



# Instacart Analysis for Personalized Recommendations

An in-depth exploration of  
customer purchasing patterns.

Team Members: Harish Narava,  
Bharath Gajula, Ram Malkari

# Overview

- Data source: Instacart online grocery orders.
- Goal: Our central analysis objectives are to comprehensively understand Instacart customer purchasing behaviors and uncover actionable insights to inform business strategy and enhance customer experiences. By rigorously analyzing order patterns, product preferences, reordering habits and associations, we aim to paint a nuanced picture of customer segments and shopping dynamics
- Approach: Initial descriptive statistics on monthly/weekly order rates, peak hours, and popular product categories will outline macro-level directional indicators of customer activity. Building on this, advanced algorithms will group customers into distinct segments based on their unique order characteristics. These tailored profiles allow for precision targeting through customized engagement strategies and recommendations.



# Data Overview



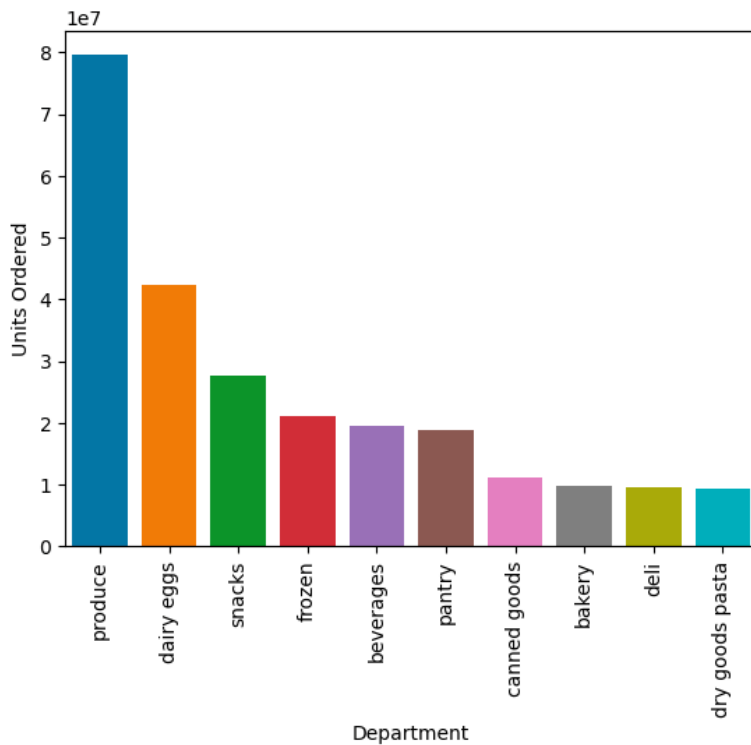
205,000 users contributing to the data.



Over 3 million orders analyzed.



49,685 products examined.

