



**BUSINESS
ANALYTICS**

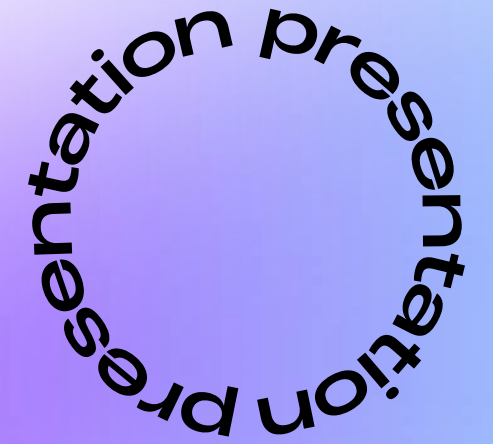
**Presented By:
BA10 - Group 6**

RETAIL ANALYSIS

FINAL PROJECT PRESENTATION

2025

TABLE OF CONTENTS



Data Understanding

Data Cleaning

Descriptive Statistics

Basic Charts (Dashboard Overview)

Q&A for EDA

Solutions for business improvement

Data Understanding

1.Understand the data fields

	Column	Data Type		Relationships
		Qualitative	Quantitative	
1	TransactionID	Nominal		
2	CustomerID	Nominal		
3	Date	Ordinal		
4	Time	Ordinal		
5	Age		Discrete	
6	Gender	Nominal		
7	Income	Ordinal		
8	CustomerSegment	Nominal		
9	Country	Nominal		
10	State	Nominal		
11	City	Nominal		
12	ZipCode	Nominal		
13	Products	Nominal		
14	ProductCategory	Nominal		
15	ProductBrand	Nominal		
16	ProductType	Nominal		
17	ShippingMethod	Nominal		
18	OrderStatus	Nominal		
19	PaymentMethod	Nominal		
20	TotalPurchase → Quantity		Discrete	= Sales/Price
21	Amount → Price		Continuous	= Sales/Quantity
22	TotalAmount → Sales		Continuous	= Quantity*Price
23	Ratings		Discrete	
24	Feedback	Ordinal		

Data Cleaning

1. Identify missing values

Initial number of rows: 65,121

Blanks:

Blanks in columns		Transaction	CustomerID	Date	Time	Age	Gender	Income	CustomerSe	Country	State	City	ZipCode	Products	ProductCate	ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	Purchases	Amount	TotalAmount	Ratings	Feedback
		0	0	0	0	70	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	80	77	0	0
Moreover, cells filled with the word "NA" are also considered and highlighted.																									

- Time (70 NA) and ZipCode (72 NA) → DELETED
- Amount (80 NA), TotalAmount (77 NA) → can be calculated

Cells containing “NA”:

TotalPurchase (64 NA): can be calculated

Data Cleaning

1. Identify missing values

Initial number of rows: 65,121

Cells containing “NA”:

	B	C	D	E	F	G	H	I	J	K	L	M	N
1	CustomerID	Date	Time		Gender	Income	CustomerSegment	Country	State	City	ZipCode	Products	ProductCategory
663	65490	2023-10-30	16:56:02	21	NA	Medium	Regular	UK	England	Portsmouth	21271	Low-rise jeans	Clothing
1174	50838	2023-12-07	14:22:04	24	NA	Medium	Regular	UK	England	Portsmouth	58029	Biography	Books
1272	22093	2024-01-13	14:32:02	24	NA	Medium	Regular	UK	England	Portsmouth	58375	Soap dispenser	Home Decor
1390	50515	2023-12-28	12:22:06	24	NA	Medium	Regular	UK	England	Portsmouth	63512	Tape measure	Home Decor
3394	61250	2023-12-04	13:42:12	19	NA	Medium	Regular	UK	England	Portsmouth	31870	Mystery	Books
4216	27229	2023-09-02	5:21:13	19	NA	Medium	New	USA	New Mexico	Fort Worth	23078	Bed	Home Decor
5946	83230	2023-10-18	7:00:25	22	NA	Medium	Regular	Germany	Berlin	Frankfurt	95460	Mineral water	Grocery
6439	18750	2024-02-10	16:22:48	22	NA	Medium	Regular	Germany	Berlin	Frankfurt	2852	Sony Xperia	Electronics
6883	12554	2024-01-08	17:07:40	22	NA	High	Regular	Canada	Ontario	Barrie	65132	Bed	Home Decor
9486	15599	2023-10-09	13:10:20	20	NA	Low	Regular	Germany	Berlin	Düsseldorf	90795	iPhone	Electronics
10784	99036	2023-08-28	6:57:24	20	NA	Low	Regular	Australia	New South Wales	Perth	16541	Apple juice	Grocery
11551	25753	2023-12-07	6:58:21	20	NA	Medium	New	UK	England	Manchester	24110	Boyfriend jeans	Clothing
12418	76413	2023-08-10	18:41:08	20	NA	Low	New	USA	Kentucky	Memphis	40467	Espadrilles	Clothing
14378	38390	2023-12-30	9:09:12	20	NA	Medium	Premium	USA	Pennsylvania	Wichita	15700	Running shoes	Clothing
14485	11755	2024-01-17	0:43:21	20	NA	Medium	Premium	Germany	Berlin	Frankfurt	97827	Oxfords	Clothing
15002	45016	2023-09-23	19:58:40	20	NA	Low	New	UK	England	Edinburgh	82560	Clothing	Books
16031	22717	2023-10-20	18:32:49	20	NA	High	Premium	USA	Connecticut	Chicago	97877	Sink	Home Decor
16908	86630	2023-09-05	5:35:23	34	NA	High	Regular	USA	Connecticut	Chicago	93658	Artesian water	Grocery
19497	71337	2023-08-03	17:35:04	34	NA	Medium	Premium	USA	Connecticut	Chicago	63140	Flavored water	Grocery
21086	65907	2024-01-27	1:18:27	46	NA	Medium	New	Canada	Ontario	Quebec City	1268	Affogato	Grocery
22854	74313	2023-10-17	7:38:20	46	NA	Medium	Premium	Australia	New South Wales	Adelaide	9481	Board shorts	Clothing
23716	30582	2023-12-20	5:46:06	46	NA	Medium	Premium	Australia	New South Wales	Darwin	20030	Sculptures	Home Decor

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retail_data_duplicates

duplicate_ae_lam

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- Age: 37 NA
- Gender: 57 NA
- Income: 69 NA
- CustomerSegment: 53 NA
- Ratings, Feedback: both have 41 NA
- Shipping method: 58 NA
- OrderStatus: 60 NA

→ Delete because we could not know or calculate these information.

Data Cleaning

1. Identify missing values

Initial number of rows: 65,121

Cells containing “NA”:

Count

→ Can be used as a column for ProductB

1	K	L	M	N	O	P	Q	R	S	T	U	V
		ZipCode	Products	ProductCategory	ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchase	Amount	TotalAmount
292	mouth	38806	Bookshelf	Home Decor	NA	Furniture	Standard	Shipped	Credit Card	8	303.07	2,424.5
1844	mouth	89361	Duvet cover	Home Decor	NA	Bedding	Same-Day	Processing	Debit Card	10	45.20	451.5
2918	mouth	54537	Sports equipment	Books	NA	Children's	Express	Delivered	Cash	7	195.52	1,368.6
3558	mouth	95178	Samsung Galaxy Tab	Electronics	NA	Tablet	Same-Day	Delivered	Credit Card	4	173.72	694.8
3658	mouth	30256	Coffee table	Home Decor	NA	Furniture	Same-Day	Delivered	Cash	5	360.90	1,804.4
7806		6816	Samsung Galaxy	Electronics	NA	Smartphone	Same-Day	Delivered	Credit Card	1	260.76	260.7
10461	ton	55273	Games	Books	NA	Children's	Express	Pending	Cash	10	134.88	1,348.7
10895	ipeg	76603	Short stories	Books	NA	Literature	Same-Day	Shipped	Debit Card	5	448.28	2,241.3
11968	egas	68046	Horror	Books	NA	Fiction	Express	Pending	PayPal	10	261.10	2,611.0
12329	on	29497	Suspense	Books	NA	Thriller	Same-Day	Processing	PayPal	8	237.73	1,901.8

