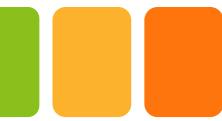


# Driving Order Basket Size



Team Melbourne



# Executive Summary



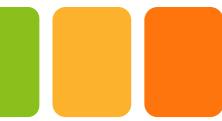
Looking at top SKUs ordered per user, close to 30% of the top 20 items occur in every basket.



Based on the association rules, we recommend items for personalized smart baskets.



Using item-based collaborative filtering, we suggest top 5 items at checkout that customers most likely forget.



# Current State – Poor User Experience



Many SKUs make it difficult to find specific product



Potential to forget key items and either do a small order or buy outside of the platform



Order process is long



No current recommendation engine

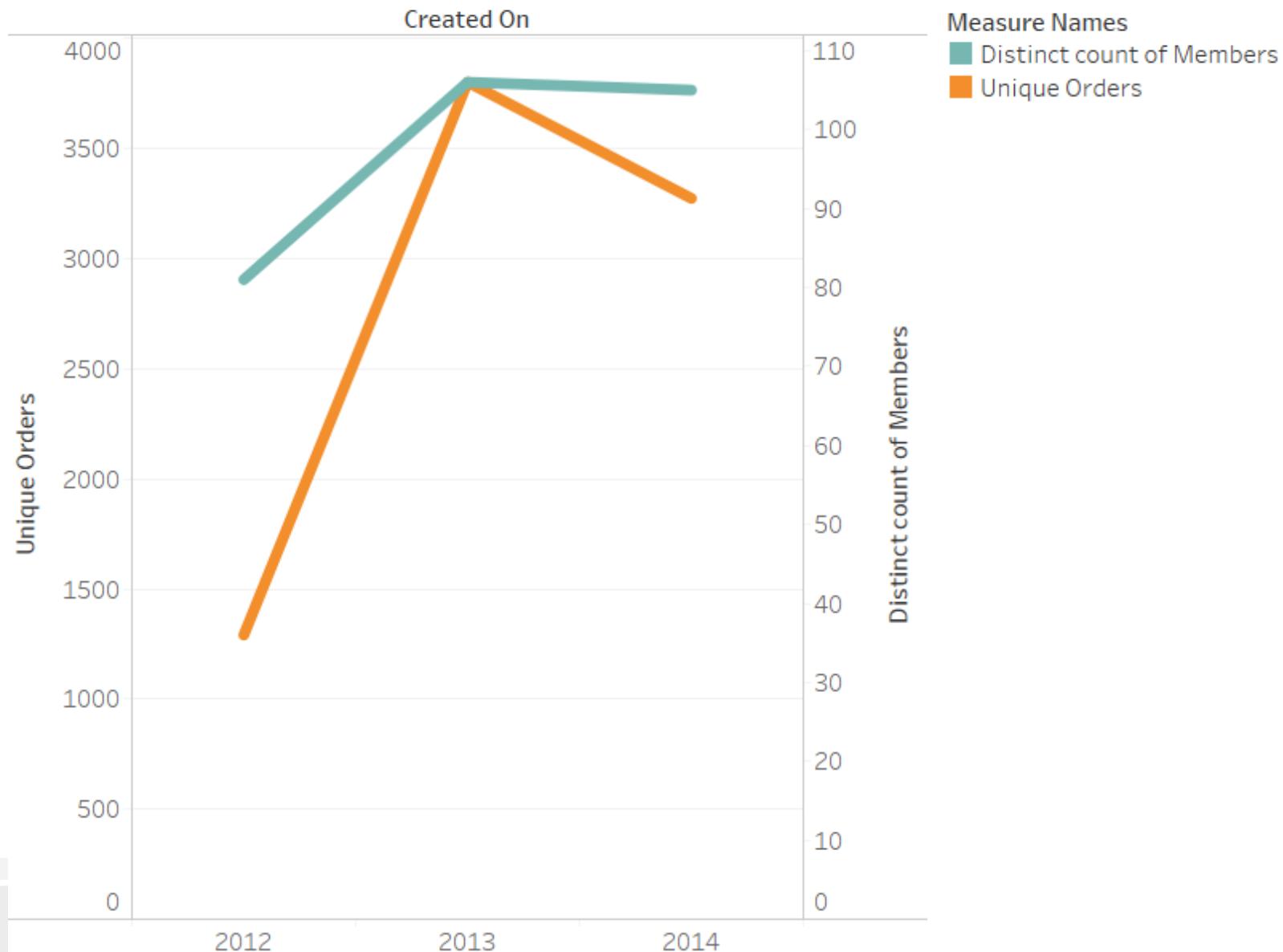


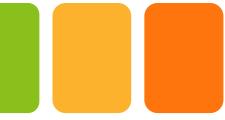
How might we adjust the user experience in order to drive growth?



