Business Problem Statement

A leading retail company wants to better understand its customers' shopping behavior in order to improve sales, customer satisfaction, and long-term loyalty. The management team has noticed changes in purchasing patterns across demographics, product categories, and sales channels (online vs. offline). They are particularly interested in uncovering which factors, such as discounts, reviews, seasons, or payment preferences, and drive consumer decisions and repeat purchases.

You are tasked with analyzing the company's consumer behavior dataset to answer the following overarching business question:

"How can the company leverage consumer shopping data to identify trends, improve customer engagement, and optimize marketing and product strategies?"

Deliverables

1. **Data Preparation & Modeling (Python):** Clean and transform the raw dataset for analysis.
2. **Data Analysis (SQL):** Organize the data into a structured format, simulate business transactions, and run queries to extract insights on customer segments, loyalty, and purchase drivers.
3. **Visualization & Insights (Power BI):** Build an interactive dashboard that highlights key patterns and trends, enabling stakeholders to make data-driven decisions.
4. **Report and Presentation:** Write a clear project report summarizing your key findings and business recommendations. Prepare a presentation that visually communicates insights and actionable recommendations to stakeholders.
5. **Git Hub Repository:** Include all SQL queries, and dashboard files in a well-structured repository.

Customer Shopping Behavior Analysis

1. Project Overview

This project analyzes customer shopping behaviour using transactional data from 3,900 purchases across various product categories. The goal to uncover insights into spending patterns, customer segments, product preferences, and subscription behaviour to guide strategic business decisions.

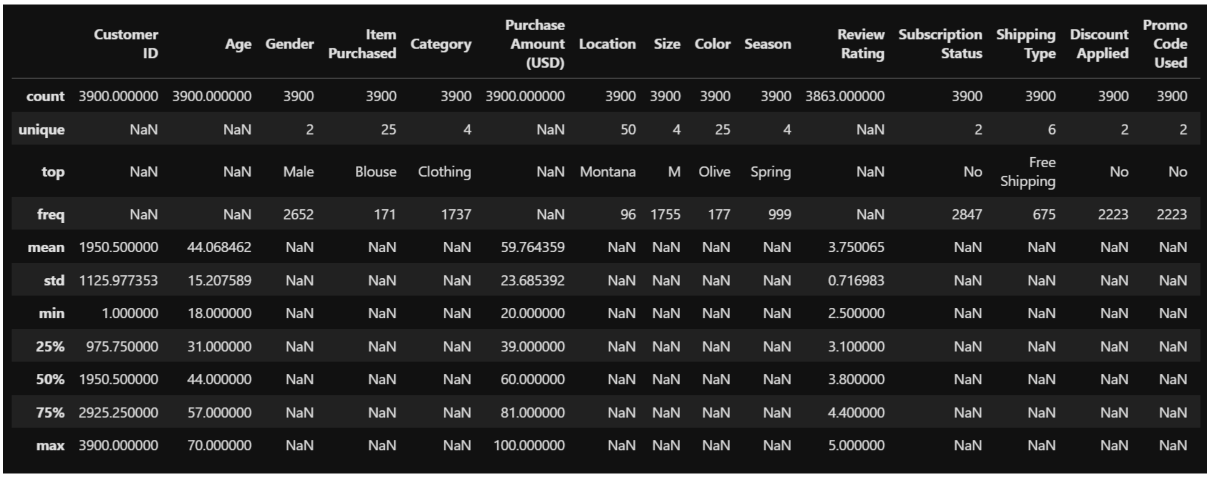
2. Dataset Summary

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

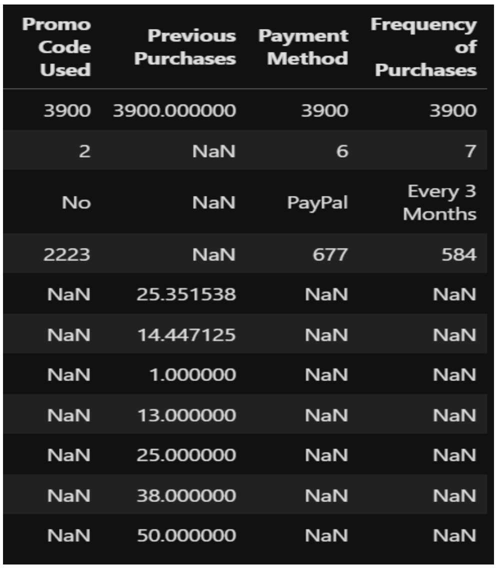
3. Exploratory Data Analysis using Python