Country

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	TransactionID	CustomerID	Date	Time	A	Gender	Income	CustomerSegment	Country	State	City	ZipCode	Products	ProductCategory
1	TransactionID	CustomerID	Date	Time	A	Gender	Income	CustomerSegment	Country	State	City	ZipCode	Products	ProductCategory
7284	3894419	93390	2023-10-13	17:12:42	22	Male	Low	Regular	NA	Ontario	Oshawa	73391	Maxi dress	Clothing
8772	4207210	23736	2023-11-20	6:08:09	22	Male	Medium	Regular	NA	England	Oxford	80194	Raglan tee	Clothing
9281	5462909	15648	2023-12-10	15:47:22	22	Male	Low	Regular	NA	Berlin	Düsseldorf	4116	Chocolate fondue	Grocery
9321	3963361	87197	2023-08-23	16:44:32	22	Female	Low	Regular	NA	New South Wales	Adelaide	16934	Refrigerator	Home Decor
10808	9826195	26398	2023-10-28	7:48:25	20	Male	Low	Regular	NA	New South Wales	Launceston	59144	Spring water	Grocery
10986	7860619	88042	2023-11-30	23:35:23	20	Female	Medium	Premium	NA	Berlin	Berlin	63274	Mineral water	Grocery
11213	8887553	49328	2023-11-26	12:57:14	20	Male	Low	New	NA	England	Birmingham	59895	Detective	Books
11591	1859801	37204	2023-11-17	7:49:10	20	Female	Medium	New	NA	Ontario	Ottawa	99509	Decorative pillows	Home Decor
12955	9162715	21729	2024-01-15	1:26:20	20	Male	Low	New	NA	Berlin	Wuppertal	17979	Loafers	Clothing
21098	9967356	24322	2024-02-04	15:29:32	46	Male	Low	Premium	NA	England	Glasgow	87286	Sony Xperia Tablet	Electronics
22331	3491082	14451	2023-11-23	1:41:57	46	Male	Medium	Regular	NA	Ontario	Barrie	22205	Pomegranate juice	Grocery
22554	2670549	63944	2023-08-03	1:20:27	46	Female	Medium	Premium	NA	Minnesota	Nashville	55623	OnePlus	Electronics
23242	4228876	85021	2024-02-01	10:23:00	46	Male	Medium	Regular	NA	Berlin	Bielefeld	92987	LG Gram	Electronics
24247	6480148	44131	2023-10-01	13:13:29	46	Female	Medium	Premium	NA	England	Oxford	64730	Vases	Home Decor
25622	7674546	94214	2023-10-12	8:52:19	46	Female	Medium	New	NA	New South Wales	Newcastle	15455	Purified water	Grocery
26321	2338044	19041	2023-12-25	3:51:55	46	Male	High	Premium	NA	Ontario	Kitchener	54285	Google Pixel	Electronics
26391	1675950	69324	2024-02-16	18:18:01	46	Female	Medium	Premium	NA	Ontario	Montreal	98044	Books	Books
26720	2589597	26999	2023-12-11	8:54:47	55	Female	Medium	New	NA	New South Wales	Townsville	66747	Swim trunks	Clothing
28542	5314929	26975	2023-12-14	5:29:40	26	Male	Low	New	NA	England	Bristol	70381	Distressed jeans	Clothing
29202	8614086	11078	2023-09-16	6:37:04	26	Male	High	Regular	NA	England	Oxford	75346	Counter-depth refrigerator	Electronics
29619	7976228	75184	2023-10-19	22:53:40	26	Male	Medium	Regular	NA	New South Wales	Sydney	46082	Compact refrigerator	Electronics
37142	1486008	14551	2023-12-21	7:47:52	25	Female	Medium	Regular	NA	Berlin	Bielefeld	67760	Lenovo Tab	Electronics

retail_data_NA

retail_data_duplicatesduplicate_ae_lam

- **ProductCategory:** 63 NA
- **ProductBrand:** 53 NA
- **Country:** 63 NA

→ Can be joined, using the 'Product' column for ProductCategory and ProductBrand; City column for Country

=> 64,318 remaining rows
after checking NA

Data Cleaning

2. Check duplicates

Check 1

- Check duplicates using `=CONCATENATE(TransactionID, CustomerID, Products)`

=> 86 duplicated values

→ Delete all because a distinct transaction cannot have the same TransactionID, CustomerID, Products at the same time

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchase	Amount	TotalAmount	Rating	Feedback	check 1	check 2	
2	Chocolate	Standard	Shipped	Cash	2	124.28	248.55	1	Bad	498377527901Chocolate cookies	498377527901	
3	Chocolate	Same-Day	Delivered	Cash	8	328.84	2,630.71	1	Bad	415584580175Dark chocolate	415584580175	
4	Beer	Standard	Delivered	PayPal	10	161.88	1,618.79	1	Bad	284683231930Bottled water	284683231930	
5		Express	Shipped	Credit Card	1	210.14	210.14	1	Bad	772809978376Orange juice	772809978376	
6	Fiction	Same-Day	Processing	PayPal	6	34.12	204.75	2	Average	947685542410Self-help	947685542410	
7		Same-Day	Processing	PayPal	2	285.30	570.60	1	Bad	907044799870Grape juice	907044799870	
8	Net	Same-Day	Shipped	Credit Card	5	471.48	2,357.41	1	Bad	523087623097Amazon Fire Tablet	523087623097	
9	Shoes	Same-Day	Pending	Debit Card	3	159.80	479.41	3	Good	341329698256Running shoes	341329698256	
10	Chocolate	Same-Day	Pending	Credit Card	2	333.70	667.41	4	Excellent	420852666911Chocolate mousse	420852666911	
11	Men's	Standard	Pending	Cash	9	161.39	1,452.49	4	Excellent	457966331767Toys	457966331767	
12	Drink	Express	Processing	PayPal	7	44.33	310.31	4	Good	599204630637Iced tea	599204630637	
13	Shoes	Same-Day	Pending	Credit Card	8	28.83	230.60	4	Excellent	245823396840Running shoes	245823396840	
14		Same-Day	Pending	PayPal	10	20.53	205.29	4	Excellent	205503625848Apple juice	205503625848	
15	Shoes	Standard	Delivered	Cash	3	312.98	938.93	2	Average	323936762464Bodycon dress	323936762464	
16	Chocolate	Express	Processing	PayPal	3	394.61	1,183.82	5	Excellent	458044112911White chocolate	458044112911	
17	Headphones	Express	Delivered	Cash	4	303.79	1,215.16	1	Bad	631515175456Studio headphones	631515175456	
18	Shoes	Same-Day	Shipped	Debit Card	4	129.76	519.03	1	Bad	685716050574Sneakers	685716050574	
19	Sculptures	Same-Day	Shipped	Debit Card	10	387.55	3,875.53	2	Average	692123321381Sculptures	692123321381	
20	Shoes	Standard	Pending	Debit Card	6	71.19	427.15	2	Average	867092380071Pliers	867092380071	
21	Shoes	Same-Day	Delivered	Cash	3	85.16	255.47	2	Average	442745897683Oxfords	442745897683	
22	Furniture	Standard	Processing	PayPal	2	405.45	810.90	4	Good	676102711397Dining table	676102711397	
23	Fiction	Express	Delivered	Cash	4	187.09	748.37	1	Bad	920296935966Cooking	920296935966	
24	Pillowcase set	Express	Shipped	Debit Card	4	312.43	1,249.71	1	Bad	441965421444Pillowcase set	441965421444	

Data Cleaning

2. Check duplicates

Check 2

- Check duplicates using **=CONCATENATE(TransactionID, CustomerID)**
- Keep these rows, because some transactions can have the same customer, but cannot have the same product

Excel screenshot showing a formula bar with `=CONCATENATE(A2,B2)` and a column of concatenated TransactionID and CustomerID values. A red box highlights the column.

ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchase	Amount	TotalAmount	Rating	Feedback	check 1	check 2
Chocolate	Standard	Shipped	Cash	2	124.28	248.55	1	Bad	498377527901Chocolate cookies	498377527901
Chocolate	Same-Day	Delivered	Cash	8	328.84	2,630.71	1	Bad	415584580175Dark chocolate	415584580175
Water	Standard	Delivered	PayPal	10	161.88	1,618.79	1	Bad	284683231930Bottled water	284683231930
Orange juice	Express	Shipped	Credit Card	1	210.14	210.14	1	Bad	772809978376Orange juice	772809978376
Self-help	Same-Day	Processing	PayPal	6	34.12	204.75	2	Average	947685542410Self-help	947685542410
Grape juice	Same-Day	Processing	PayPal	2	285.30	570.60	1	Bad	907044799870Grape juice	907044799870
Amazon Fire Tablet	Same-Day	Shipped	Credit Card	5	471.48	2,357.41	1	Bad	523087623097Amazon Fire Tablet	523087623097
Running shoes	Same-Day	Pending	Debit Card	3	159.80	479.41	3	Good	341329698256Running shoes	341329698256
Chocolate mousse	Same-Day	Pending	Credit Card	2	333.70	667.41	4	Excellent	420852666911Chocolate mousse	420852666911
Toys	Standard	Pending	Cash	9	161.39	1,452.49	4	Excellent	457966331767Toys	457966331767
Iced tea	Express	Processing	PayPal	7	44.33	310.31	4	Good	599204630637Iced tea	599204630637
Running shoes	Same-Day	Pending	Credit Card	8	28.83	230.60	4	Excellent	245823396840Running shoes	245823396840
Apple juice	Same-Day	Pending	PayPal	10	20.53	205.29	4	Excellent	205503625848Apple juice	205503625848
Bodycon dress	Standard	Delivered	Cash	3	312.98	938.93	2	Average	323936762464Bodycon dress	323936762464
White chocolate	Express	Processing	PayPal	3	394.61	1,183.82	5	Excellent	458044112911White chocolate	458044112911
Studio headphones	Express	Delivered	Cash	4	303.79	1,215.16	1	Bad	631515175456studio headphones	631515175456
Sneakers	Same-Day	Shipped	Debit Card	4	129.76	519.03	1	Bad	685716050574Sneakers	685716050574
Sculptures	Same-Day	Shipped	Debit Card	10	387.55	3,875.53	2	Average	692123321381Sculptures	692123321381
Pliers	Standard	Pending	Debit Card	6	71.19	427.15	2	Average	867092380071Pliers	867092380071
Oxfords	Same-Day	Delivered	Cash	3	85.16	255.47	2	Average	442745897683Oxfords	442745897683
Dining table	Standard	Processing	PayPal	2	405.45	810.90	4	Good	676102711397Dining table	676102711397
Cooking	Express	Delivered	Cash	4	187.09	748.37	1	Bad	920296935966Cooking	920296935966
Pillowcase set	Express	Shipped	Debit Card	4	312.43	1,249.71	1	Bad	441965421444Pillowcase set	441965421444

Check 3

- Sort the data based on Date, then Time
- Keep the transaction that occurs first

Excel screenshot showing a formula bar with `=IF(COUNTIF(A2:A2, A2)=1, "Keep", "Delete")` and a column of 'Keep or Delete' values. A red box highlights the column.

ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchase	Amount	TotalAmount	Rating	Feedback	Keep or Delete
Home Depot	Tools	Standard	Delivered	Cash	8	289.1135209	2312.908167	4	Good	Keep
Bed Bath & Beyond	Bedding	Same-Day	Delivered	PayPal	10	316.969135	3169.69135	2	Average	Keep
Pepsi	Water	Express	Pending	Debit Card	8	311.7753202	2494.202561	3	Good	Keep
Whirepool	Fridge	Express	Delivered	Cash	7	433.1149779	3031.804845	2	Average	Keep
BlueStar	BlueStar AC	Express	Delivered	Credit Card	5	243.4049095	1217.024548	4	Excellent	Keep
Nestle	Coffee	Express	Pending	Debit Card	1	440.0107177	440.0107177	2	Average	Keep
Nike	Shoes	Same-Day	Pending	Cash	4	447.3984365	1789.593746	4	Excellent	Keep
IKEA	Lighting	Same-Day	Delivered	PayPal	6	422.2880848	2533.728509	1	Bad	Keep
Penguin Books	Fiction	Same-Day	Delivered	Debit Card	4	92.0018125	368.00725	5	Excellent	Keep
Random House	Non-Fiction	Same-Day	Shipped	PayPal	8	413.0526345	3304.421076	1	Bad	Keep
Home Depot	Furniture	Same-Day	Pending	Debit Card	8	146.3586098	1170.868879	4	Good	Keep
Samsung	Tablet	Same-Day	Shipped	Credit Card	7	201.850802	1412.955614	5	Excellent	Keep
Pepsi	Juice	Express	Pending	PayPal	1	370.4375146	370.4375146	2	Average	Keep
Zara	Dress	Same-Day	Processing	PayPal	5	156.1784172	780.8920861	5	Excellent	Keep
Whirepool	Fridge	Express	Delivered	PayPal	2	485.6511822	971.3023644	4	Good	Keep
Coca-Cola	Water	Standard	Pending	Cash	1	470.9689094	470.9689094	2	Average	Keep
Coca-Cola	Soft Drink	Express	Processing	Credit Card	10	57.72359768	577.2359768	4	Good	Keep
HarperCollins	Thriller	Same-Day	Shipped	PayPal	4	163.6620737	654.6482948	4	Good	Keep
Nestle	Snacks	Standard	Delivered	Cash	3	20.33103528	60.99310583	4	Good	Keep

=> **64,052** rows remaining after cleaning duplicated values

Data Cleaning

3. Identify and replace errors

Value errors

- ProductType: Replace **BlueStar AC** and **Mitsubishi...AC** → **Air-conditioner**
- City **“Düsseldorf”** has an error: **“DÃ¼sseldorf”**

	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Date	Time	Age	Gender	Income	CustomerSegment	Country	State	City	ZipCode	Products	ProductCategory	ProductBrand	ProductType
2709	2023-12-31	10:36:32	61	Male	Low	Regular	Germany	Berlin	Düsseldorf	68504	HDR TV	Electronics	Sony	Television
2807	2023-12-31	10:36:32	61	Male	Low	Regular	Germany	Berlin	Düsseldorf	68504	QLED TV	Electronics	Sony	Television
3868	2023-11-08	21:03:20	19	Female	Medium	New	Germany	Berlin	Düsseldorf	56094	Desk	Home Decor	Home Depot	Furniture
6541	2023-09-30	10:03:45	22	Male	High	Regular	Germany	Berlin	Düsseldorf	42328	Mystery	Books	Random House	Fiction
6887	2024-02-16	11:19:06	22							4129	Grape juice	Grocery	Pepsi	Juice
7061	2023-09-04	22:33:51	22							19777	Iced tea	Grocery	Pepsi	Soft Drink
7262	2023-09-04	20:29:46	22							66916	Track lighting	Home Decor	IKEA	Lighting
7400	2023-10-18	22:58:49	22							41471	Beef jerky	Grocery	Nestle	Snacks
7757	2024-01-05	3:26:08	22							36808	Straight-leg jeans	Clothing	Zara	Jeans
7819	2023-08-21	4:24:05	22							43376	Straight-leg jeans	Clothing	Zara	Jeans
7884	2024-02-05	1:28:48	22							14276	Psychology	Books	Random House	Non-Fiction
7969	2023-12-20	2:50:19	22							56767	Sony Xperia Tablet	Electronics	Sony	Tablet
8005	2023-10-13	23:37:05	22							60004	Mango juice	Grocery	Pepsi	Juice
8006	2023-09-27	17:27:22	22							27778	Peacoat	Clothing	Adidas	Jacket
8022	2023-11-30	16:54:37	22							81766	Google Pixel	Electronics	Google	Smartphone
8222	2023-10-26	4:00:16	22							30605	Dystopian	Books	Penguin Books	Fiction
8377	2023-11-25	7:38:21	22	Male	Low	Regular	Germany	Berlin	Düsseldorf	91235	Samsung Notebook	Electronics	Samsung	Laptop
8485	2023-08-18	9:11:44	22	Male	Medium	Regular	Germany	Berlin	Düsseldorf	3500	Alkaline water	Grocery	Coca-Cola	Water
8557	2023-11-27	22:06:49	22	Female	Low	Regular	Germany	Berlin	Düsseldorf	44659	Mattress topper	Home Decor	Bed Bath & Beyond	Bedding
8611	2023-11-24	21:34:02	22	Female	Low	Regular	Germany	Berlin	Düsseldorf	24288	Bottled water	Grocery	Pepsi	Water
8656	2023-09-12	17:29:48	22	Male	Medium	Regular	Germany	Berlin	Düsseldorf	55771	Google Pixel	Electronics	Google	Smartphone
8806	2024-01-07	11:48:04	22	Male	Low	Regular	Germany	Berlin	Düsseldorf	27063	Cooking	Books	Penguin Books	Non-Fiction
8856	2024-01-23	7:45:39	22	Male	High	Regular	Germany	Berlin	Düsseldorf	13896	Rugs	Home Decor	IKEA	Decoration
9092	2023-09-11	13:57:32	22	Female	High	Regular	Germany	Berlin	Düsseldorf	34298	Bottled water	Grocery	Coca-Cola	Water

Data Cleaning

3. Identify and replace errors

Value errors

- City “Münster” has an error: “MÃ¼nster”

The screenshot shows a Microsoft Excel spreadsheet with a table containing retail data. The table has columns for Segment, Country, State, City, ZipCode, Products, ProductCategory, ProductBrand, ProductType, ShippingMethod, OrderStatus, PaymentMethod, and TotalPurchases. The 'City' column contains the value 'Münster' in multiple rows. A 'Find and Replace' dialog box is open, showing 'Find what: MÃ¼nster' and 'Replace with: Münster'. The 'Options' button is visible. A confirmation message box is also present, stating 'All done. We made 466 replacements.' The spreadsheet tabs at the bottom include 'retail_data_cleaned', 'retail_data_joint', 'tables', 'geography', and 'result'.