# Member and order growth has stalled

## Unique Orders and Members per Year

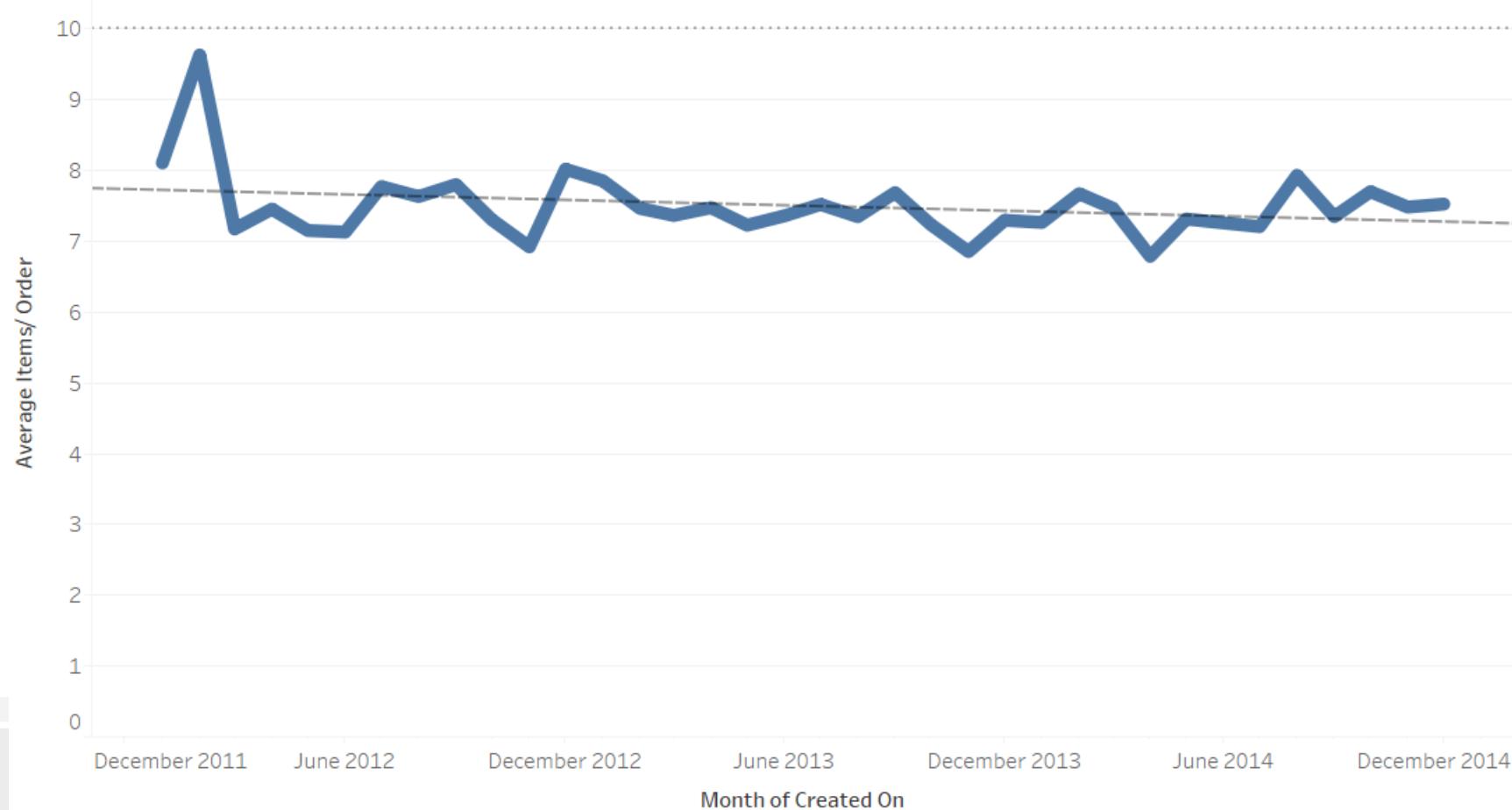


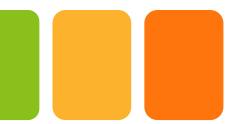


# Average basket size is falling

Average order basket by Month

From January 2012

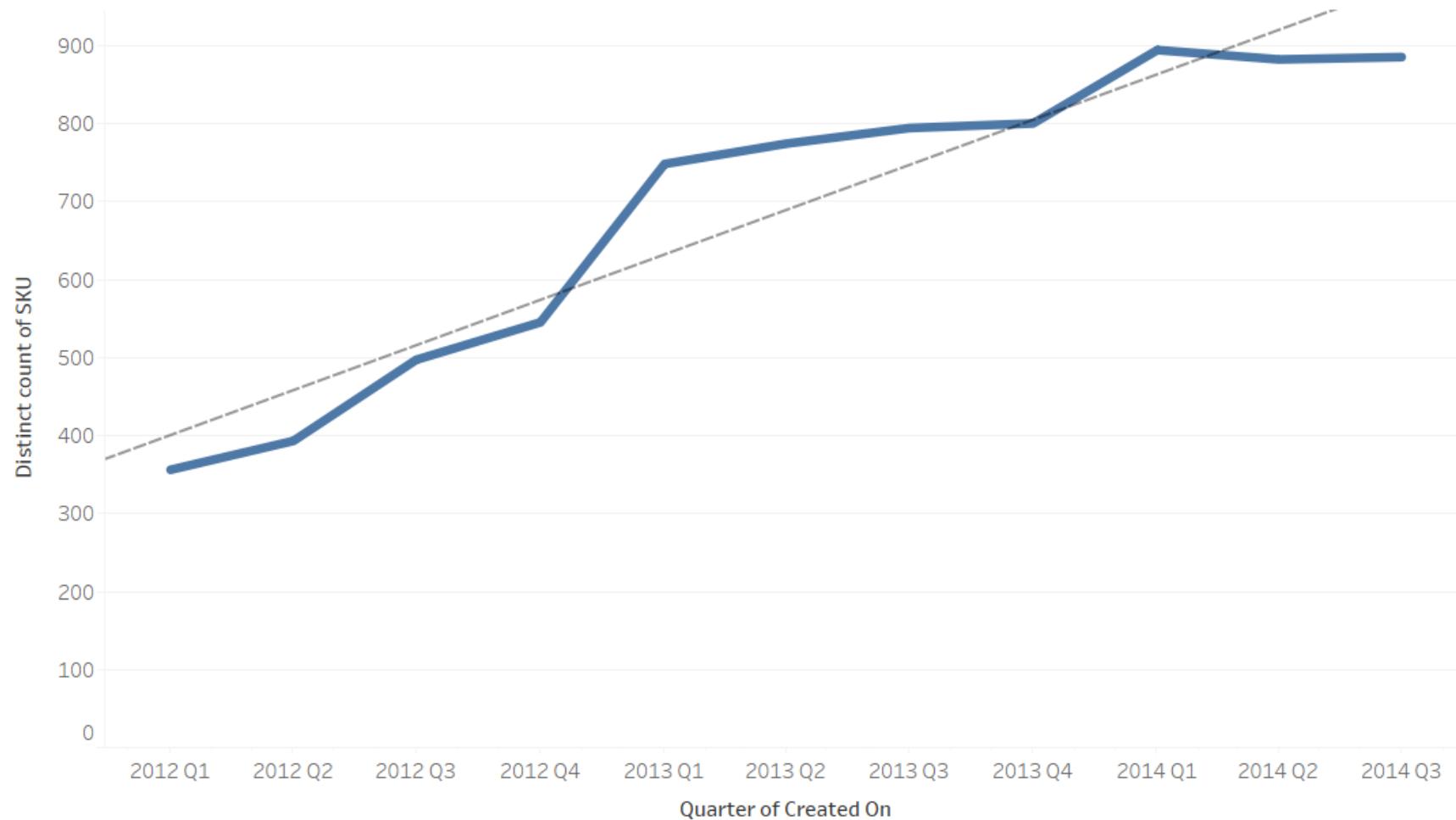




# Product SKUs are growing

Unique Skus ordered by Quarter

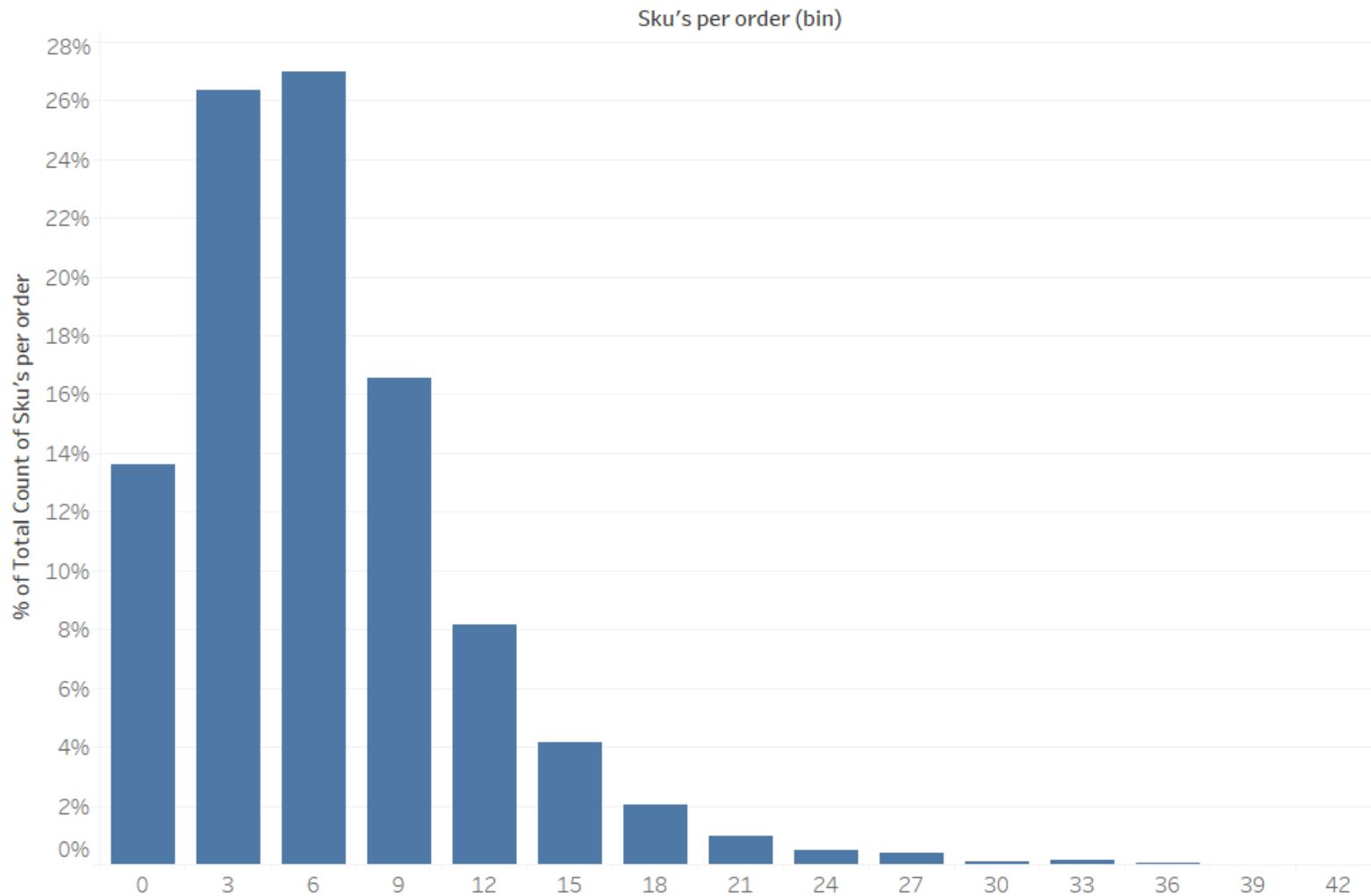
From January 2012 to September 2014

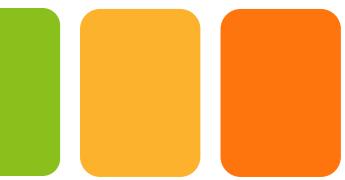




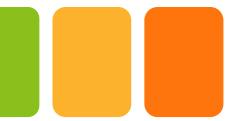
# Small baskets are the norm

Count of orders by order size

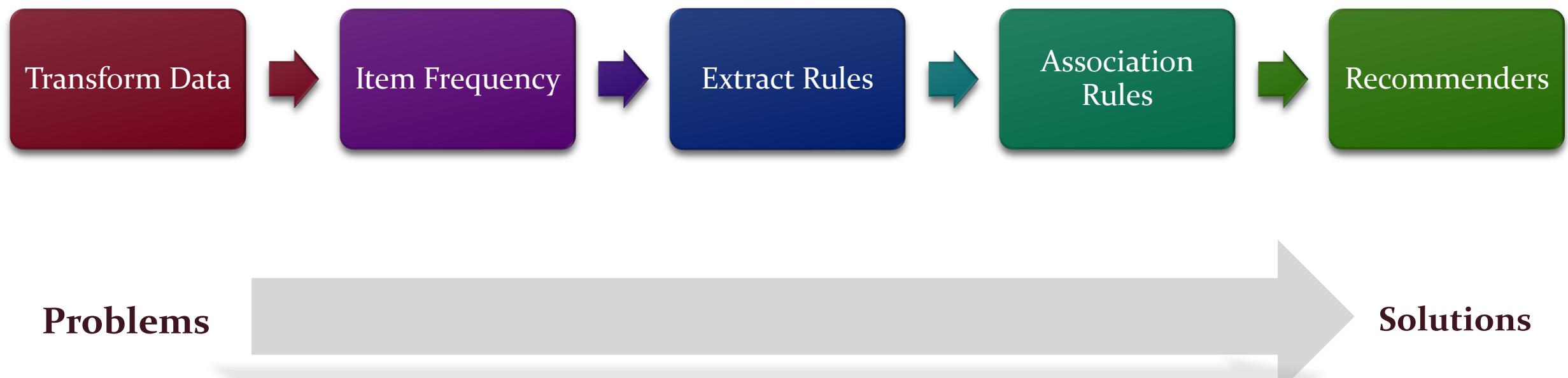


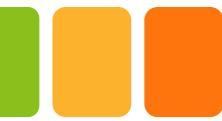


How can we increase order  
basket size – profit?



# Market Basket Analysis





# Recommender #1

## “Smart Basket”



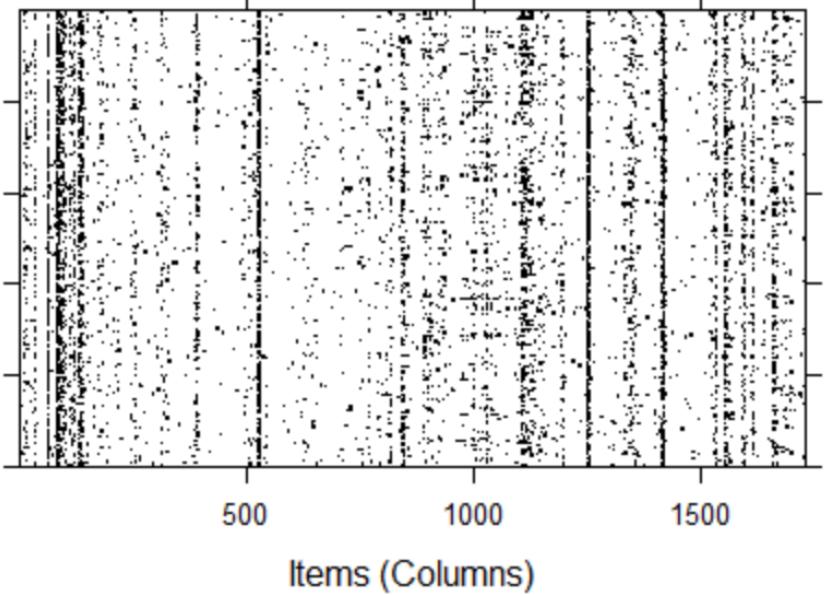
- **Association Rules** for the recommender feature
- Out of 248 rules, removed the redundancy to extract the finalized 194 rules
- Order the items under the RHS and LHS based on the highest Lift
- Demo 5 recommender rules to test "Smart Basket" feature