We began 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
count	3900.000000	3900.000000	3900	3900	3900	3900.000000	3900	3900	3900	3900	3863.000000	3900	3900	3900	3900
unique	NaN	NaN	2	25	4	NaN	50	4	25	4	NaN	2	6	2	2
top	NaN	NaN	Male	Blouse	Clothing	NaN	Montana	M	Olive	Spring	NaN	No	Free Shipping	No	No
freq	NaN	NaN	2652	171	1737	NaN	96	1755	177	999	NaN	2847	675	2223	2223
mean	1950.500000	44.068462	NaN	NaN	NaN	59.764359	NaN	NaN	NaN	NaN	3.750065	NaN	NaN	NaN	NaN
std	1125.977353	15.207589	NaN	NaN	NaN	23.685392	NaN	NaN	NaN	NaN	0.716983	NaN	NaN	NaN	NaN
min	1.000000	18.000000	NaN	NaN	NaN	20.000000	NaN	NaN	NaN	NaN	2.500000	NaN	NaN	NaN	NaN
25%	975.750000	31.000000	NaN	NaN	NaN	39.000000	NaN	NaN	NaN	NaN	3.100000	NaN	NaN	NaN	NaN
50%	1950.500000	44.000000	NaN	NaN	NaN	60.000000	NaN	NaN	NaN	NaN	3.800000	NaN	NaN	NaN	NaN
75%	2925.250000	57.000000	NaN	NaN	NaN	81.000000	NaN	NaN	NaN	NaN	4.400000	NaN	NaN	NaN	NaN
max	3900.000000	70.000000	NaN	NaN	NaN	100.000000	NaN	NaN	NaN	NaN	5.000000	NaN	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 **snack case** for better readability and documentation.

- **Feature Engineering:**
  - Created **age_group** column by binning customer ages.
  - Created **purchase_frequency_days** column from purchase data.

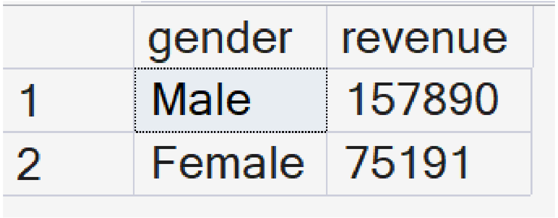
- **Data Consistency Check:** Verified if **discount_applied** and **promo_code_used** were redundant, dropped **promo_code_used.**

- **Database Integration:** Connected Python script to SQL Server Management Studio 22 and loaded the cleaned DataFrame.

4. Data Analysis using SQL (Business Transactions)

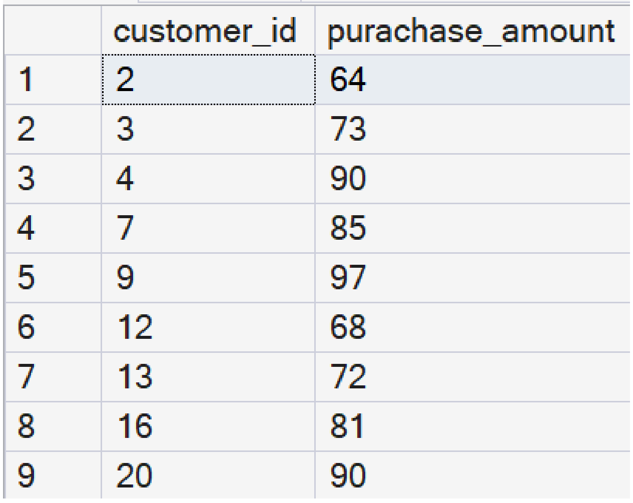
We performed analysis in SQL Server to answer key business questions:

1. **Revenue by Gender-** Compared total revenue generated by Male vs. Female customer.



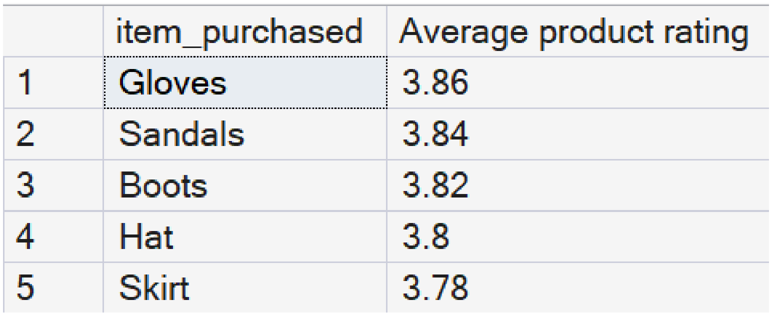
	gender	revenue
1	Male	157890
2	Female	75191

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



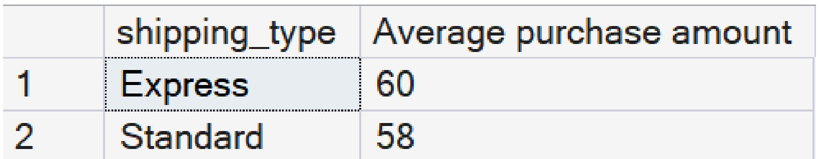
	customer_id	purachase_amount
1	2	64
2	3	73
3	4	90
4	7	85
5	9	97
6	12	68
7	13	72
8	16	81
9	20	90