Segment	Country	State	City	ZipCode	Products	ProductCategory	ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchases
6624	Germany	Berlin	Münster	53728	Travel	Books	Random House	Non-Fiction	Standard	Delivered	PayPal	8
6660	Germany	Berlin	Münster	64603	Polo shirt	Clothing			Standard	Delivered	Credit Card	3
6689	Germany	Berlin	Münster	64341	Mattress topper	Home Decor			Same-Day	Delivered	Cash	8
6709	Germany	Berlin	Münster	76585	Nokia	Electronics			Standard	Delivered	PayPal	3
6855	Germany	Berlin	Münster	25817	Crackers	Grocery			Express	Delivered	PayPal	8
6878	Germany	Berlin	Münster	17077	Duvet cover	Home Decor						
7079	Germany	Berlin	Münster	16105	Health	Books						
7138	Germany	Berlin	Münster	34208	Distilled water	Grocery	Coca-Cola	Water				
7144	Germany	Berlin	Münster	96640	Plasma TV	Electronics	Samsung	Television				
7192	Germany	Berlin	Münster	84840	Xiaomi Mi	Electronics	Xiaomi	Smartphone				
7309	Germany	Berlin	Münster	35012	Energy drink	Grocery	Pepsi	Soft Drink				
7323	Germany	Berlin	Münster	25030	Historical fiction	Books	HarperCollins	Fiction				
7346	Germany	Berlin	Münster	54827	Grape juice	Grocery	Coca-Cola	Juice				
7373	Germany	Berlin	Münster	59941	Cooking	Books	Penguin Books	Non-Fiction				
7427	Germany	Berlin	Münster	43046	Coffee table	Home Decor	Home Depot	Furniture				
7497	Germany	Berlin	Münster	21526	Wall art	Home Decor	Home Depot	Decorations				
7643	Germany	Berlin	Münster	3202	Memoir	Books	Penguin Books	Non-Fiction				
7834	Germany	Berlin	Münster	53997	Travel	Books	Random House	Non-Fiction	Standard	Delivered	Cash	6
7989	Germany	Berlin	Münster	77151	Distilled water	Grocery	Pepsi	Water	Express	Delivered	Debit Card	2
8031	Germany	Berlin	Münster	56833	OnePlus	Electronics	OnePlus	Smartphone	Express	Delivered	Debit Card	7
8080	Germany	Berlin	Münster	49899	Wall art	Home Decor	IKEA	Decorations	Same-Day	Delivered	PayPal	7
8240	Germany	Berlin	Münster	7538	Art supplies	Books	Penguin Books	Children's	Standard	Delivered	PayPal	7
8250	Germany	Berlin	Münster	47562	Wardrobe	Home Decor	IKEA	Furniture	Express	Delivered	Debit Card	2
8700	Germany	Berlin	Münster	95480	Classic literature	Books	Random House	Literature	Same-Day	Delivered	Cash	1

Column errors

Fix the names in the Product and City columns.

M	N	O
Products	ProductCatego	ProductBrand
LG G	Electronics	Apple

- Example: **LG G - Apple → Incorrect**
- (Fix: Filter the Electronics category and assign the correct brand name based on the first word of the **Product name**. For **Apple** products, detect based on the first letters such as "iP" or "Macbook", then assign the brand as Apple.)

Fix the Country and State name:

Country	State	City
USA	Oregon	New York

- Example: **USA - Oregon - New York → Incorrect**
- (Fix: Create a new **Geography table** using existing city data. Use AI to generate a correct Geography table with Country, State, and City fields, then join it back to the main dataset.)

The scale for Ratings and Feedback is incorrect (e.g., both **3 and 4 are labeled "Good"**)

→ Fix: Join with a corrected scale table.

W	X
Rating	Feedback
2	Average
4	Good
2	Average
2	Average
4	Good
1	Bad
3	Good
4	Excellent

Column errors

Tables created for joining:

- Geography
- Product
- Ratings

	A	B	C	D	E	F	G	H	I
1		ProductBrand		Ratings	FeedbackUpdate		Country	State	City
2		Apple		1	Very bad		Australia	Australian Capital Territory	Canberra
3		Sony		2	Bad		Australia	New South Wales	Albury-Wodonga
4		Samsung		3	Average		Australia	New South Wales	Sydney
5		Whirepool		4	Good		Australia	New South Wales	Wollongong
6		Mitsubhisi		5	Excellent		Australia	Northern Territory	Darwin
7		BlueStar					Australia	Queensland	Brisbane
8		Huawei					Australia	Queensland	Cairns
9		Amazon					Australia	Queensland	Gold Coast
10		Google					Australia	Queensland	Mackay
11		HP					Australia	Queensland	Toowoomba
12		Xiaomi					Australia	Queensland	Townsville
13		Acer					Australia	South Australia	Adelaide
14		Lenovo					Australia	Tasmania	Hobart
15		Dell					Australia	Tasmania	Launceston
16		Nokia					Australia	Victoria	Ballarat
17		Asus					Australia	Victoria	Bendigo
18		Motorola					Australia	Victoria	Geelong
19		Microsoft					Australia	Victoria	Melbourne
20		Razer					Australia	Western Australia	Perth
21		LG					Canada	British Columbia	Kelowna
22		OnePlus					Canada	British Columbia	Vancouver
23							Canada	British Columbia	Victoria
24							Canada	Manitoba	Winnipeg
25							Canada	Newfoundland and Labrador	St. John's
26							Canada	Nova Scotia	Halifax
27							Canada	Ontario	Barrie
28							Canada	Ontario	Hamilton
29							Canada	Ontario	Kitchener
30							Canada	Ontario	London
31							Canada	Ontario	Oshawa
32							Canada	Ontario	Ottawa
33							Canada	Ontario	Toronto

3. Identify and replace errors

Geography:

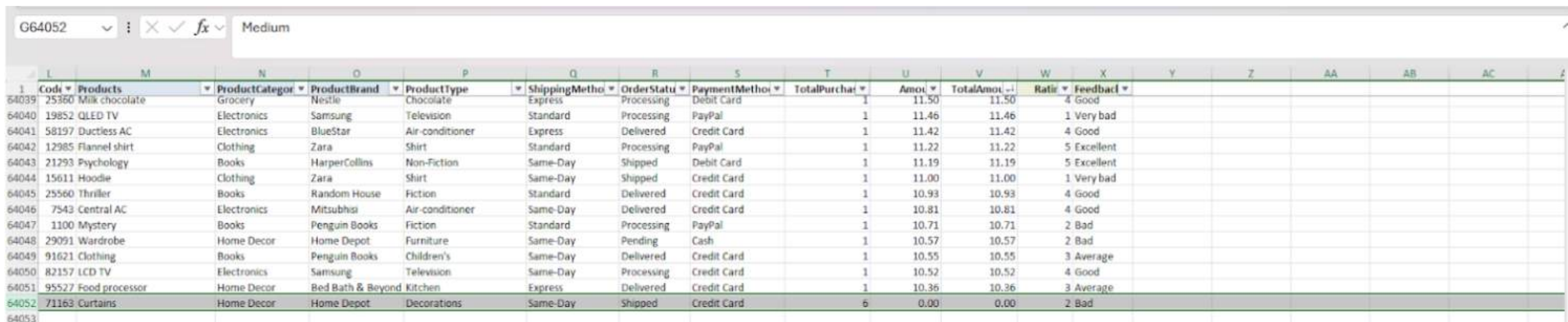
Product Name:

Ratings:

Page 13

Data Cleaning

4. Anomalies



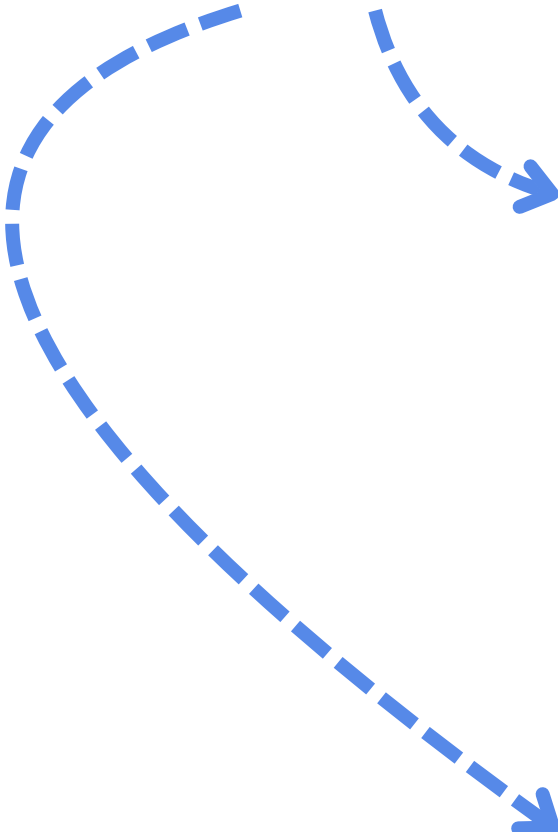
	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	Code	Products	ProductCategory	ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchased	Amount	TotalAmount	Rating	Feedback					
64039	25360	Milk chocolate	Grocery	Nestle	Chocolate	Express	Processing	Debit Card	1	11.50	11.50	4	Good					
64040	19852	QLED TV	Electronics	Samsung	Television	Standard	Processing	PayPal	1	11.46	11.46	1	Very bad					
64041	58197	Ductless AC	Electronics	BlueStar	Air-conditioner	Express	Delivered	Credit Card	1	11.42	11.42	4	Good					
64042	12985	Flannel shirt	Clothing	Zara	Shirt	Standard	Processing	PayPal	1	11.22	11.22	5	Excellent					
64043	21293	Psychology	Books	HarperCollins	Non-Fiction	Same-Day	Shipped	Debit Card	1	11.19	11.19	5	Excellent					
64044	15611	Hoodie	Clothing	Zara	Shirt	Same-Day	Shipped	Credit Card	1	11.00	11.00	1	Very bad					
64045	25560	Thriller	Books	Random House	Fiction	Standard	Delivered	Credit Card	1	10.93	10.93	4	Good					
64046	7543	Central AC	Electronics	Mitsubishi	Air-conditioner	Same-Day	Delivered	Credit Card	1	10.81	10.81	4	Good					
64047	1100	Mystery	Books	Penguin Books	Fiction	Standard	Processing	PayPal	1	10.71	10.71	2	Bad					
64048	29091	Wardrobe	Home Decor	Home Depot	Furniture	Same-Day	Pending	Cash	1	10.57	10.57	2	Bad					
64049	91621	Clothing	Books	Penguin Books	Children's	Same-Day	Delivered	Credit Card	1	10.55	10.55	3	Average					
64050	82157	LCD TV	Electronics	Samsung	Television	Same-Day	Processing	Credit Card	1	10.52	10.52	4	Good					
64051	95527	Food processor	Home Decor	Bed Bath & Beyond	Kitchen	Express	Delivered	Credit Card	1	10.36	10.36	3	Average					
64052	71163	Curtains	Home Decor	Home Depot	Decorations	Same-Day	Shipped	Credit Card	6	0.00	0.00	2	Bad					
64053																		