# Extracting the rules

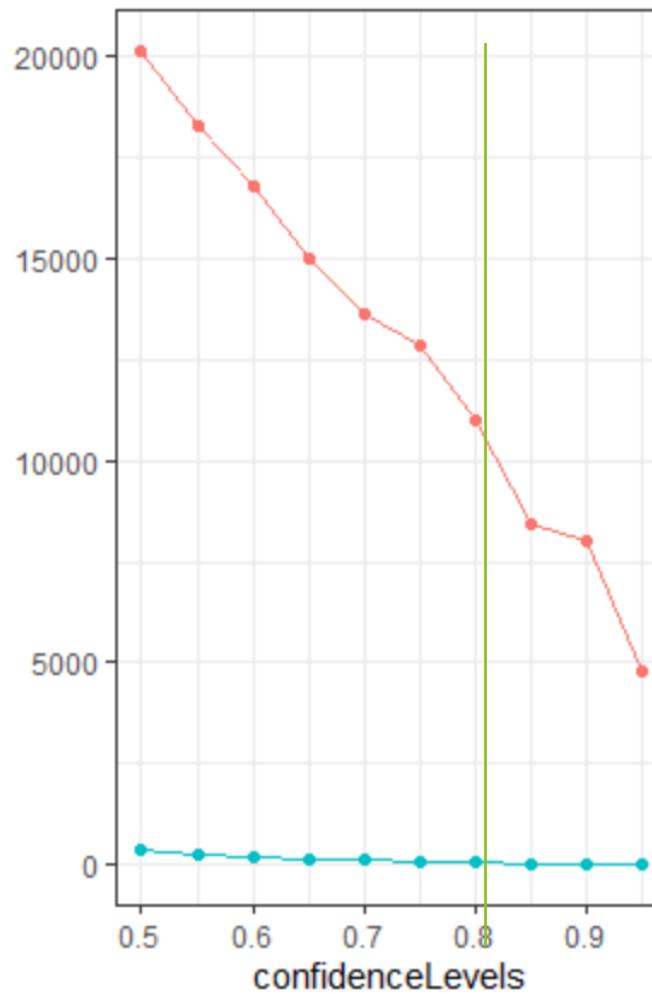
1

Density of 0.43%

Transactions (Rows)



Number of extracted rules with apriori



2

At Confidence Level of 80%:

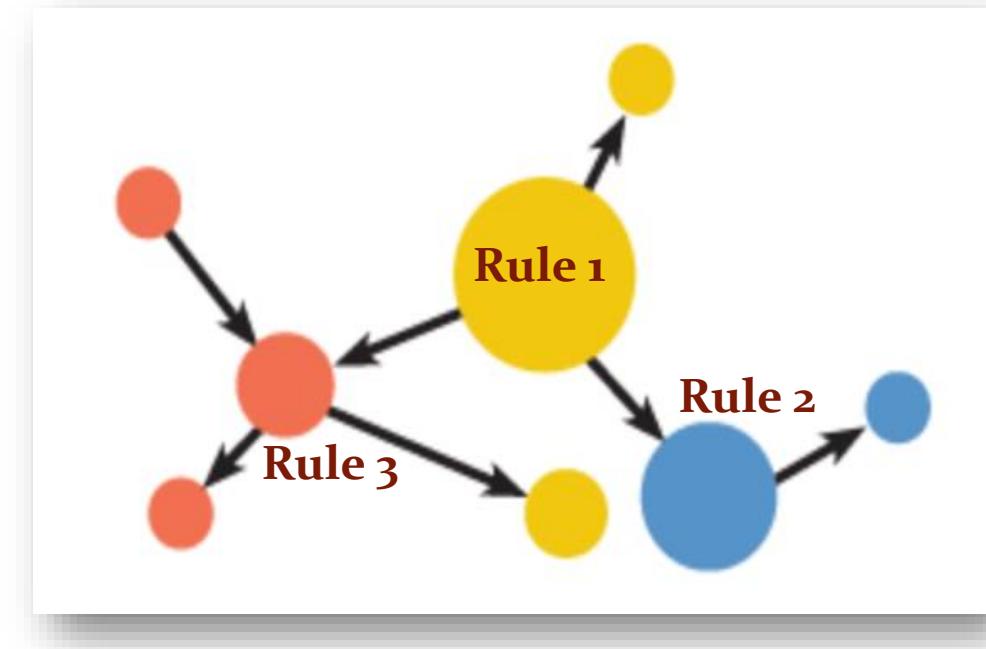
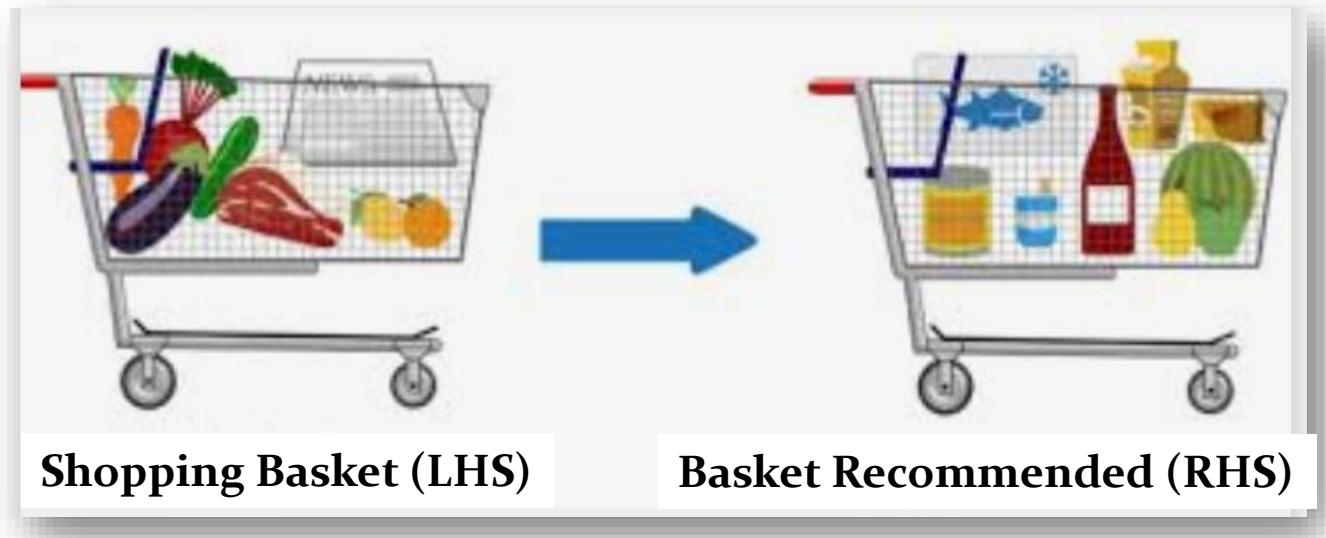
- Support at 0.1% = 11,006 rules
- Support at 0.3% = 56 rules

3

Set the rule with the following minimum parameters:

- Support = 0.25%
- Confidence = 80%

# "Smart Basket" – Association Rules



Rules	LHS	RHS
Rule 1	Beans_Haricot	Brinjals_Eggplant
	Exotic Vegetables_Broccoli	
	Other Vegetables_Onion Flower	
	Other Vegetables_Bottle of Pickle #2	
	Root Vegetables_Beet Root	

Support	0.25%
Confidence	84%
Lift	83.86
Count	21

\*For more details, see Slides 34, 35, 36, 38 & 41 in Appendix.

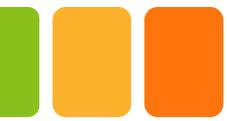


## Recommender #2

“Did you forget”



- Recommenderlab to evaluate 5 recommenders using cross validation: AR, IBCF, UBCF, Popular & Random
- Select recommender with best performance per ROC and TPR/FPR plots
- Demo 3 shopping scenarios to test recommender suggestions



# Three Recommendations



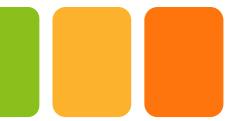
**START WITH YOUR  
TOP 20?**



**"SMART BASKET"  
RECOMMENDER  
ENGINE**



**"DID YOU  
FORGET?"  
RECOMMENDER  
ENGINE**

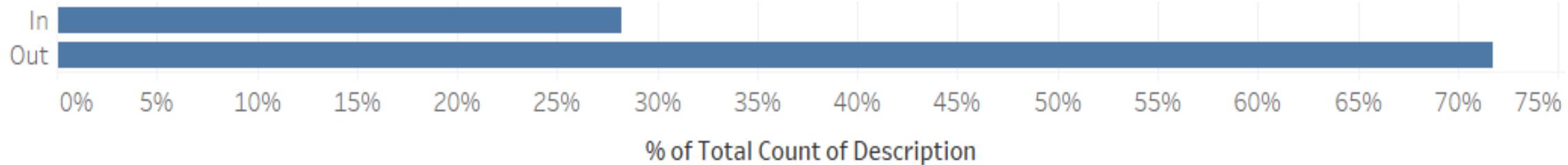


# Start with your top 20?

## Top 20 SKU present in order

In shows items covered in average users order | Out shows items order that are not in top 20

In / Out o..





