

Customer Purchase Trend Analysis

1. Project Overview

This project analyses customer Purchase trends using transactional data from 1,300 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: 1,300
- 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 the 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.
- **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 the **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 Workbench and loaded the cleaned

DataFrame into the database for SQL analysis.

```
Run cpts x
...
top      NaN Female   NaN Raincoat Footwear Spring Olive M North Dakota NaN Yes 2-Day Shipping Yes
freq     NaN 654    NaN 44.073846 NaN NaN NaN NaN NaN 3.741946 988 245 762
mean    650.500000 NaN 44.073846 NaN NaN NaN NaN NaN 3.741946 NaN NaN NaN
std     375.421985 NaN 15.169022 NaN NaN NaN NaN NaN 0.710211 NaN NaN NaN
min     1.000000 NaN 18.000000 NaN NaN NaN NaN NaN 2.500000 NaN NaN NaN
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50%    650.500000 NaN 44.000000 NaN NaN NaN NaN NaN 3.700000 NaN NaN NaN
75%    975.250000 NaN 57.000000 NaN NaN NaN NaN NaN 4.400000 NaN NaN NaN
max   1390.000000 NaN 78.000000 NaN NaN NaN NaN NaN 5.000000 NaN NaN NaN
customer ID 0
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Size 0
Location 0
Ratings 46
Subscription status 0
Shipping Type 0
Discount Applied 0
Promo Code Used 0
Previous Purchased 0
Payment method 0
Frequency Of Purchases 0
Purchase Amount USD 0
dtype: int64
8 4.2
```

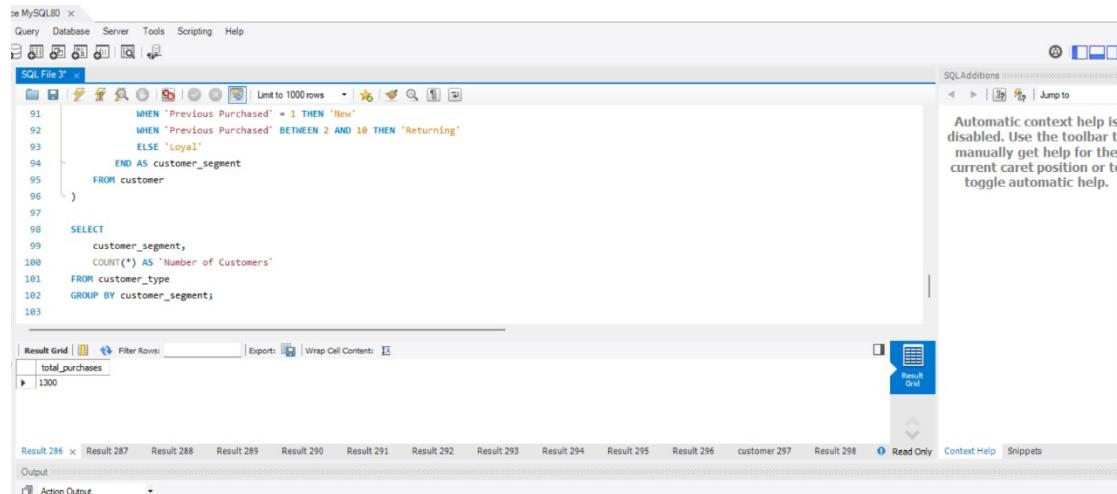
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Project v Run cpts x
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Name: Ratings, dtype: float64
customer ID 0
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Age 0
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Category 0
Season 0
Color 0
Size 0
Location 0
Ratings 0
Subscription status 0
Shipping Type 0
Discount Applied 0
Promo Code Used 0
Previous Purchased 0
Payment method 0
Frequency Of Purchases 0
Purchase Amount USD 0
dtype: int64
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       'color', 'size', 'location', 'ratings', 'subscription_status',
       'shipping_type', 'discount_applied', 'promo_code_used',
       'previous_purchased', 'payment_method', 'frequency_of_purchases',
       'purchase_amount_usd'],
      dtype='object')
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age age_group
0 22 21+
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2 32 32+
3 52 52+
4 67 67+
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4. Data Analysis using SQL (Business Transactions)

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

1. Total Number of Purchases

Shows the total count of purchase records, indicating overall transaction volume.



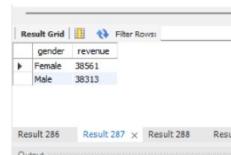
The screenshot shows the MySQL Workbench interface with a SQL editor tab containing the following code:

```
91 WHEN 'Previous Purchased' = 1 THEN 'New'
92 WHEN 'Previous Purchased' BETWEEN 2 AND 10 THEN 'Returning'
93 ELSE 'Loyal'
94 END AS customer_segment
95
96 FROM customer
97
98 SELECT
99     customer_segment,
100    COUNT(*) AS 'Number of Customers'
101   FROM customer_type
102  GROUP BY customer_segments;
103
```

The result grid shows a single row with the value 1300.

2. Revenue by Gender

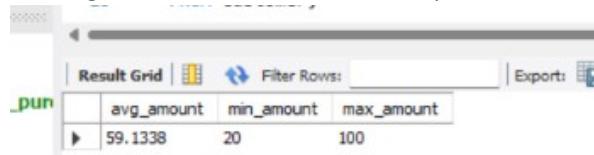
Compares total revenue generated by each gender to understand spending distribution.