Amount = 0 → delete

→ 64,050 rows for final analysis

Additional column created for analysis:

- **Quarter:** in the format “Q1, 2024” → for the slicers to work with quarters
- **Time_Bin:** classified the time into 6 bins (4 hours each bin)
- **Weekday:** get the weekday from the Date column with the format “ddd”



```
1 Time_Bin =  
2 VAR BinNumber = INT(HOUR('retail_data_joint'[Time]) / 4)  
3 VAR StartHour = BinNumber * 4  
4 VAR EndHour = StartHour + 4  
5 RETURN  
6 FORMAT(StartHour, "00") & ":00 to " & FORMAT(EndHour, "00") & ":00"
```

```
1 Weekday =  
2 FORMAT(WEEKDAY('retail_data_joint'[Date], 2), "0")  
3 & " - " & FORMAT('retail_data_joint'[Date], "ddd")
```


Descriptive Statistics

TotalPurchase	
Mean	5.35
Standard Error	0.01
Median	5.00
Mode	2.00
Standard Deviation	2.87
Sample Variance	8.22
Kurtosis	-1.22
Skewness	0.07
Range	9.00
Minimum	1.00
Maximum	10.00
Sum	342,941.00
Count	64050

moderate engagement
across the customer base

most customers rate
around the middle to
slightly positive range

Ratings	
Mean	3.15
Standard Error	0.01
Median	3.00
Mode	4.00
Standard Deviation	1.33
Sample Variance	1.76
Kurtosis	-1.18
Skewness	-0.23
Range	4.00
Minimum	1.00
Maximum	5.00
Sum	201,766.00
Count	64050

Amount	
Mean	254.60
Standard Error	0.56
Median	254.30
Mode	474.60
Standard Deviation	141.04
Sample Variance	19,892.20
Kurtosis	-1.20
Skewness	0.01
Range	489.99
Minimum	10.01
Maximum	500.00
Sum	16,307,396.08
Count	64050

varied product pricing and
spending habits

attract a good proportion
of younger customers

Age	
Mean	35.42
Standard Error	0.06
Median	32.00
Mode	20.00
Standard Deviation	15.02
Sample Variance	225.68
Kurtosis	-0.79
Skewness	0.66
Range	52.00
Minimum	18.00
Maximum	70.00
Sum	2,268,332.00
Count	64050

TotalAmount	
Mean	1,362.82
Standard Error	4.45
Median	1,036.62
Mode	4,746.01
Standard Deviation	1,125.89
Sample Variance	1,267,631.58
Kurtosis	0.21
Skewness	0.99
Range	4,988.98
Minimum	10.36
Maximum	4,999.34
Sum	87,288,483.33
Count	64050

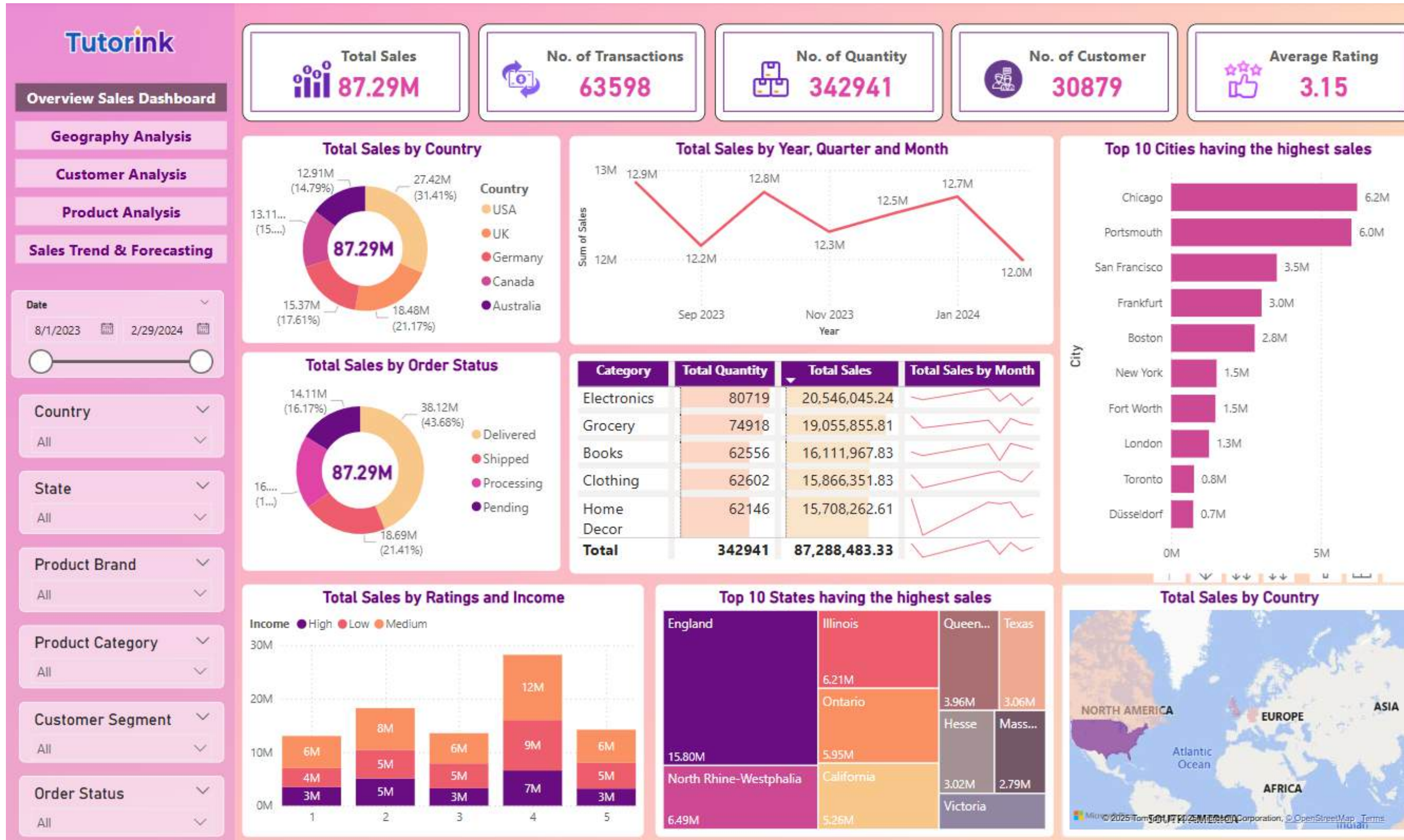
few high-value
customers, while the
majority spend much less

