- Key Features: - Customer demographics (Age, Gender, Location, Subscription Status)
- Purchase details (Item Purchased, Category, Purchase Amount, Season, Size, Colour)
- Shopping behaviour (Discount Applied, Promo Code Used, Previous Purchases, Frequency of Purchases, Review Rating, Shipping Type)
- Missing Data: 37 values in Review Rating column

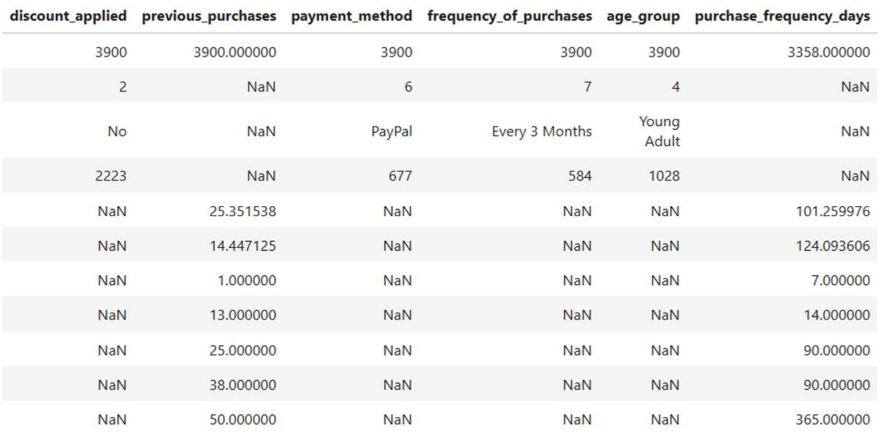
3. Exploratory Data Analysis using Python

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	location	size	color	season	review_rating	subscription_status	shipping_type
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3900.000000	3900	3900
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
mean	1950.500000	44.068462	NaN	NaN	NaN	59.764359	NaN	NaN	NaN	NaN	3.750051	NaN	NaN
std	1125.977353	15.207589	NaN	NaN	NaN	23.685392	NaN	NaN	NaN	NaN	0.713590	NaN	NaN
min	1.000000	18.000000	NaN	NaN	NaN	20.000000	NaN	NaN	NaN	NaN	2.500000	NaN	NaN
25%	975.750000	31.000000	NaN	NaN	NaN	39.000000	NaN	NaN	NaN	NaN	3.100000	NaN	NaN
50%	1950.500000	44.000000	NaN	NaN	NaN	60.000000	NaN	NaN	NaN	NaN	3.800000	NaN	NaN
75%	2925.250000	57.000000	NaN	NaN	NaN	81.000000	NaN	NaN	NaN	NaN	4.400000	NaN	NaN
max	3900.000000	70.000000	NaN	NaN	NaN	100.000000	NaN	NaN	NaN	NaN	5.000000	NaN	NaN



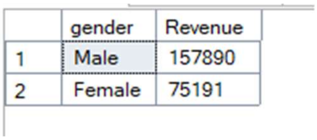
discount_applied	previous_purchases	payment_method	frequency_of_purchases	age_group	purchase_frequency_days
3900	3900.000000	3900	3900	3900	3358.000000
2	NaN	6	7	4	NaN
No	NaN	PayPal	Every 3 Months	Young Adult	NaN
2223	NaN	677	584	1028	NaN
NaN	25.351538	NaN	NaN	NaN	101.259976
NaN	14.447125	NaN	NaN	NaN	124.093606
NaN	1.000000	NaN	NaN	NaN	7.000000
NaN	13.000000	NaN	NaN	NaN	14.000000
NaN	25.000000	NaN	NaN	NaN	90.000000
NaN	38.000000	NaN	NaN	NaN	90.000000
NaN	50.000000	NaN	NaN	NaN	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 Data Frame into the database for SQL analysis.