# Start with your top 20? Impact



Shows users products that they often buy



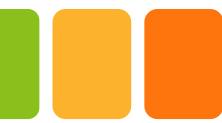
Drive ease in purchasing their common items quickly



Increase minimum basket size to 6



Provides a basket to build recommendations from

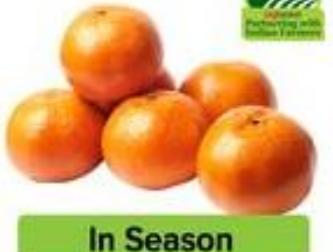


# “Smart Basket”

- Based on the highest Lift level, identified the obtain Top 5 association rules
- Recommendation notification popup

Frequently Bought Together

28% Off



In Season

Fresho  
Fresho Orange - Kinnar

1 kg - Rs 36

MRP Rs 50    Rs 36

**ADD**

20% Off



Fresho  
Fresho Sweet Corn

2 pcs - Rs 30

MRP Rs 37.50    Rs 30

**ADD**

20% Off



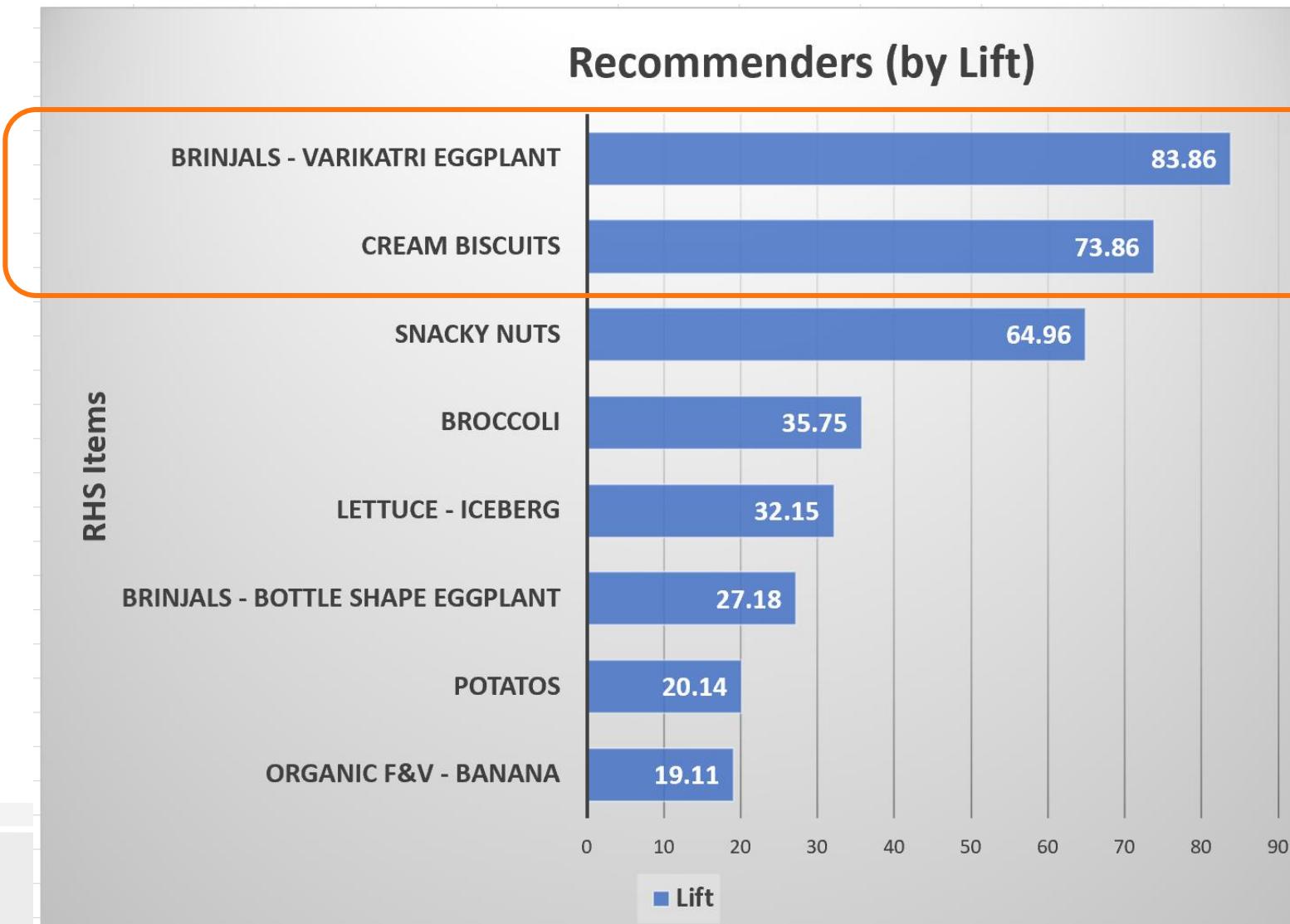
Fresho  
Fresho Knol Khol

500 g - Rs 21

MRP Rs 26.25    Rs 21

**ADD**

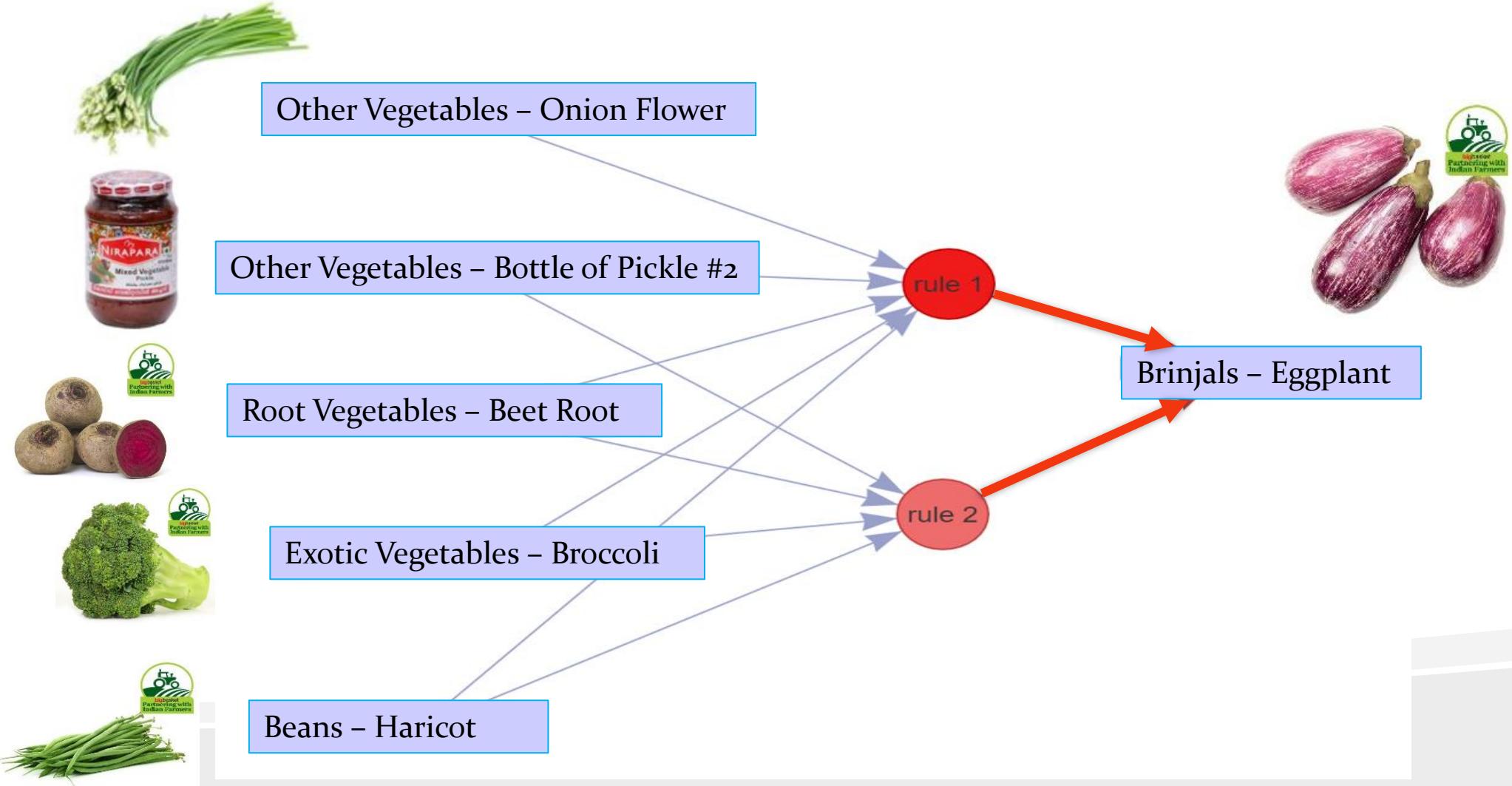
# "Smart Basket" - Top Recommenders



\*For more details, see Slide 42 in Appendix.



# People are also buying...



\*For more details, see Slide 43 in Appendix.