Business Overview

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	TransactionID	CustomerID	Date	Time	Age	Gender	Income	CustomerSegment	Country	State	City	ZipCode	Products	ProductCategory	ProductBrand	ProductType	ShippingMethod	OrderStatus	PaymentMethod	TotalPurchas	Amou	TotalAmou	Ratin	Feedback
2	4983775	27901	2024-01-10	16:54:07	22	Male	Low	Premium	UK	England	Bristol	48704	Chocolate coo	Grocery	Nestle	Chocolate	Standard	Shipped	Cash	2	124.28	248.55	1	Bad
3	4155845	80175	2024-01-06	14:38:26	46	Male	Medium	New	Australia	New South	Wollong	39820	Dark chocolate	Grocery	Nestle	Chocolate	Same-Day	Delivered	Cash	8	328.84	2,630.71	1	Bad
4	2846832	31930	2024-01-02	0:00:47	56	Female	Medium	Regular	UK	England	Portsmo	38173	Bottled water	Grocery	Coca-Cola	Water	Standard	Delivered	PayPal	10	161.88	1,618.79	1	Bad
5	7728099	78376	2024-02-07	18:29:59	49	Male	Low	Regular	UK	England	Portsmo	82975	Orange juice	Grocery	Coca-Cola	Juice	Express	Shipped	Credit Card	1	210.14	210.14	1	Bad
6	9476855	42410	2024-02-03	6:22:00	21	Female	Low	Regular	UK	England	Portsmo	83903	Self-help	Books	Penguin Books	Non-Fiction	Same-Day	Processing	PayPal	6	34.12	204.75	2	Average
7	9070447	99870	2024-02-27	13:51:11	38	Male	Medium	Regular	UK	England	Portsmo	2916	Grape juice	Grocery	Coca-Cola	Juice	Same-Day	Processing	PayPal	2	285.30	570.60	1	Bad
8	5230876	23097	2024-01-07	17:33:45	67	Male	Low	Regular	UK	England	Portsmo	14668	Amazon Fire T	Electronics	Apple	Tablet	Same-Day	Shipped	Credit Card	5	471.48	2,357.41	1	Bad
9	3413296	98256	2024-02-06	1:59:20	26	Female	Low	Regular	UK	England	Portsmo	43602	Running shoes	Clothing	Adidas	Shoes	Same-Day	Pending	Debit Card	3	159.80	479.41	3	Good
10	4208526	66911	2023-12-16	4:00:08	24	Female	Low	Regular	UK	England	Portsmo	71994	Chocolate mou	Grocery	Nestle	Chocolate	Same-Day	Pending	Credit Card	2	333.70	667.41	4	Excellent
11	4579663	31767	2024-02-16	20:44:42	28	Male	High	Regular	UK	England	Portsmo	15127	Toys	Books	Penguin Books	Children's	Standard	Pending	Cash	9	161.39	1,452.49	4	Excellent
12	5992046	30637	2024-02-08	12:07:52	34	Female	High	Regular	UK	England	Portsmo	79514	Iced tea	Grocery	Pepsi	Soft Drink	Express	Processing	PayPal	7	44.33	310.31	4	Good
13	2458233	96840	2023-10-29	13:43:05	65	Male	Low	Regular	UK	England	Portsmo	85074	Running shoes	Clothing	Adidas	Shoes	Same-Day	Pending	Credit Card	8	28.83	230.60	4	Excellent
14	2055036	25848	2024-02-21	22:28:09	40	Male	High	Regular	UK	England	Portsmo	42516	Apple juice	Grocery	Coca-Cola	Juice	Same-Day	Pending	PayPal	10	20.53	205.29	4	Excellent
15	3239367	62464	2023-12-14	20:24:39	58	Female	High	Regular	UK	England	Portsmo	15160	Bodycon dress	Clothing	Zara	Dress	Standard	Delivered	Cash	3	312.98	938.93	2	Average
16	4580441	12911	2023-11-11	15:38:31	69	Male	High	Regular	UK	England	Portsmo	27283	White chocola	Grocery	Nestle	Chocolate	Express	Processing	PayPal	3	394.61	1,183.82	5	Excellent
17	6315151	75456	2023-10-03	4:34:26	38	Female	High	Regular	UK	England	Portsmo	87547	Studio headph	Electronics	Sony	Headphones	Express	Delivered	Cash	4	303.79	1,215.16	1	Bad
18	6857160	50574	2023-10-17	6:40:06	46	Male	Low	Regular	UK	England	Portsmo	52548	Sneakers	Clothing	Nike	Shoes	Same-Day	Shipped	Debit Card	4	129.76	519.03	1	Bad
19	6921233	21381	2023-11-26	16:09:33	67	Male	Medium	Regular	UK	England	Portsmo	36935	Sculptures	Home Decor	Home Depot	Decorations	Same-Day	Shipped	Debit Card	10	387.55	3,875.53	2	Average
20	8670923	80071	2023-09-17	1:25:11	41	Female	Low	Regular	UK	England	Portsmo	17549	Pliers	Home Decor	Home Depot	Tools	Standard	Pending	Debit Card	6	71.19	427.15	2	Average
21	4427458	97683	2023-11-04	14:44:24	31	Female	Low	Regular	UK	England	Portsmo	57256	Oxfords	Clothing	Nike	Shoes	Same-Day	Delivered	Cash	3	85.16	255.47	2	Average
22	6761027	11397	2023-08-31	0:34:27	29	Female	Low	Regular	UK	England	Portsmo	49782	Dining table	Home Decor	Home Depot	Furniture	Standard	Processing	PayPal	2	405.45	810.90	4	Good
23	9202969	35966	2024-02-20	7:34:49	69	Male	Low	Regular	UK	England	Portsmo	41418	Cooking	Books	HarperCollins	Non-Fiction	Express	Delivered	Cash	4	187.09	748.37	1	Bad
24	4419654	21444	2023-10-30	18:07:26	30	Male	Medium	Regular	UK	England	Portsmo	42579	Pillowcase set	Home Decor	Bed Bath & Beyond	Bedding	Express	Shipped	Debit Card	4	312.43	1,249.71	1	Bad
25	9711181	50100	2024-01-13	16:41:07	54	Female	Low	Regular	UK	England	Portsmo	44803	Samsung Galax	Electronics	Sony	Smartphone	Same-Day	Processing	PayPal	3	279.58	838.75	4	Good
26	6573179	55594	2023-11-13	1:04:00	41	Male	Low	Regular	UK	England	Portsmo	50743	Puffer jacket	Clothing	Adidas	Jacket	Express	Delivered	Credit Card	6	422.39	2,534.32	5	Excellent
27	6650415	98788	2023-09-03	11:03:16	29	Male	Medium	Regular	UK	England	Portsmo	70549	Fantasy	Books	Penguin Books	Fiction	Same-Day	Processing	Credit Card	10	147.88	1,478.85	2	Average
28	7978896	28489	2023-12-07	6:27:17	43	Male	Medium	Regular	UK	England	Portsmo	52638	Nuts	Grocery	Nestle	Snacks	Express	Processing	Credit Card	3	199.82	599.47	1	Bad
29	4615607	22945	2024-01-26	17:05:34	26	Female	Medium	Regular	UK	England	Portsmo	30472	Detective	Books	HarperCollins	Thriller	Express	Pending	Debit Card	9	386.98	3,482.86	1	Bad
30	3326402	67949	2024-02-20	3:39:48	54	Male	Medium	Regular	UK	England	Portsmo	18758	Cheese snacks	Grocery	Nestle	Snacks	Standard	Processing	PayPal	3	242.86	728.57	2	Average
31	8942113	72626	2024-01-25	17:48:38	58	Male	Medium	Regular	UK	England	Portsmo	21841	Blanket	Home Decor	Bed Bath & Beyond	Bedding	Same-Day	Processing	Cash	1	212.30	212.30	2	Average
32	6219631	26736	2023-08-30	19:19:22	67	Female	Medium	Regular	UK	England	Portsmo	4692	OLED TV	Electronics	Samsung	Television	Express	Shipped	PayPal	8	221.54	1,772.30	4	Good
33	8748941	77875	2024-01-14	21:18:43	65	Male	Medium	Regular	UK	England	Portsmo	5563	HDR TV	Electronics	Sony	Television	Standard	Shipped	PayPal	3	399.37	1,198.12	3	Good
34	7018142	67530	2023-08-23	1:40:26	50	Male	Low	Regular	UK	England	Portsmo	67486	Crew neck tee	Clothing	Adidas	T-shirt	Standard	Processing	PayPal	7	178.03	1,246.24	4	Excellent
35	7567107	27353	2023-10-30	2:34:45	60	Female	Low	Regular	UK	England	Portsmo	11524	Literary fiction	Books	Random House	Literature	Same-Day	Shipped	Cash	1	180.16	180.16	3	Good
36	5343974	66428	2023-11-28	19:22:50	48	Female	Medium	Regular	UK	England	Portsmo	89333	Pomegranate j	Grocery	Coca-Cola	Juice	Standard	Shipped	Cash	1	315.72	315.72	1	Bad
37	9084403	89815	2024-02-26	2:31:09	26	Male	Low	Regular	UK	England	Portsmo	80499	Literary fiction	Books	Random House	Fiction	Standard	Shipped	Cash	3	291.40	874.21	4	Excellent
38	2300962	11602	2023-12-13	18:26:04	37	Male	Low	Regular	UK	England	Portsmo	9715	Over-ear headp	Electronics	Sony	Headphones	Express	Pending	Debit Card	4	126.82	507.28	4	Excellent
39	5820774	46908	2023-10-14	8:02:34	54	Male	Medium	Regular	UK	England	Portsmo	19707	Adventure	Books	Penguin Books	Fiction	Same-Day	Processing	Cash	5	402.12	2,010.58	4	Excellent
40	5648072	89211	2024-02-25	23:22:49	27	Female	Medium	Regular	UK	England	Portsmo	56517	Horror	Books	Penguin Books	Fiction	Same-Day	Shipped	PayPal	2	168.02	336.04	1	Bad
41	8810446	93866	2023-09-23	16:15:39	32	Female	Medium	Regular	UK	England	Portsmo	64222	Sculptures	Home Decor	IKEA	Decorations	Same-Day	Processing	Credit Card	5	188.72	943.60	1	Bad

⇒ A retail company selling a wide range of products to customers across 5 countries