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



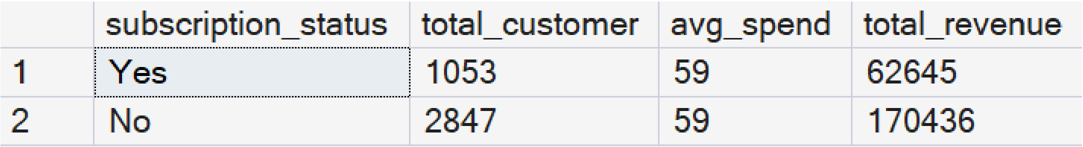
	item_purchased	Average product rating
1	Gloves	3.86
2	Sandals	3.84
3	Boots	3.82
4	Hat	3.8
5	Skirt	3.78

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



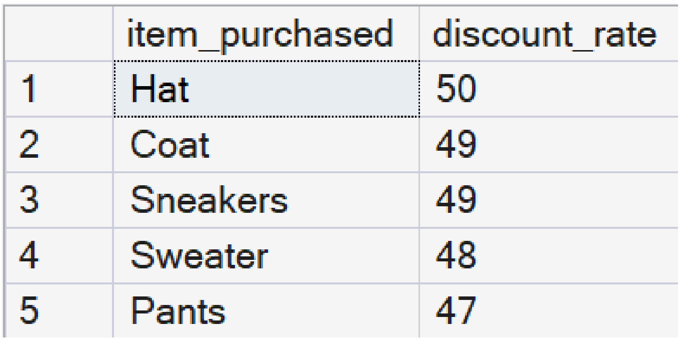
	shipping_type	Average purchase amount
1	Express	60
2	Standard	58

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



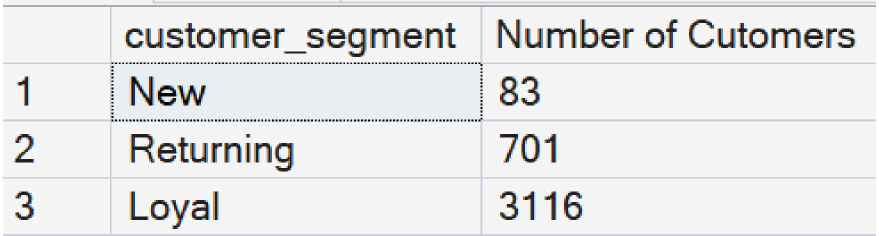
	subscription_status	total_customer	avg_spend	total_revenue
1	Yes	1053	59	62645
2	No	2847	59	170436

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



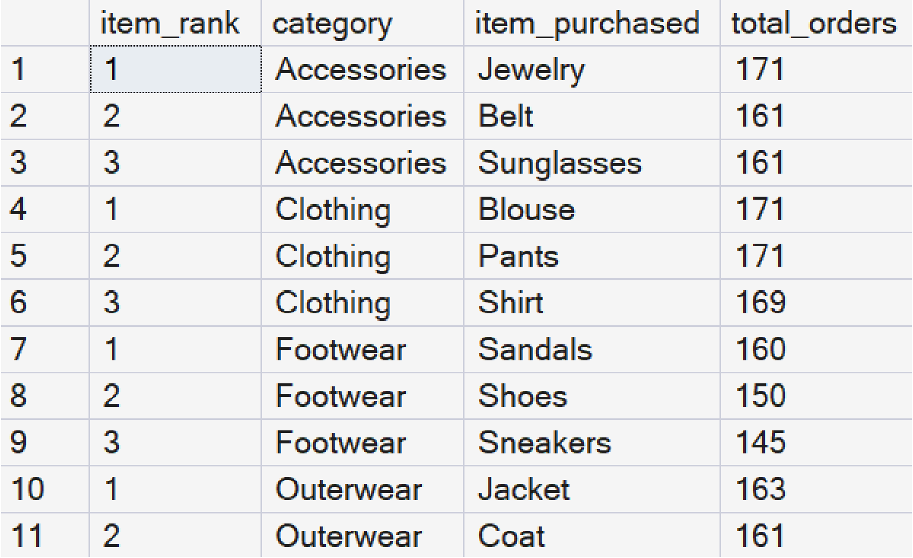
	item_purchased	discount_rate
1	Hat	50
2	Coat	49
3	Sneakers	49
4	Sweater	48
5	Pants	47