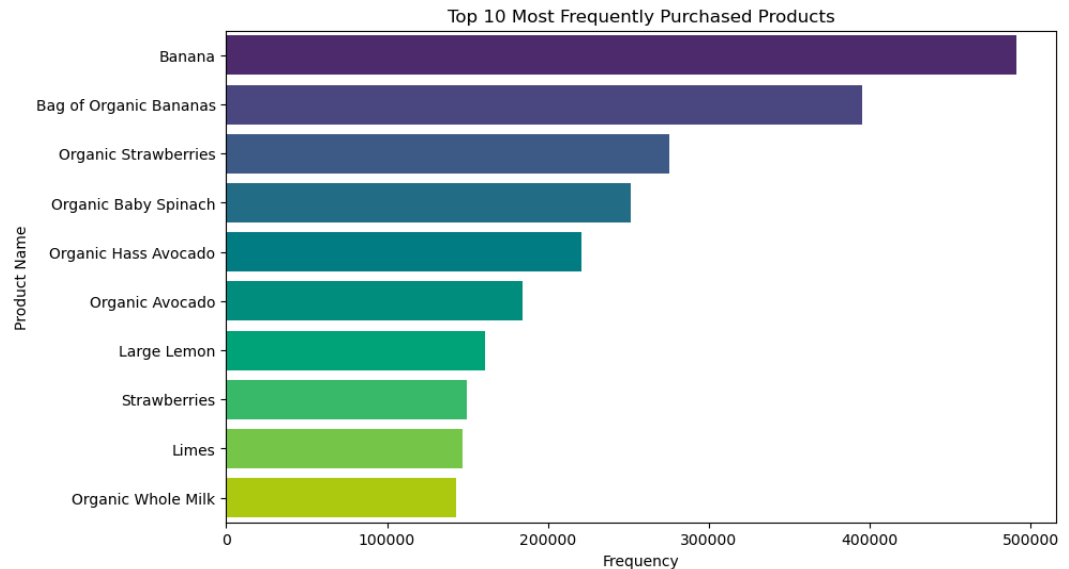


## Top Departments

- Produce is most purchased in terms of the number of units.
- Followed closely by dairy eggs and snacks.

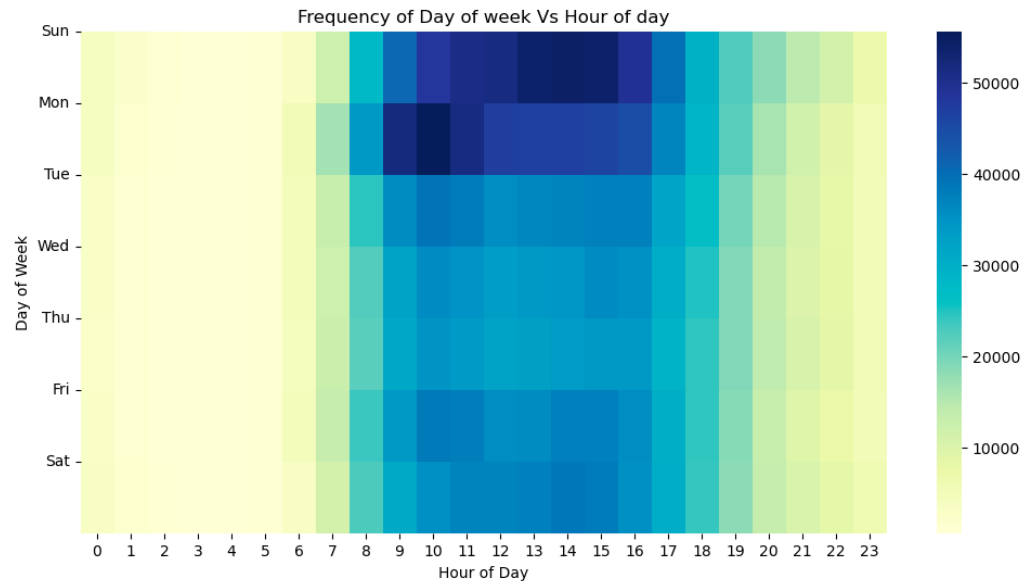
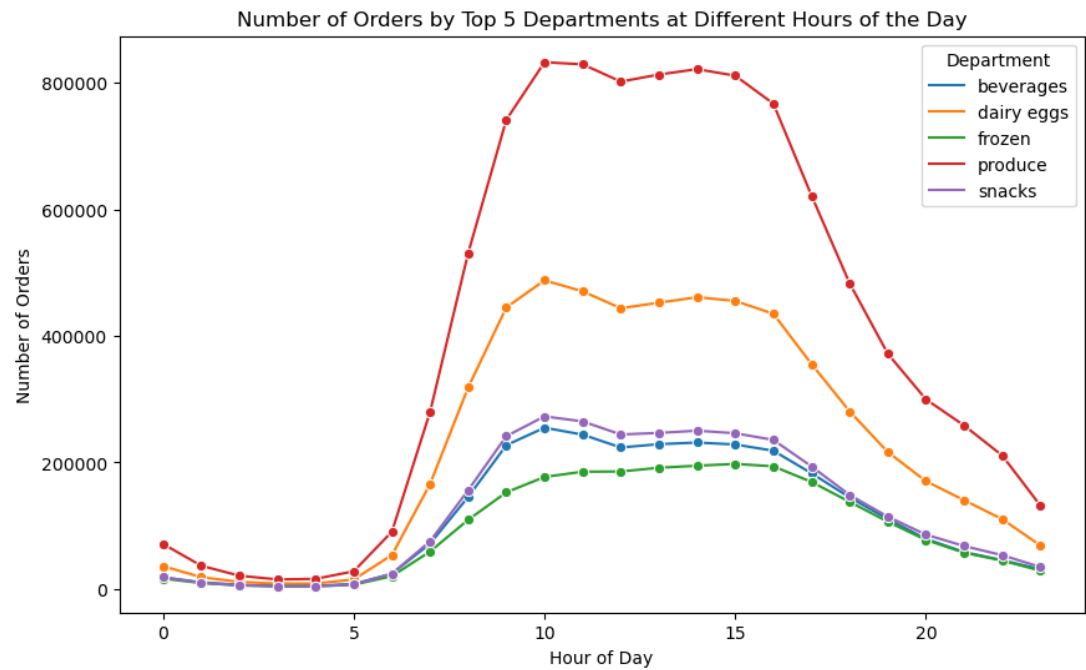
## Most frequent