4. Data Analysis using SQL (Business Transactions)

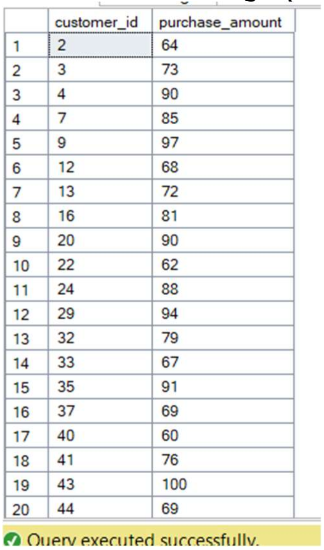
We performed structured analysis in PostgreSQL to answer key business questions:

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



	gender	Revenue
1	Male	157890
2	Female	75191

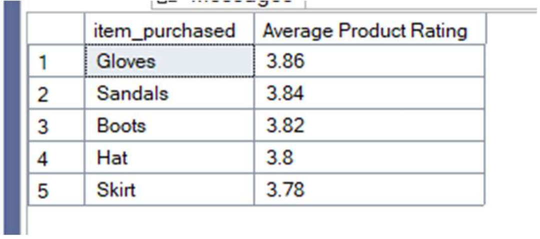
2. **High-Spending Discount Users** – Identified customers who used discounts but still spent above the average purchase amount.



	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
16	37	69
17	40	60
18	41	76
19	43	100
20	44	69

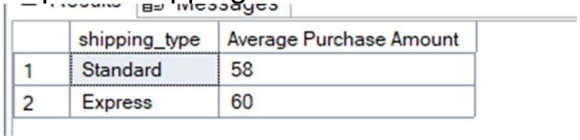
✓ Query executed successfully.

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



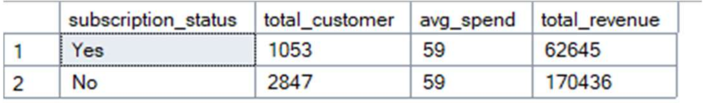
	item_purchased	Average Product Rating
1	Gloves	3.86
2	Sandals	3.84
3	Boots	3.82
4	Hat	3.8
5	Skirt	3.78

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



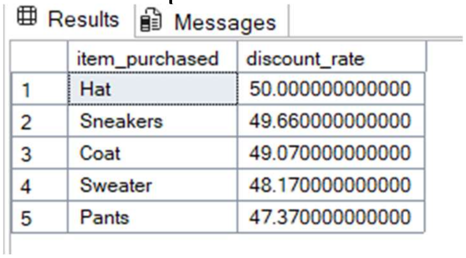
	shipping_type	Average Purchase Amount
1	Standard	58
2	Express	60

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



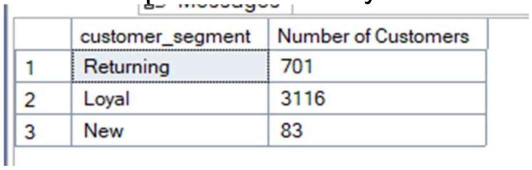
	subscription_status	total_customer	avg_spend	total_revenue
1	Yes	1053	59	62645
2	No	2847	59	170436

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



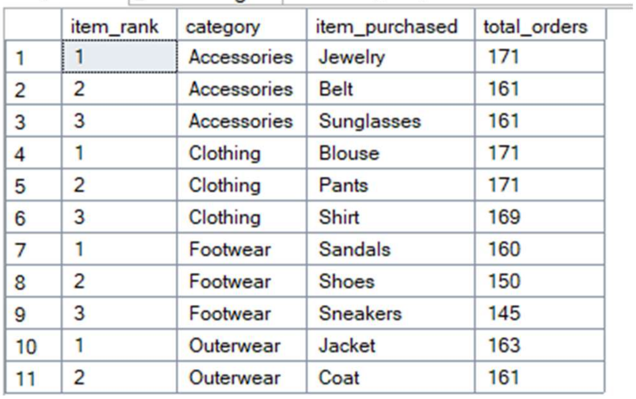
	item_purchased	discount_rate
1	Hat	50.000000000000
2	Sneakers	49.660000000000
3	Coat	49.070000000000
4	Sweater	48.170000000000
5	Pants	47.370000000000

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



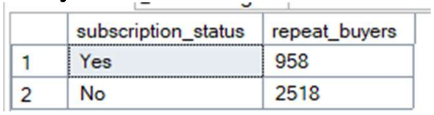
	customer_segment	Number of Customers
1	Returning	701
2	Loyal	3116
3	New	83