# Cross-selling opportunity



Cream Biscuits – Orange Flavour



Gourd & Cucumber



Brinjals – Eggplant,  
Bottle Shape

rule 3



Cream Biscuits – Mint Flavour



# Cross-selling opportunity



Cream Biscuits – Orange Flavour



Gourd & Cucumber



Brinjals – Eggplant,  
Bottle Shape

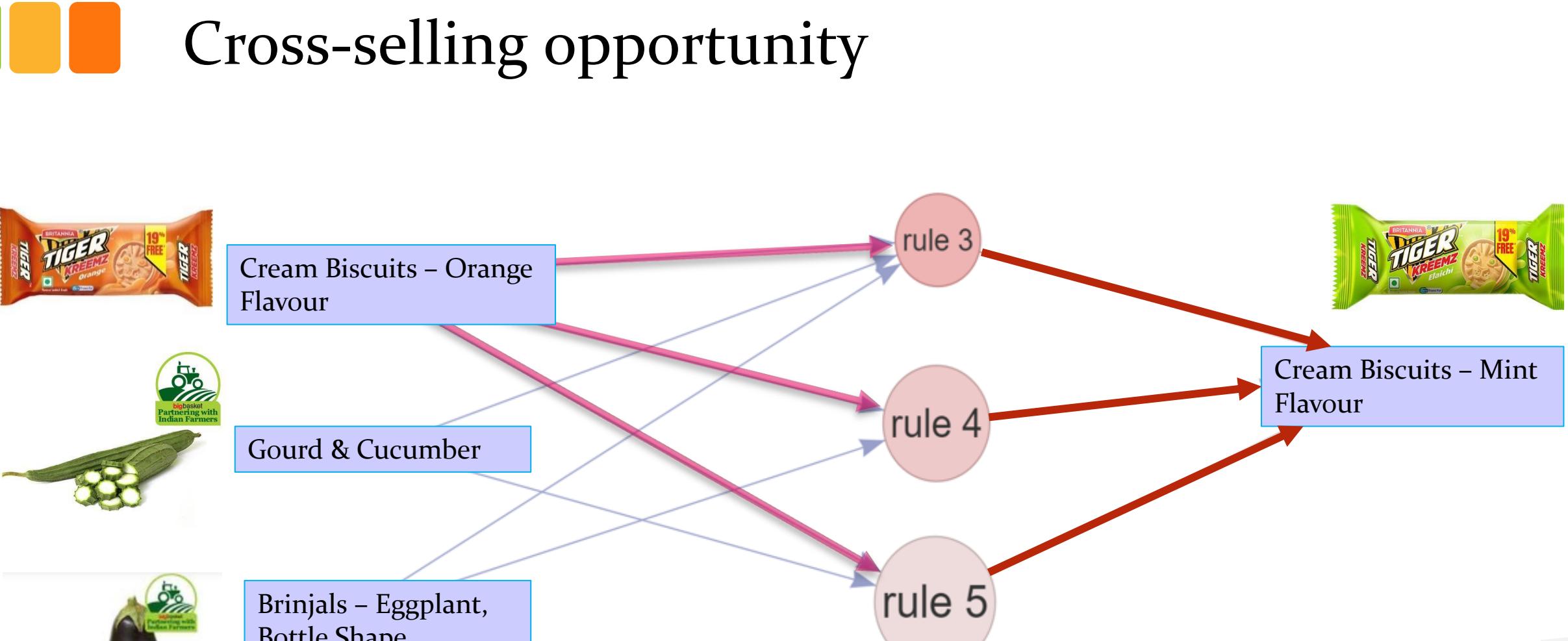
rule 3

rule 4

rule 5



Cream Biscuits – Mint Flavour





# "Smart Basket" Impact



Create cross-selling & upselling opportunities by showing related items



Increase the average basket size of orders



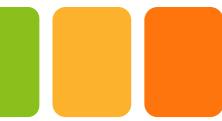
Improve the user experience



Make easier to find items



Shorten the shopping time



# "Did you forget?" Recommender

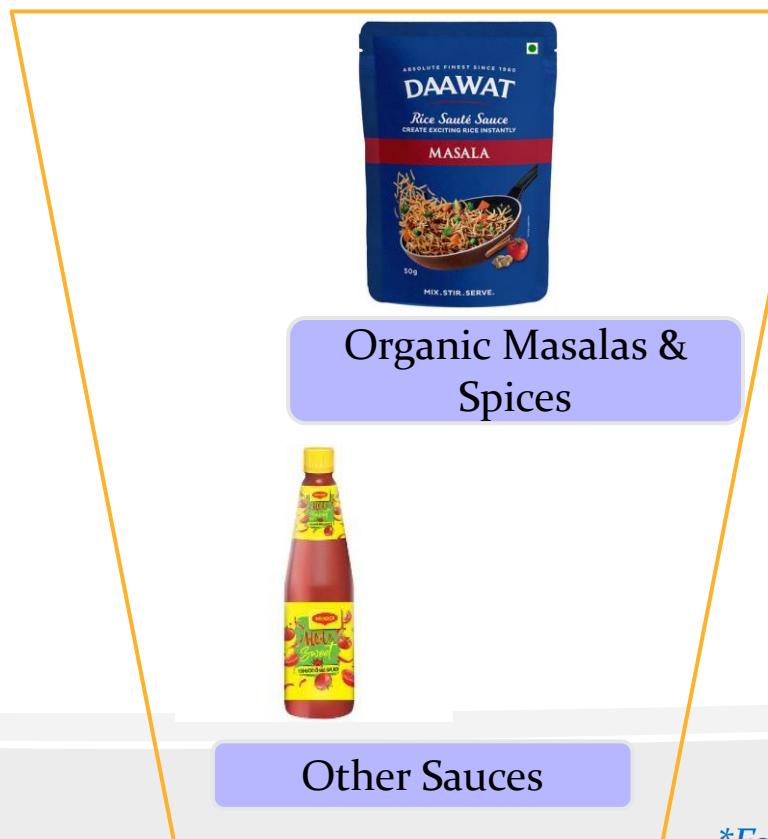
- Suggests top 5 items that may have been forgotten, based on basket content at check out





# “Did you forget?” Demo at Check-Out

**Scenario:** Customer is shopping for ingredients for a Masala recipe



Top 5 “Did you forget?” suggested items



\*For more details, see Slide 46 in Appendix.



# “Did you forget?” Demo at Check-Out

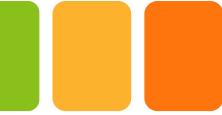
**Scenario:** Customer is shopping for personal care items



Top 5 “Did you forget?” suggested items



\*For more details, see Slide 47 in Appendix.



# “Did You Forget” Impact



Potential increase in sales of recommended items of 9% <sup>1</sup>

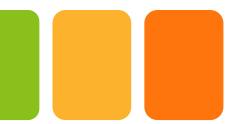


Reduce delivery costs by reducing number of weekly deliveries per customer due to forgotten items



Track sales of recommended items to determine actual sales lift and impact on number of weekly deliveries per customer

1. <https://news.ufl.edu/articles/2018/09/how-helpful-are-product-recommendations-really.html>



# New Customer Order Flow

Start with your top 20?

Yes! User adds 6+ items to their basket

User manually adds other items to basket

Smart Basket recommends items as they shop

Did you forget  
raises 5 potential items that the user may have forgotten

Add some of these



# Conclusion

## ***Business Issues***

- Poor customer experience
- High operational costs
- Reduced profit

## ***Analytics Approach***

### Features:

- Your Top 20
- Smart Basket
- “Did You Forget”

## ***Improve the customer experience:***

- Increase average basket size from 6 to 10 items, with expected sales lift of 9%<sup>1</sup>
- Increase average order growth rate from 30% to 50% every month
- Shorten shop to checkout time from 30 minutes to 10 minutes
- Lower delivery costs by reducing from 4 to 2 deliveries per day to the same location, increasing the efficiency by 50%.

1. <https://news.ufl.edu/articles/2018/09/how-helpful-are-product-recommendations-really.html>

2. For detailed estimations, see Slide 50 in Appendix.



Nicole Hong



David Trinh



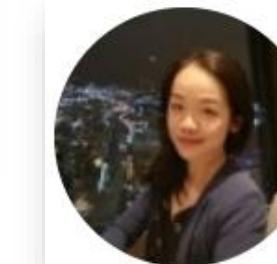
Busola Daodu



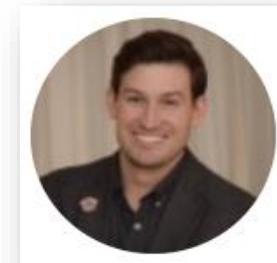
Anthony Azar



Di Wu



Lorraine Feng



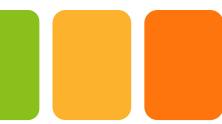
Joel McInnis

# Thank you!



# Appendix

The image features the logo for bigbasket, which includes a green square with a red stylized 'bb' monogram. To the right of the logo, the word 'bigbasket' is written in a bold, lowercase sans-serif font. Below the main text, the tagline 'India's largest online supermarket' is displayed in a smaller, lowercase sans-serif font. Below the text, there is a photograph of a woven basket overflowing with various fresh fruits and vegetables, including grapes, broccoli, carrots, and leafy greens, surrounded by more produce like bananas, tomatoes, and onions.



# Market Basket Analysis



Raw Dataset

Data Preprocessing

Conversion to  
Transactional Data

Product  
(SKU & Description):

- Most frequent items
- Least frequent items

Density Plot  
Apriori Function:

- Set Support & Confidence Level

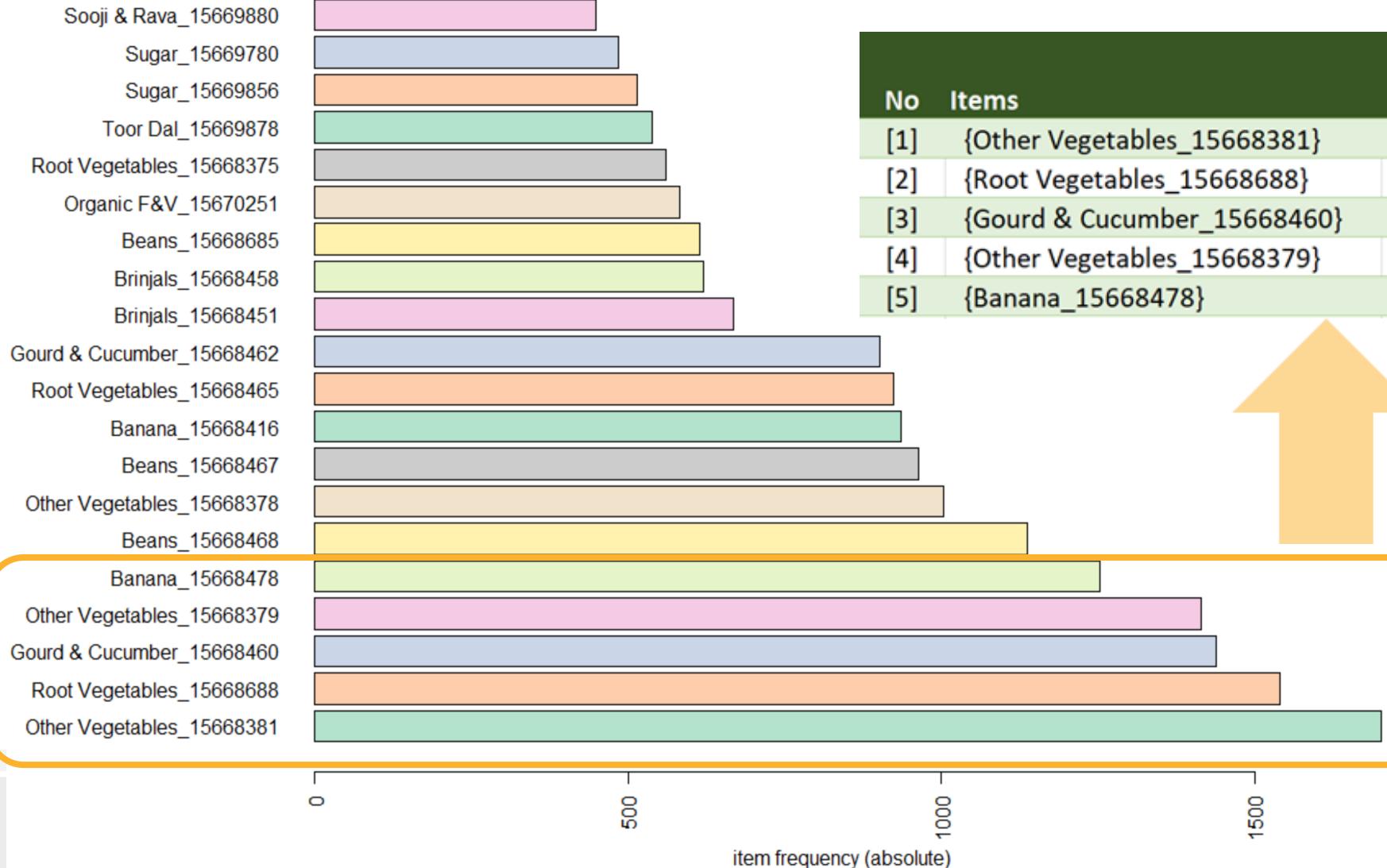
- 194 non-redundant rules
- Top 20 Rules with the highest lift
- Observe the rules with the visualizations