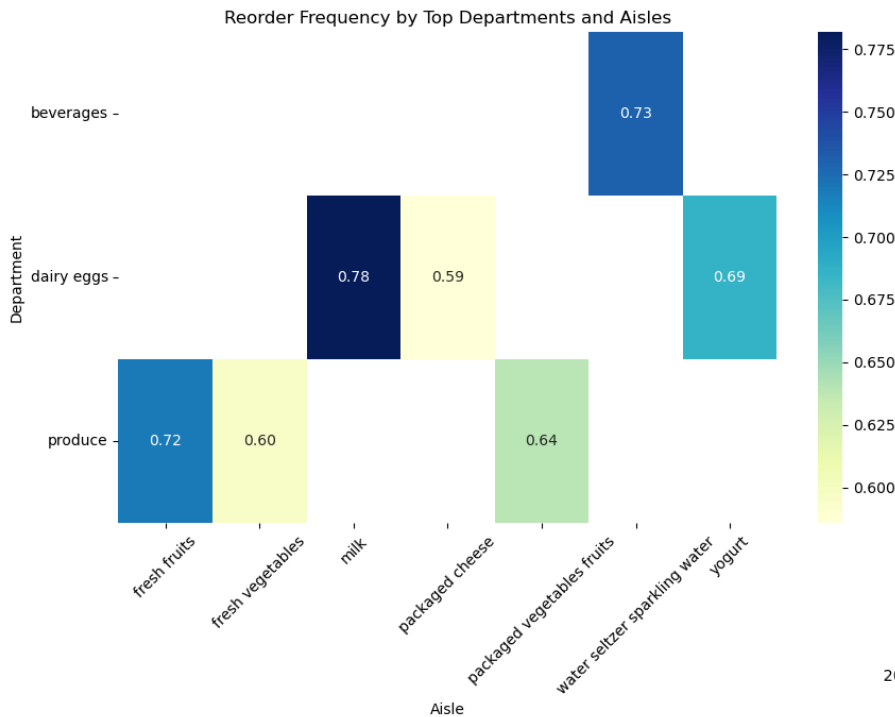
- Most of the items belong to the fruits and vegetables department
- Banana is the most purchased item.



## Peak Order Times

- Afternoons and evenings are most popular for orders.
- Produce department peaks in purchases mid-day.
- Sunday and Monday are the busiest days of the week.