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



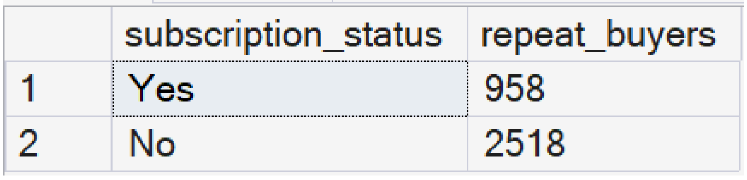
	customer_segment	Number of Cutomers
1	New	83
2	Returning	701
3	Loyal	3116

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



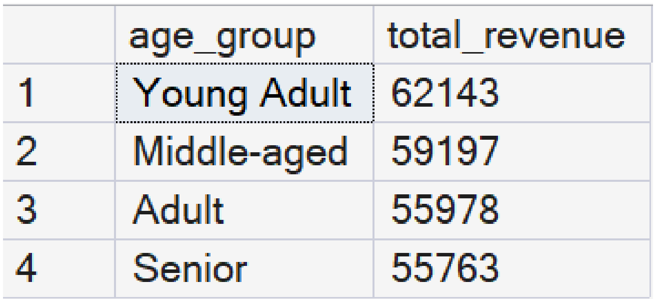
	item_rank	category	item_purchased	total_orders
1	1	Accessories	Jewelry	171
2	2	Accessories	Belt	161
3	3	Accessories	Sunglasses	161
4	1	Clothing	Blouse	171
5	2	Clothing	Pants	171
6	3	Clothing	Shirt	169
7	1	Footwear	Sandals	160
8	2	Footwear	Shoes	150
9	3	Footwear	Sneakers	145
10	1	Outerwear	Jacket	163
11	2	Outerwear	Coat	161

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



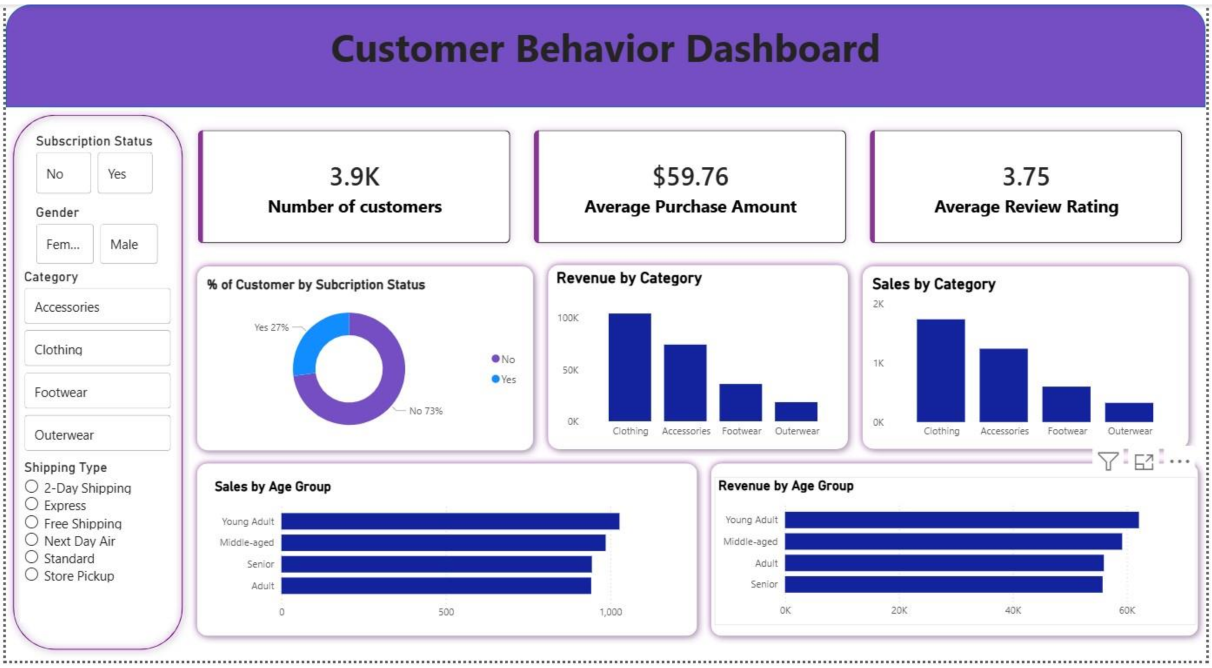
	subscription_status	repeat_buyers
1	Yes	958
2	No	2518

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



Customer Behavior Dashboard

3.9K
Number of customers

$59.76
Average Purchase Amount

3.75
Average Review Rating

6. Final Recommendation-

- Promote exclusive benefits for subscribers to increase subscription adoption.
- Strengthen customer loyalty programs by rewarding repeat buyers and moving them into the “Loyal” segment.
- Review and optimize discount policies to balance sales growth with margin control.
- Improve product positioning by highlighting top-rated and best-selling products in campaigns.
- Focus targeted marketing efforts on high-revenue age groups and express-shipping customers.