- Top 20
- “Smart Basket”
- “Did you forget?” Engine



# Popular Products

## Absolute Item Frequency Plot



No	Items	Trans Identical		
		Support	To Itemsets	Count
[1]	{Other Vegetables_15668381}	0.20	0.02	1,702
[2]	{Root Vegetables_15668688}	0.18	0.03	1,540
[3]	{Gourd & Cucumber_15668460}	0.17	0.02	1,439
[4]	{Other Vegetables_15668379}	0.17	0.03	1,415
[5]	{Banana_15668478}	0.15	0.04	1,252



# "Smart Basket“ – Association Rules in Table

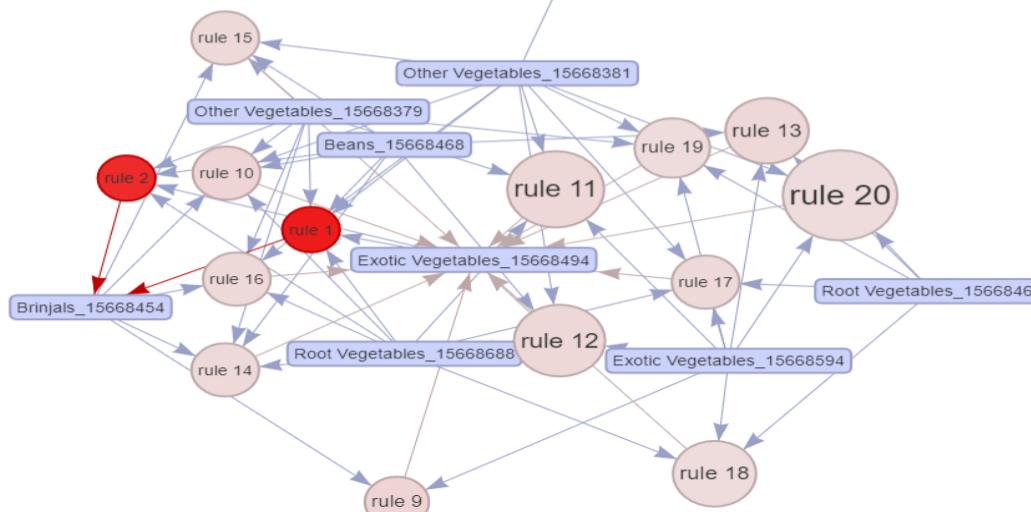
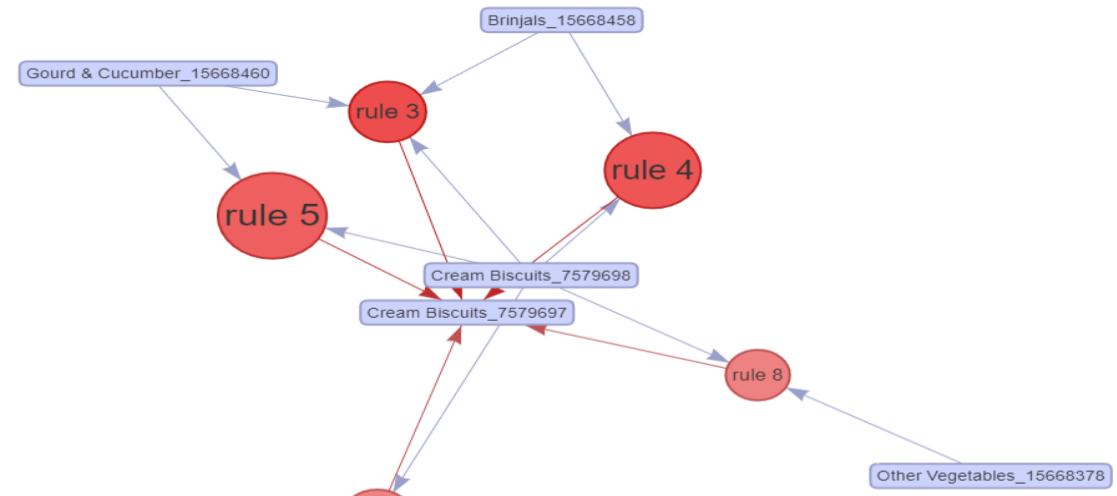
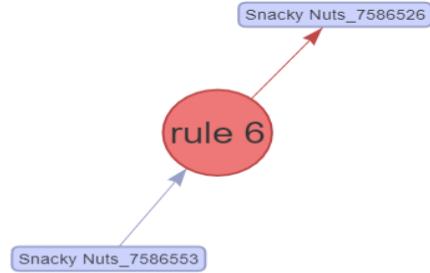
Rules	LHS	RHS	Support	Confidence	Lift	Count	Coverage
[1]	Beans_15668468						
[1]	Exotic Vegetables_15668494						
[1]	Other Vegetables_15668379						
[1]	Other Vegetables_15668381						
[1]	Root Vegetables_15668688	Brinjals_15668454	0.25%	0.84	83.86	21	0.30%
[2]	Beans_15668468						
[2]	Exotic Vegetables_15668494						
[2]	Other Vegetables_15668379						
[2]	Root Vegetables_15668688	Brinjals_15668454	0.25%	0.81	80.63	21	0.31%
[3]	Brinjals_15668458						
[3]	Cream Biscuits_7579698						
[3]	Gourd & Cucumber_15668460	Cream Biscuits_7579697	0.29%	0.96	73.86	24	0.30%
[4]	Brinjals_15668458						
[4]	Cream Biscuits_7579698	Cream Biscuits_7579697	0.32%	0.93	71.63	27	0.35%
[5]	Cream Biscuits_7579698						
[5]	Gourd & Cucumber_15668460	Cream Biscuits_7579697	0.35%	0.91	69.72	29	0.38%
[6]	Snacky Nuts_7586553	Snacky Nuts_7586526	0.35%	0.91	64.96	29	0.38%
[7]	Cream Biscuits_7579698						
[7]	Other Vegetables_15668381	Cream Biscuits_7579697	0.27%	0.82	63.20	23	0.33%
[8]	Cream Biscuits_7579698						
[8]	Other Vegetables_15668378	Cream Biscuits_7579697	0.26%	0.81	62.69	22	0.32%
[9]	Brinjals_15668454						
[9]	Exotic Vegetables_15668594	Exotic Vegetables_15668494	0.26%	0.92	35.75	22	0.29%
[10]	Beans_15668468						
[10]	Brinjals_15668454						
[10]	Other Vegetables_15668379						
[10]	Other Vegetables_15668381						
[10]	Root Vegetables_15668688	Exotic Vegetables_15668494	0.25%	0.91	35.61	21	0.27%