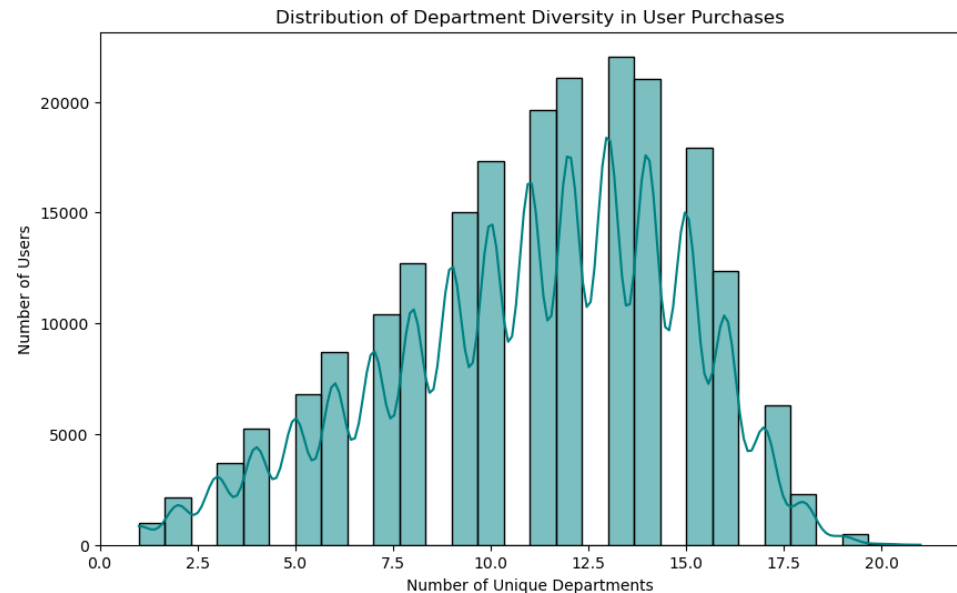


## Reorder Frequency Heatmap

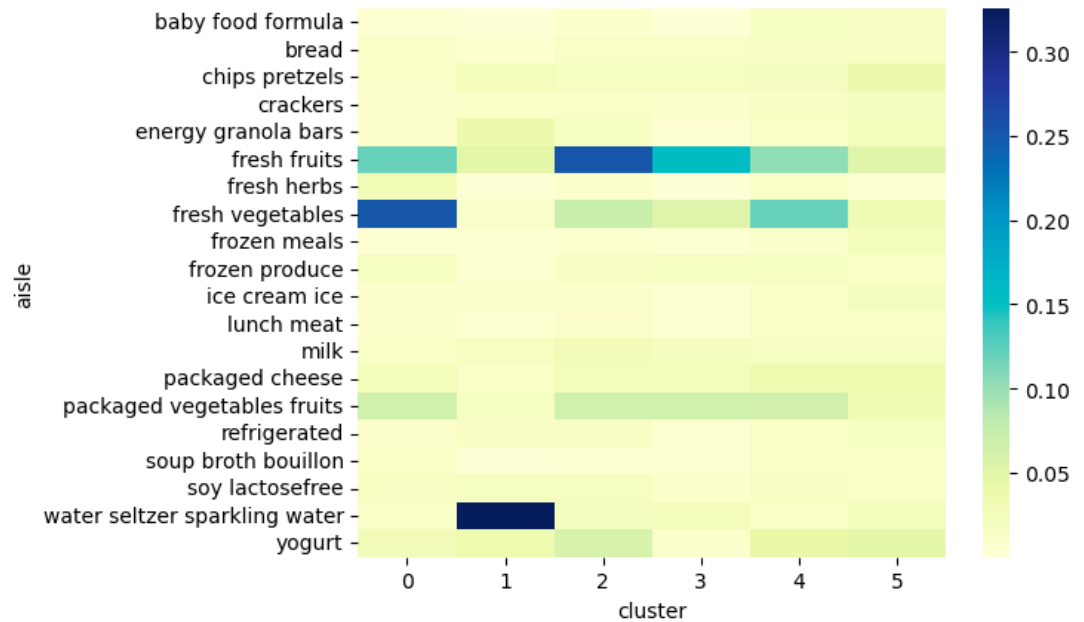
Beverages and dairy products, particularly yogurt, show strong customer repurchase patterns.