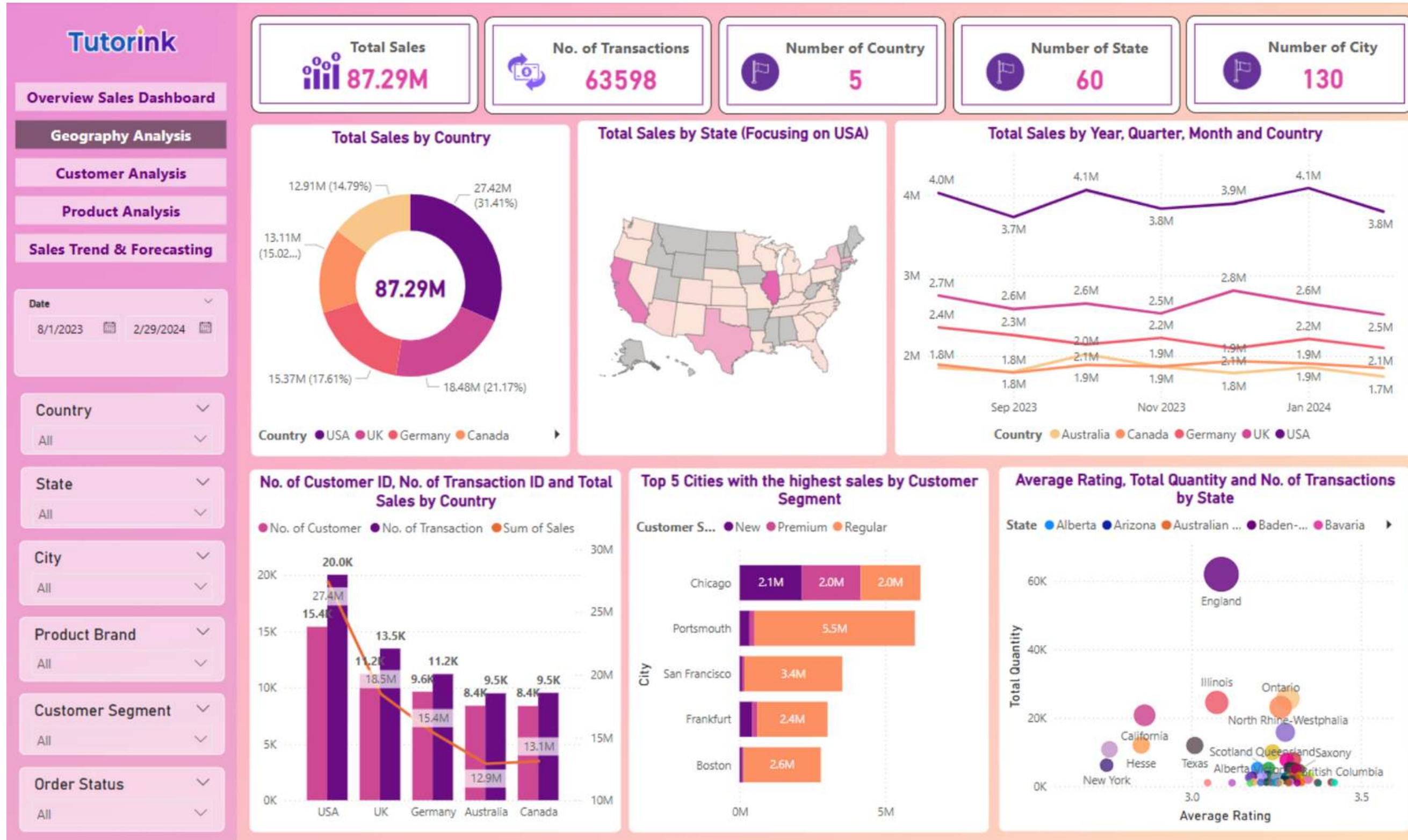
Dashboard



Overview of Sales Performance

- Monitor overall business performance and trends

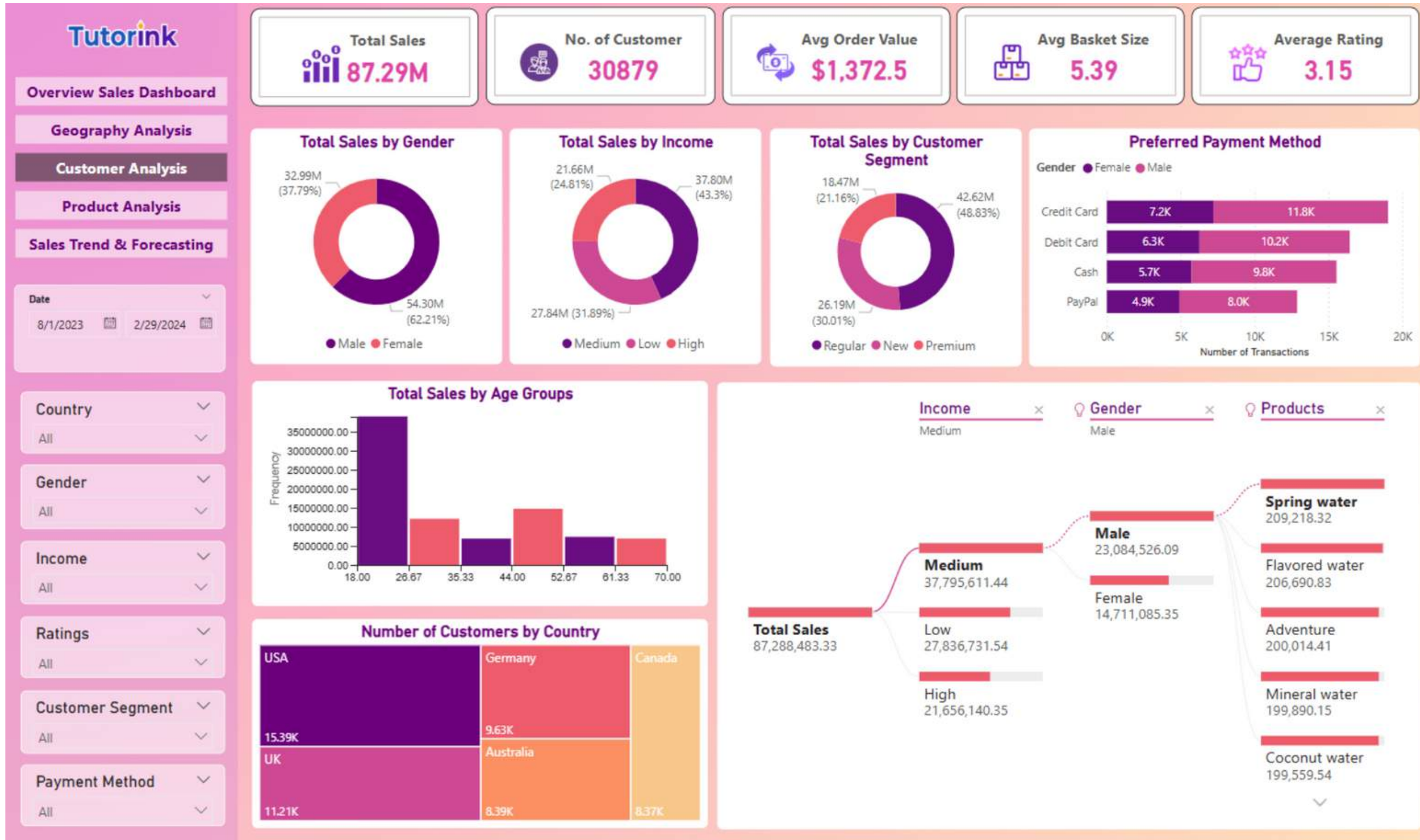
Dashboard



Geography Analysis

- Identify high-performing markets and regional opportunities

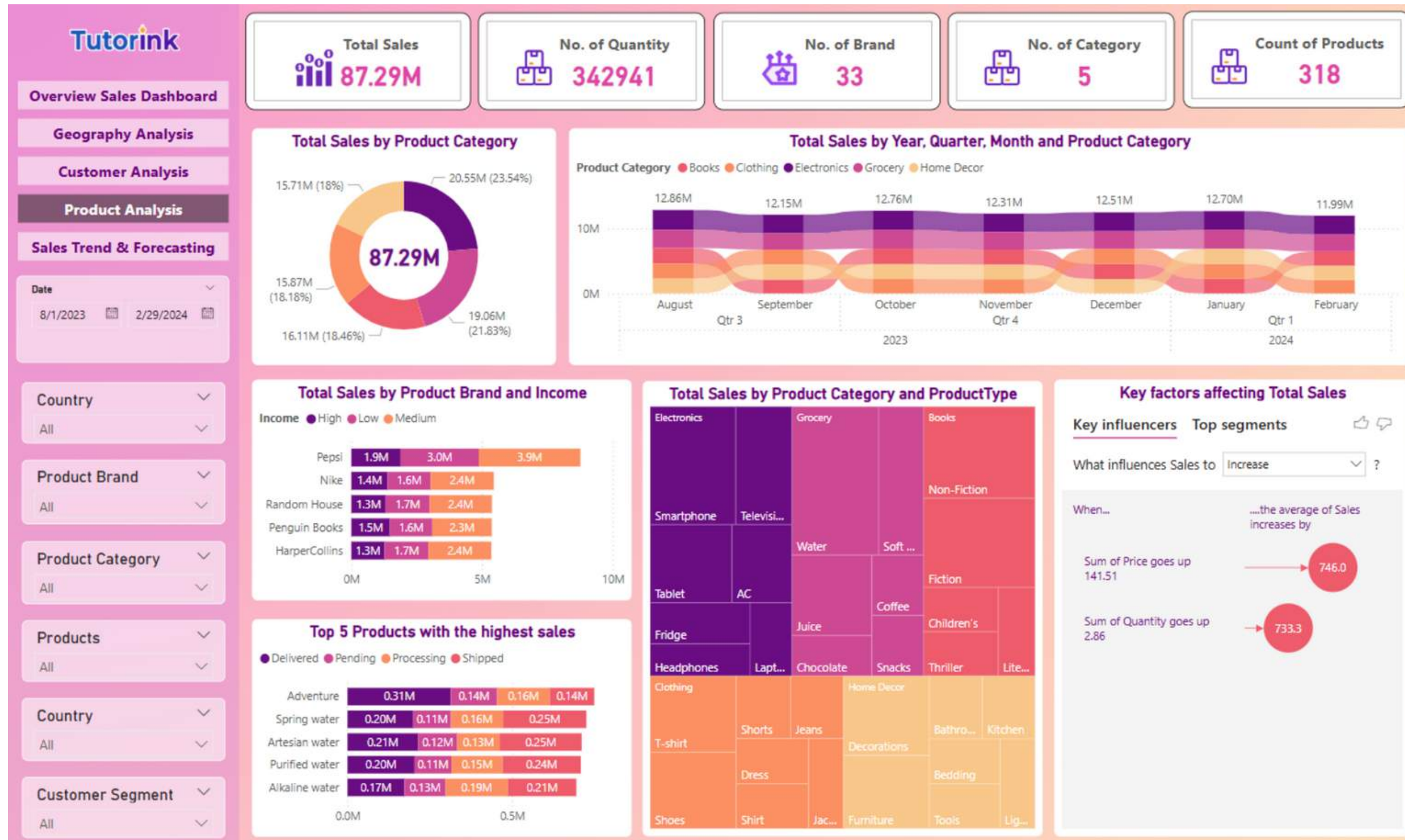
Dashboard



Customer Analysis

- Understand target audiences and drive personalized strategies

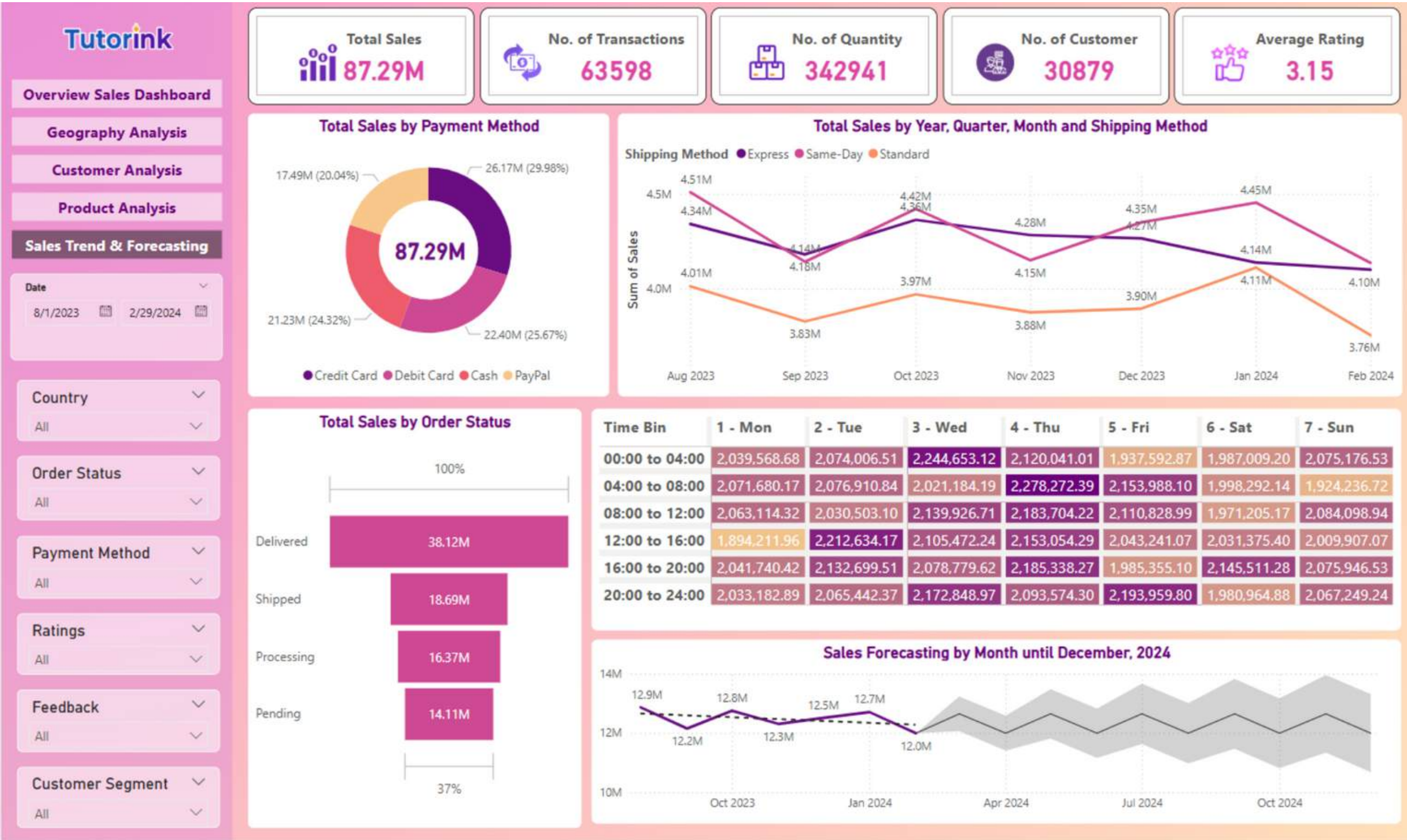
Dashboard



Product Analysis

- Identify bestsellers, underperformers, and opportunities for assortment optimization

Dashboard



Sales Trend & Forecasting

- Enable data-driven decisions for inventory planning, marketing strategies, and operational efficiency

Questions & Answers EDA

What are the key insights?

OVERVIEW DASHBOARD

Key Question: How did our sales perform from August 2023 to February 2024?

GEOGRAPHY ANALYSIS

Q1: Where do we perform best by region, and what does that mean for strategy?

GEOGRAPHY ANALYSIS

Q1: Where do we perform best by region, and what does that mean for strategy?

Q2: What is the relationship between product quantity and average ratings by State?

CUSTOMER ANALYSIS

Q1: How do demographics shape spending behavior and product preferences?

CUSTOMER ANALYSIS

Q1: How do demographics shape spending behavior and product preferences?

Q2: What are their payment preferences, and what do they reveal?

PRODUCT ANALYSIS

Q1: What product and brand trends should shape our portfolio strategy?

PRODUCT ANALYSIS

Q1: What product and brand trends should shape our portfolio strategy?

Q2: What drives total sales - volume or price?

SALES TRENDS & FORECASTING

Q1: What are the current sales behaviors, and where can we improve?

SALES TRENDS & FORECASTING

Q1: What are the current sales behaviors, and where can we improve?

Q2: What does the forecast tell us?

SALES TRENDS & FORECASTING

Q1: What are the current sales behaviors, and where can we improve?

Q2: What does the forecast tell us?