Inspecting  
10 rules out  
of 194 rules  
with the  
highest Lift

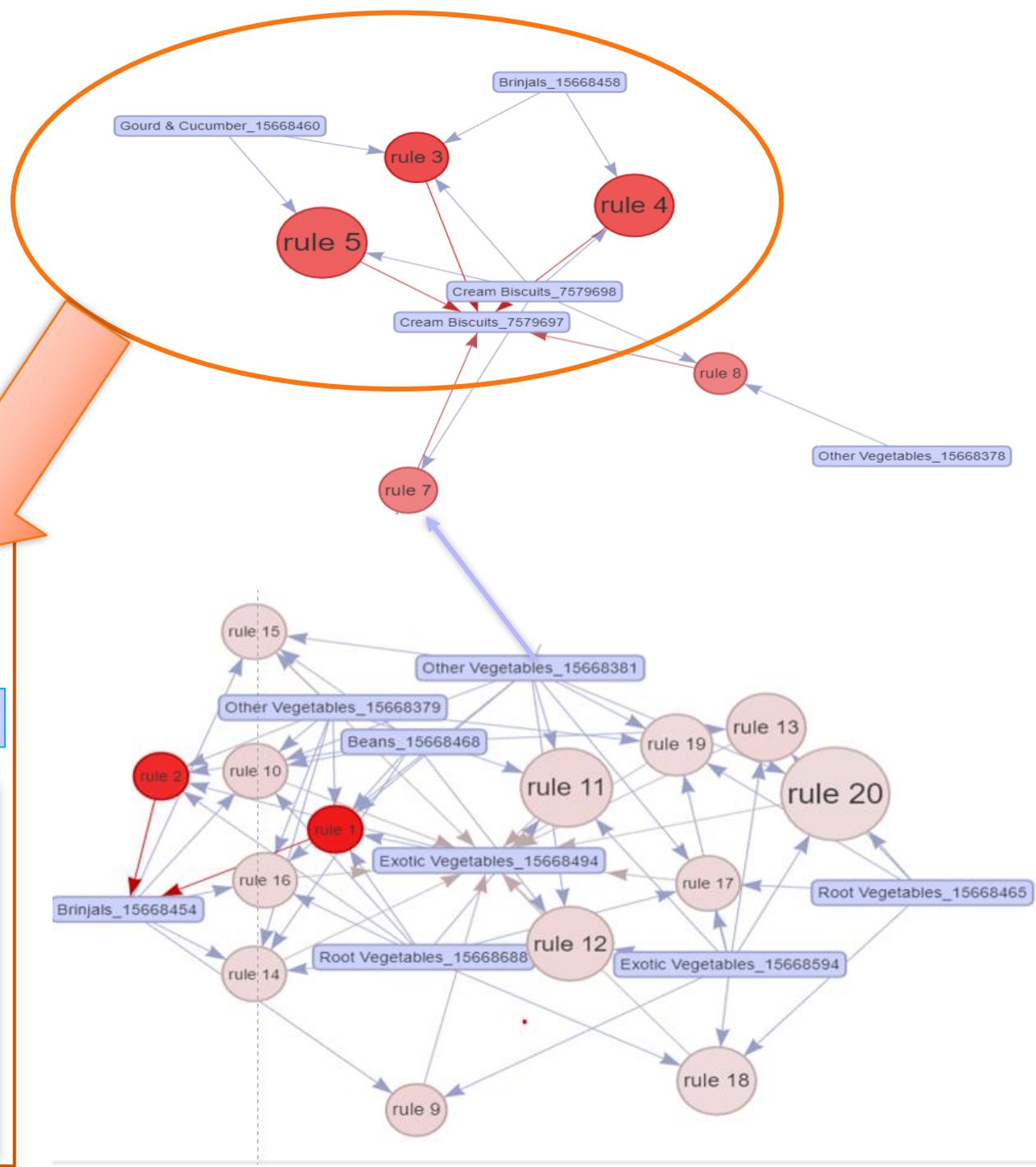
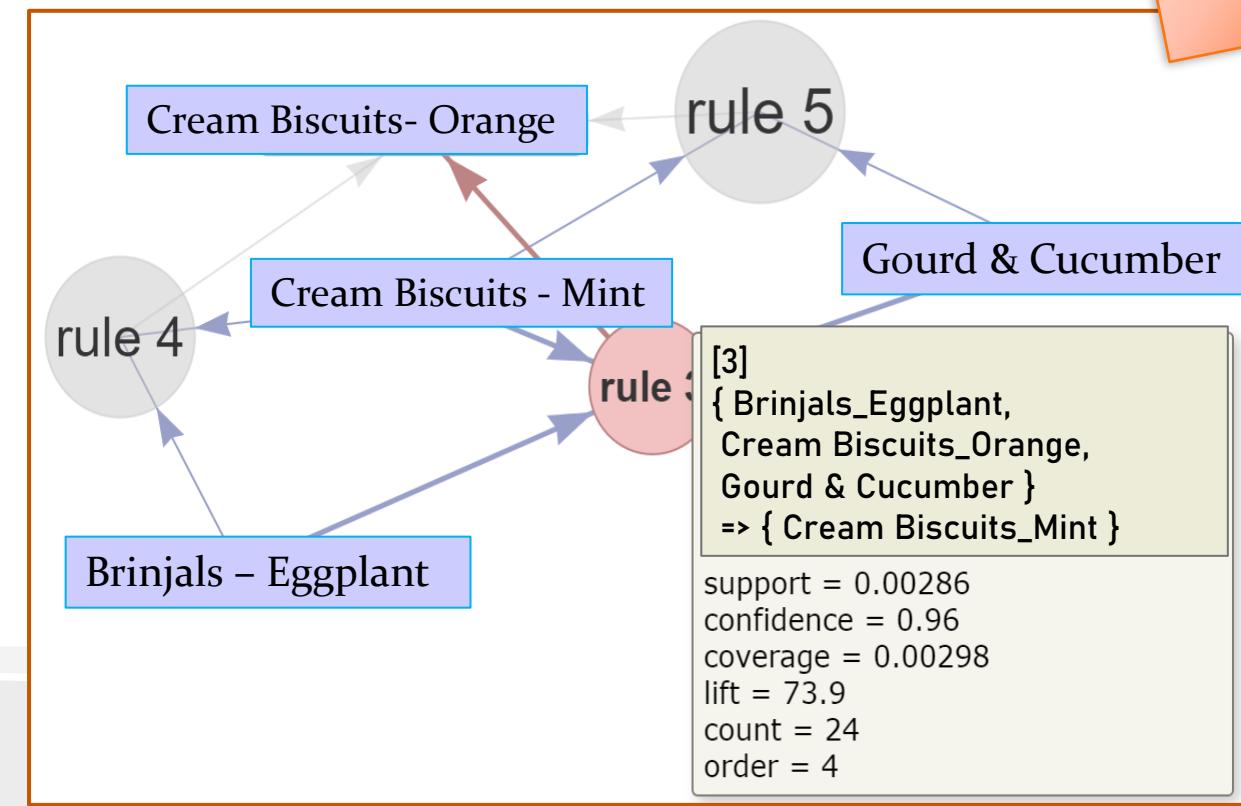


# "Smart Basket"

Top 20 rules from  
the extracted 194  
rules, ordered by  
the highest Lift



# "Smart Basket“ – Association Rules



# Grouped Matrix for 194 Rules



# Grouped Matrix for 194 Rules

## Items in LHS Group

c Vegetables\_15668494, +1 items}  
 165, Beans\_15668468, +3 items}  
 17, Other Vegetables\_15668379, +4 items}  
 Vegetables\_15668379, +3 items}

3448, Oats\_7607551, +10 items}

17, Root Vegetables\_15668688, +4 items}

17, Root Vegetables\_15668454, +4 items}

494, Other Vegetables\_15668381, +3 items}

21 rules: {Beans\_15668469, Beans\_15668473, +10 items}

11 rules: {Exotic Vegetables\_15668594, Other Vegetables\_15668379, +4 items}

6 rules: {Cream Biscuits\_7579698, Brinjals\_15668458, +3 items}

12 rules: {Snacky Nuts\_7586526, Banana\_15668478, +9 items}

10 rules: {Other Vegetables\_15668379, Exotic Vegetables\_15668494, +4 items}

8 rules: {Beans\_15668468, Exotic Vegetables\_15668494, +2 items}

5 rules: {Other Vegetables\_15668379, Root Vegetables\_15668465, +3 items}

8 rules: {Beans\_15668468, Other Vegetables\_15668381, +3 items}

9 rules: {Organic F&V\_15670252, Gourd & Cucumber\_15668463, +15 items}

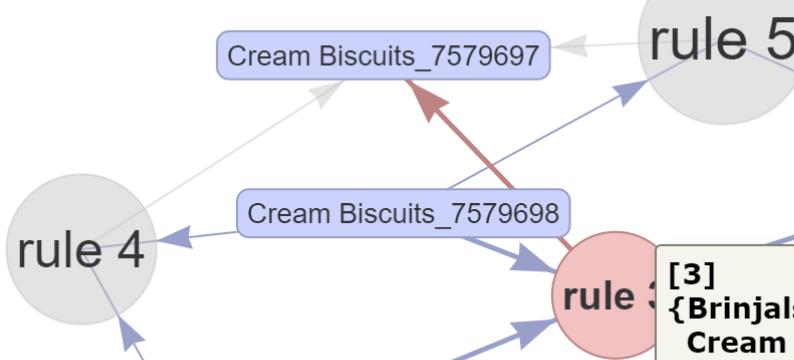
8 rules: {Beans\_15668468}

{Snacky Nuts\_7586526}  
 {Other Vegetables\_15668379}  
 {Exotic Vegetables\_15668594}  
 {Other Vegetables\_15668381}  
 {Root Vegetables\_15668688}

**RHS**

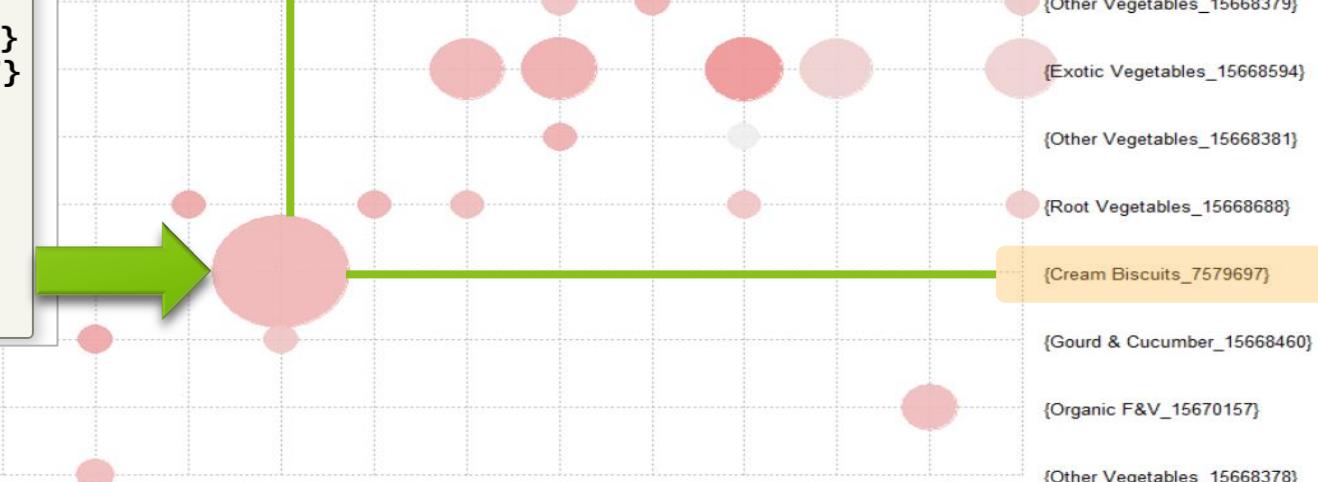
{Cream Biscuits\_7579697}  
 {Gourd & Cucumber\_15668460}  
 {Organic F&V\_15670157}  
 {Other Vegetables\_15668378}

Size: lift  
 Color: confidence



[3]  
**{Brinjals\_15668458,  
 Cream Biscuits\_7579698,  
 Gourd & Cucumber\_15668460}**  
 $\Rightarrow$  **{Cream Biscuits\_7579697}**

support = 0.00286  
 confidence = 0.96  
 coverage = 0.00298  
 lift = 73.9  
 count = 24  
 order = 4