## Department VS User Purchases

- Most users purchase from a range of 10 to 15 unique departments, indicate a moderate to high level of diversity.



# User Segmentation



- Clustering applied on aisle purchase behaviors.
- 6 distinct user segments were identified.

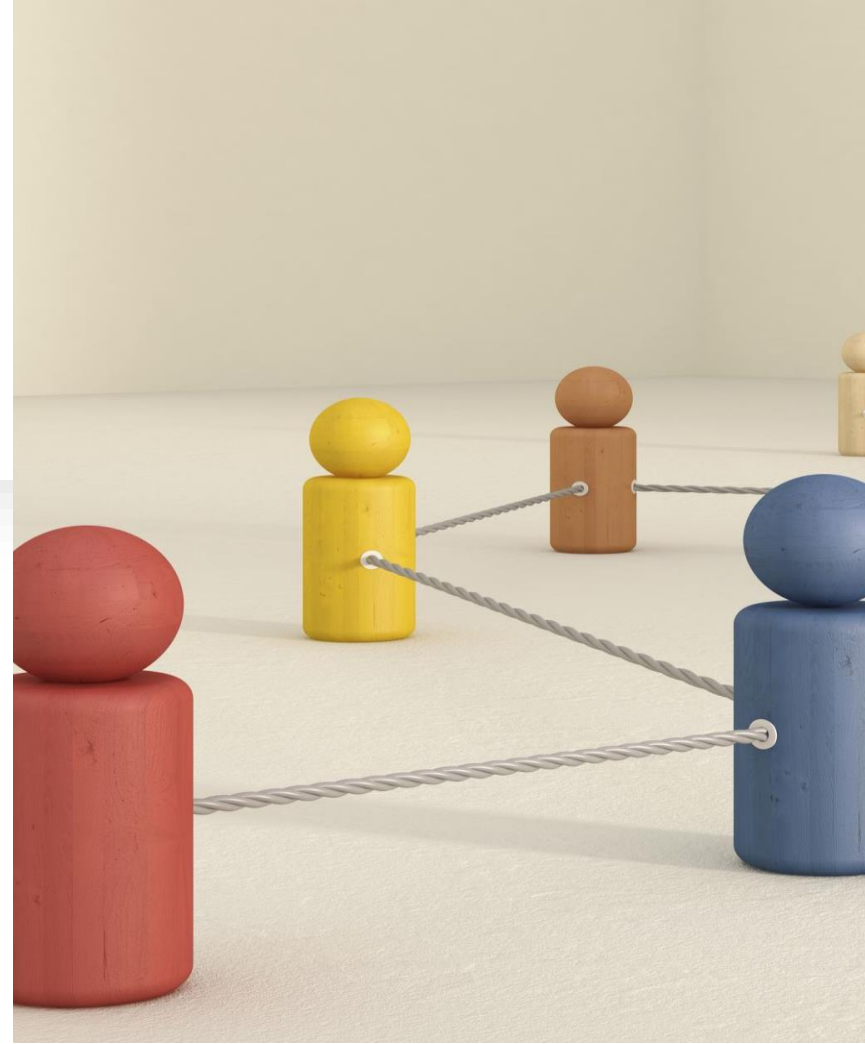
# Association Rules

- Applied separately to each user segment.
- Reveals unique relationships tailored to each cluster.

Rules	Support	Confidence
{Chips} -> {Guacamole}	0.1%	46%
{Strawberries} -> {Yogurt}	0.1%	65%

Key patterns:

- Strong associations for complementary perishable foods
- Lower support for specialized products like alcohols



	item_A	item_B	product_name_A	product_name_B	freqAB	supportAB	freqA	supportA	freqB	supportB	confidenceAtoB	confidenceBtoA	lift
0	4376	44396	Coconut Kale & Cacao Organic Superfoods Bar	Organic Hazelnut Hemp Cacao Superfoods Bar	102	0.000102	221	0.000222	192	0.000192	0.461538	0.531250	2397.987981
1	15697	35208	Apricot Walnut & Coconut Granola Bar	Granola Bar, Fig, Cranberry & Hazelnut	132	0.000132	226	0.000227	252	0.000253	0.584071	0.523810	2312.092920
6	11224	39739	Organic Cashew Nondairy Blueberry Yogurt	Organic Nondairy Strawberry Cashew Yogurt	139	0.000139	208	0.000209	302	0.000303	0.668269	0.460265	2207.419400
8	29126	36361	Organic Strawberry Chia Lowfat 2% Cottage Cheese	Organic Cottage Cheese Blueberry Acai Chia	145	0.000145	301	0.000302	220	0.000221	0.481728	0.659091	2184.334567
9	3858	15692	2nd Foods Chicken & Gravy	2nd Foods Turkey Meat	158	0.000158	373	0.000374	201	0.000201	0.423592	0.786070	2102.289544
...	...	...	...	...	...	...	...	...	...	...	...	...	...
8473	21903	23909	Organic Baby Spinach	2% Reduced Fat Milk	103	0.000103	19760	0.019808	23939	0.023997	0.005213	0.004303	0.217212
217	196	21137	Soda	Organic Strawberries	154	0.000154	22847	0.022903	31236	0.031312	0.006740	0.004930	0.215267
3943	23909	47209	2% Reduced Fat Milk	Organic Hass Avocado	111	0.000111	23939	0.023997	22921	0.022977	0.004637	0.004843	0.201801
280	16797	21137	Strawberries	Organic Strawberries	160	0.000160	33108	0.033189	31236	0.031312	0.004833	0.005122	0.154338
1772	13176	24852	Bag of Organic Bananas	Banana	215	0.000216	65224	0.065383	116854	0.117139	0.003296	0.001840	0.028140



# Recommendation Engine

- Users mapped to their respective segments.
- Next product suggestions based on cluster-specific rules.
- Cluster 1 seems to represent customers that commonly buy dairy and chips, but also pair them with dips/appetizers like hummus and guacamole. Recommendations are tailored to those behaviors. The other clusters show very similar recommendations dominated by produce, eggs, milk, and chips. This suggests significant overlap in top purchases across those user segments.
- However, cluster 4 stands out as having uniquely different tastes geared towards fresh vegetables and fruits rather than staple dairy and snacks. The recommendations like lemons, celery and grape tomatoes reflect produce affinity.

User ID	Cluster	Recommended Products
10000	0	Thin & Light Tortilla Chips, Organic Large Brown Grade AA Cage Free Eggs, Organic Reduced Fat 2% Milk, Organic Large Grade AA Brown Eggs, Thick & Crispy Tortilla Chips
2631	1	Real Guacamole, Thin & Light Tortilla Chips, Original Hummus, Organic Reduced Fat 2% Milk, Thick & Crispy Tortilla Chips
954	2	Thin & Light Tortilla Chips, Organic Large Brown Grade AA Cage Free Eggs, Organic Reduced Fat 2% Milk, Organic Large Grade AA Brown Eggs, Thick & Crispy Tortilla Chips
101	3	Thin & Light Tortilla Chips, Organic Large Brown Grade AA Cage Free Eggs, Organic Reduced Fat 2% Milk, Organic Large Grade AA Brown Eggs, Thick & Crispy Tortilla Chips
481	4	Thin & Light Tortilla Chips, Red Peppers, Organic Lemon, Organic Grape Tomatoes, Organic Small Bunch Celery
721	5	Thin & Light Tortilla Chips, Organic Large Brown Grade AA Cage Free Eggs, Organic Reduced Fat 2% Milk, Organic Large Grade AA Brown Eggs, Thick & Crispy Tortilla Chips

# Conclusion

## Key insights:

- Identified 5 customer segments with distinct purchase habits based on clustering
- Top departments by share of units ordered: produce, snacks, dairy
- Associated products likely to be ordered together like chips and hummus

## Main recommendations:

- Target department-specific promotions to customer segments
- Provide personalized product recommendations based on associations
- Adjust inventory for high demand produce and snacks