Q3: When should we push marketing efforts?

Solutions & Recommendations

Prioritize High-Margin Products and Responsive Pricing

- **Issue Addressed:** Sales are influenced by both volume and price, but no strategy is in place to optimize this dynamic.
- **Solution:**
 - Identify products with strong price sensitivity (e.g., Spring Water, Adventure products)
 - Run A/B pricing experiments to find optimal price points.
 - Promote frequently purchased items with volume discounts, and create product bundles around top-selling or high-margin items to increase average order value.

Solutions & Recommendations

Capitalize on Peak Shopping Hours and Days

- **Issue Addressed:** Peak transactions occur between 00:00–04:00 on Wednesdays and 4:00-8:00 on Thursdays, but this window is underutilized.
- **Solution:**
 - Launch limited-time offers or promotions during early-morning windows on high-performing days.
 - Coordinate email campaigns and digital ads to hit inboxes and screens 30–60 minutes before peak times.

Solutions & Recommendations

Personalize Marketing Based on Customer Segments and Regions

- **Issue Addressed:** Sales performance varies significantly across income segments and cities, but marketing efforts are not yet differentiated.
- **Solution:**
 - Segment customers based on income and geography (e.g., medium-income customers in Portsmouth and Chicago), and create localized promotions or loyalty offers.
 - Use behavioral data to tailor messaging, such as emphasizing premium quality for high-income customers or value bundles for medium-income groups.

Task Allocation

PIC	Task	Contribution
Dương Nhã Điền	Data Understanding + Data Cleaning + Slides + Dashboard	100%
Trần Hạnh Hiền Trang	Descriptive Statistics + Basic Charts + Slides	100%
Bùi Trần Mai Thy	Questions & Answers for EDA + Slides	100%
Nguyễn Phương Anh Thư	Questions & Answers for EDA + Solutions + Slides + Dashboard	100%
Hoàng Thanh Thiên Ân		100%



business analytics

Thank you