Gender revenue	
Female	38561
Male	38313

3. Purchase Amount Summary

Provides average, minimum, and maximum purchase amounts to understand customer spending



	avg_amount	min_amount	max_amount
	59.1338	20	100

patterns

Result 286 Result 287 Result 288 x Result 289 Re

4. Customer Distribution by Location

Identifies which locations have the highest number of customers.

```

4 -- Q2. What is the total revenue?
5 • SELECT gender, SUM(`Purchase`)
6 FROM customer
7 GROUP BY gender;
8 -- Q3. What is the average,

```

Result Grid | Filter Rows: R

location	customer_count
North Dakota	39
Nevada	38
Virginia	35
Delaware	34
Alabama	34
Indiana	32
Missouri	32
California	31
Mississippi	31
Minnesota	31
Massachusetts	30

Result 286 Result 287 Result 288 R

5. Seasonal Purchase Volume

Highlights the season that records the highest number of purchases.

```

8 -- Q3. What is the average,

```

Result Grid | Filter Rows: R

season	total_purchases
Spring	343
Fall	324
Winter	321
Summer	312

6. Most Preferred Product Size

Shows which product size is ordered the most by customers.

Result Grid | Filter Rows: R

size	total_orders
M	661
L	269
S	208
XL	162

7. Impact of Discounts on Spending

Analyses whether applying a discount influences the average purchase amount.

```

8 -- Q3. What is the average, minimum

```

Result Grid | Filter Rows: R

Discount Applied	avg_spending
Yes	59.2848
No	58.9201

un

8. Most Used Payment Method

Identifies the most frequently used payment option among customers.

Result Grid | Filter Rows: R

Payment method	usage_count
Cash	234
Debit Card	225
PayPal	225
Credit Card	218
Bank Transfer	199
Venmo	199

9. Subscriber vs. Non-Subscriber Spending

Compares average purchase amounts to determine whether subscribers spend more.

Subscription Status	avg_amount
No	58.8814
Yes	59.2136

10. Average Rating by Season

Shows how customer review ratings change across different seasons.

Result Grid Filter Rows:	
Season	avg_rating
Fall	3.79775641925641
Summer	3.758724832214762
Spring	3.714566265060266
Winter	3.699679487179485

11. Most Popular Colors

Identifies the colors ordered most frequently by customers.

Result Grid Filter Rows:	
Color	total_orders
Olive	76
Yellow	73
Teal	69
Purple	65
Silver	64
Charcoal	61
Green	60
Beige	57
Orange	56
White	56
Blue	53

12. High-Value Customers

Finds customers whose purchase amount is above the overall average.

Result Grid Filter Rows: Export: Wrap Cell Content: T5														
customer ID	Gender	Age	Item Purchased	Category	Season	Color	Size	Location	Ratings	Subscription status	Shipping Type	Discount Applied	Promo Code Used	Previous Purchas
55	Female	40	Puffer Jacket	Outerwear	Fall	Gold	M	West Virginia	3.1	No	Next Day Air	Yes	Yes	49
118	Female	52	Hat	Accessories	Winter	Violet	M	Minnesota	2.9	Yes	Standard	No	No	5
181	Female	24	Wallet	Accessories	Spring	Turquoise	XL	North Dakota	4.6	Yes	Standard	No	No	25
215	Female	23	Blazer	Clothing	Summer	Blue	M	Alabama	3.5	Yes	2-Day Shipping	No	No	21
369	Female	61	Sweater	Clothing	Winter	Charcoal	XL	Wyoming	3	No	Express	No	Yes	29
461	Female	22	Puffer Jacket	Outerwear	Spring	Beige	M	Arkansas	4.3	No	Free Shipping	No	Yes	10
510	Female	52	Watch	Accessories	Fall	Turquoise	M	Maine	4.5	No	2-Day Shipping	Yes	Yes	21
602	Female	56	Powerbank	Electronics	Summer	Teal	S	Massachusetts	3.6	Yes	No Press	Yes	Yes	27
651	Female	58	Shirt	Clothing	Fall	Purple	S	Virginia	3.1	Yes	Standard	Yes	Yes	22
743	Male	21	Belt	Accessories	Winter	Charcoal	S	California	3.2	Yes	Store Pickup	Yes	Yes	12

13. Average Purchase Frequency

Calculates the average number of days between customer purchases to understand buying habits.

Result Grid Filter Rows:	
avg_frequency	
0	0

14. Customer Segmentation (New, Returning, Loyal)

Categorizes customers based on the number of previous purchases, helping analyze customer loyalty levels.

customer_segment	Number of Customers
Loyal	1073
Returning	207
New	20

5. Dashboard in Power BI

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



⌚ 3. KEY BUSINESS INSIGHTS

- ★ Customers prefer Medium and Large sizes → plan more inventory.
- ★ Spring & Fall seasons show peak sales → run campaigns early.
- ★ Discount users spend slightly more/less.
- ★ Cash & Debit Card may be the most preferred payment mode.
- ★ Subscription members show higher average spending.
- ★ Certain colors (Olive, Yellow, Teal) trend higher.

- ★ Locations like North Dakota, Nevada & West Virginia may dominate orders.
- ★ A faster shipping method is preferred over standard delivery.

4. BUSINESS RECOMMENDATIONS

1. Introduce targeted seasonal promotions

Boost marketing before high-demand seasons.

2. Offer loyalty or subscription rewards

Subscribers tend to spend more → increase retention.

3. Increase inventory for popular sizes & colors

Avoid out-of-stock situations.

4. Promote items with high review ratings

High-rated items convert better.

5. Provide discounts on low-performing categories

Encourages inventory clearance.

6. Focus marketing on high-purchase cities

Cities with higher orders deserve localized campaigns.

7. Improve shipping speed

If express shipping is more popular → reduce shipping time.

8. Personalize product recommendations

Use purchase frequency + style preferences.