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



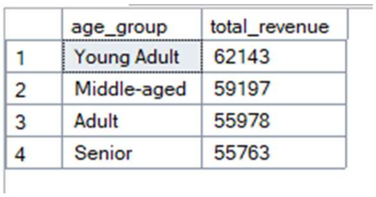
	item_rank	category	item_purchased	total_orders
1	1	Accessories	Jewelry	171
2	2	Accessories	Belt	161
3	3	Accessories	Sunglasses	161
4	1	Clothing	Blouse	171
5	2	Clothing	Pants	171
6	3	Clothing	Shirt	169
7	1	Footwear	Sandals	160
8	2	Footwear	Shoes	150
9	3	Footwear	Sneakers	145
10	1	Outerwear	Jacket	163
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	Yes	958
2	No	2518

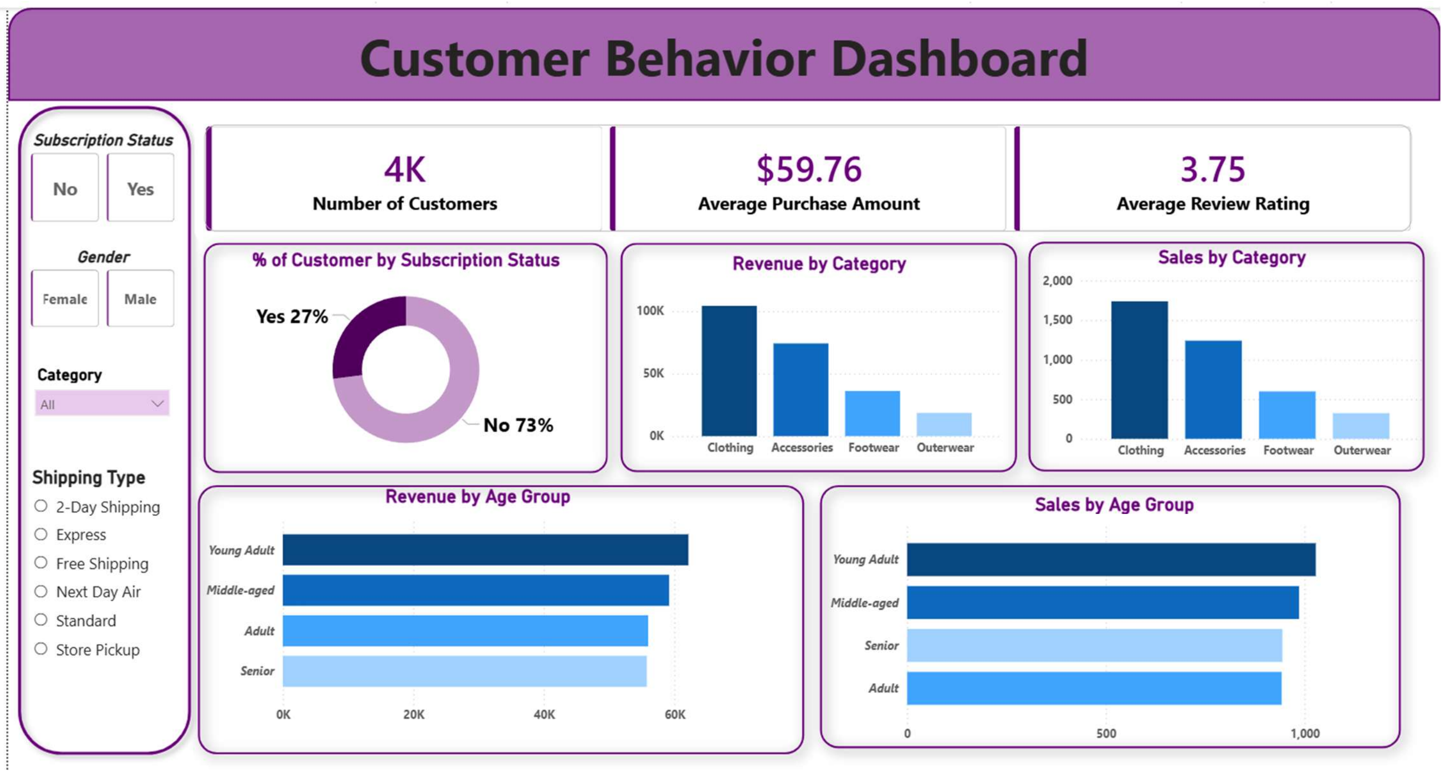
10. **Revenue by Age Group** – Calculated total revenue contribution of each age group.



	age_group	total_revenue
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.



Customer Behavior Dashboard

4K
Number of Customers

$59.76
Average Purchase Amount

3.75
Average Review Rating

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.