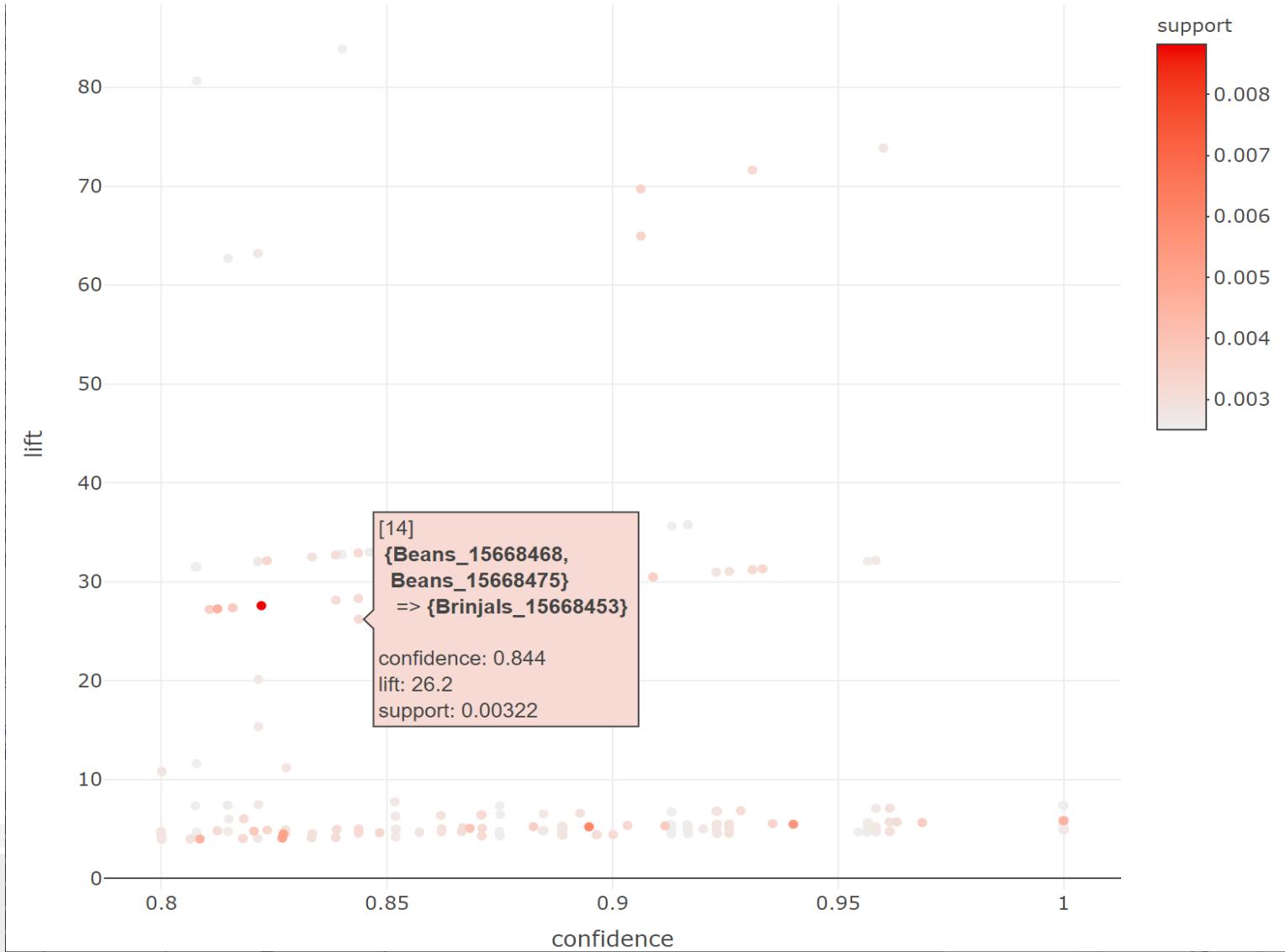


# Association Rules

+ 8 suppressed



# "Smart Basket“ – Scattered Plot



Scattered Plot for the extracted 194 rules with varying degree of Confidence, Lift and Support Levels.



# "Smart Basket“ – Matrix Plot

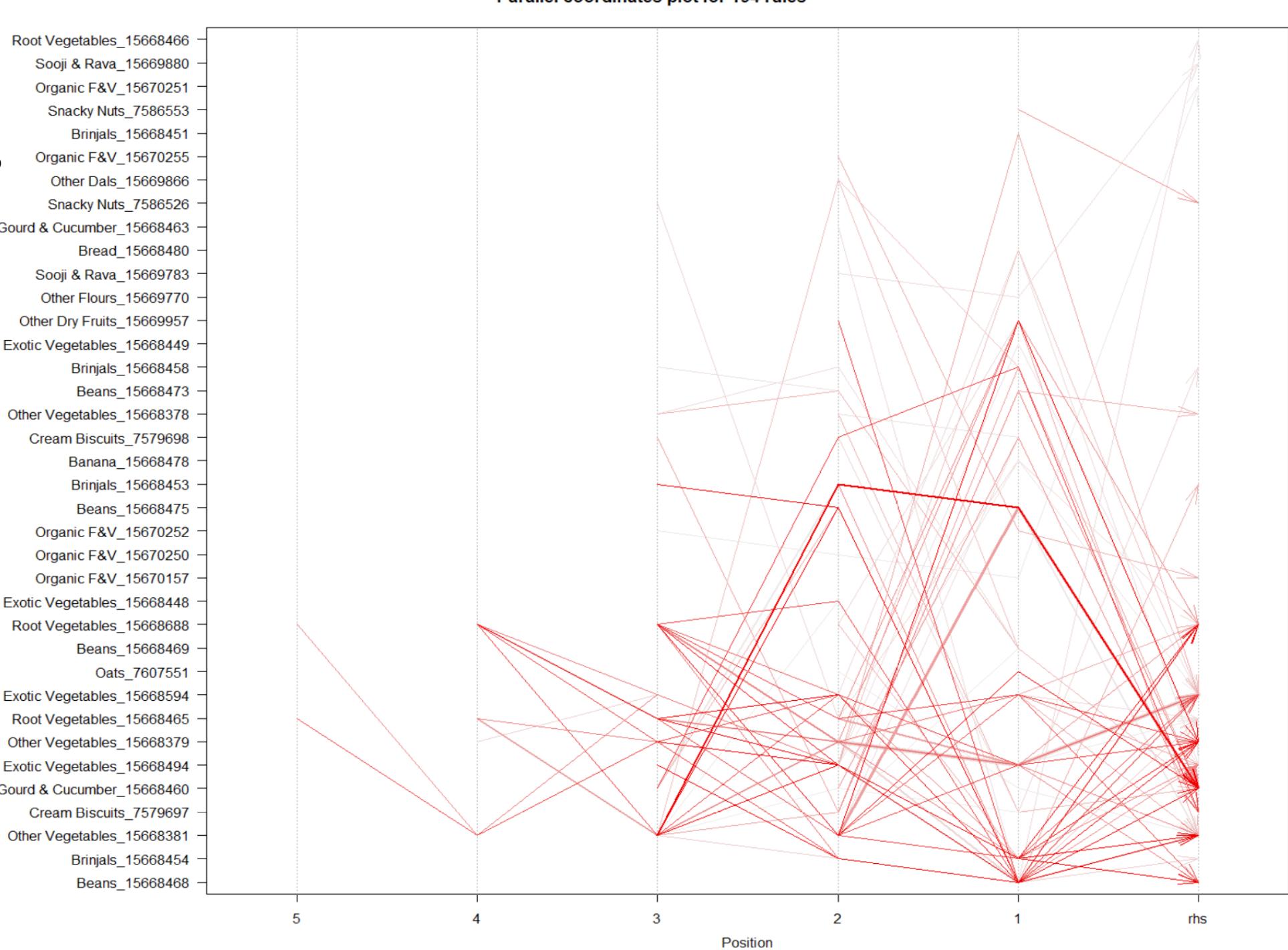


This plot shows the extracted 194 rules with RHS & LHS based on the varying degree of the support level



# "Smart Basket"

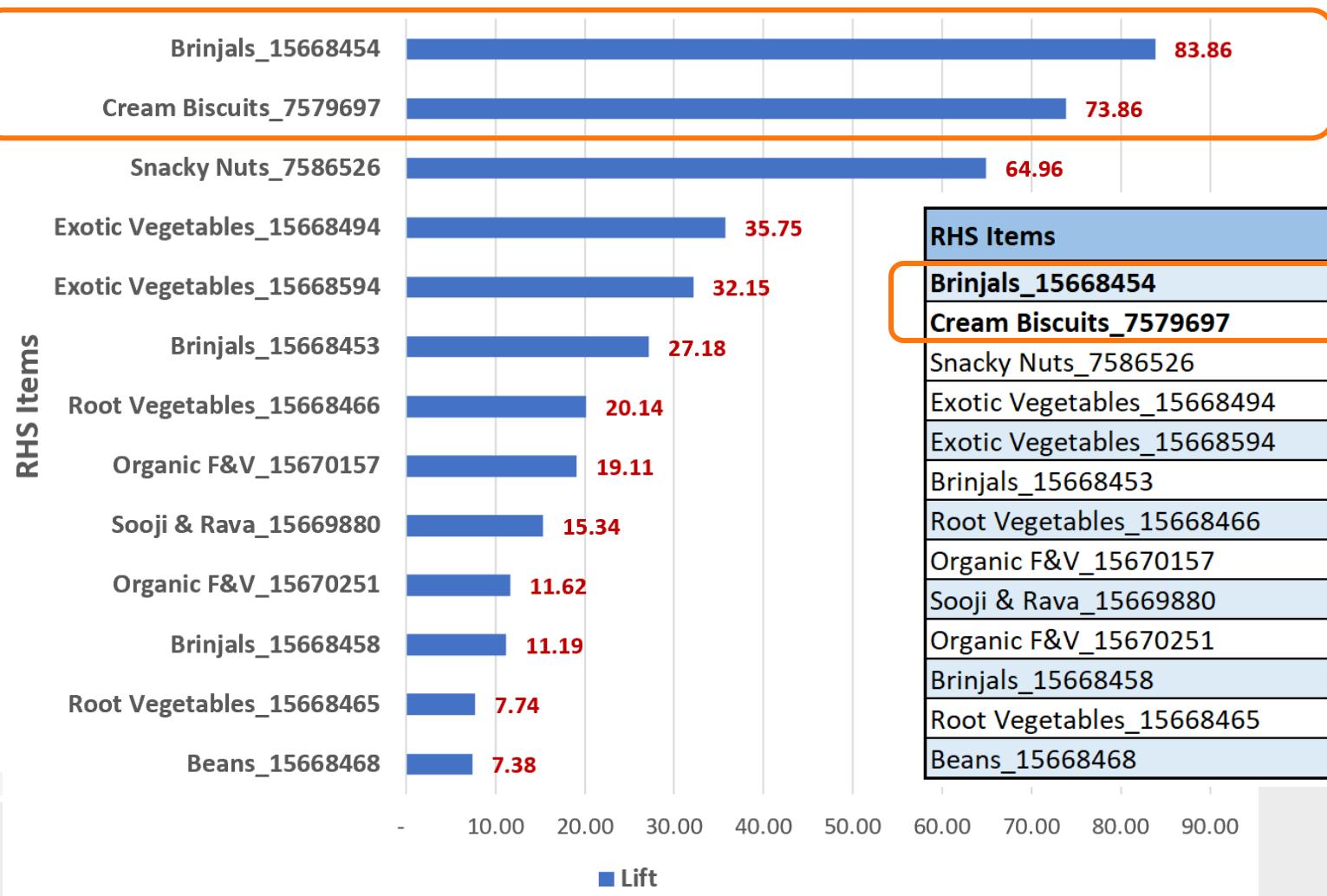
Parallel  
coordinates  
plot for the 194  
rules





# "Smart Basket" - Top Recommenders

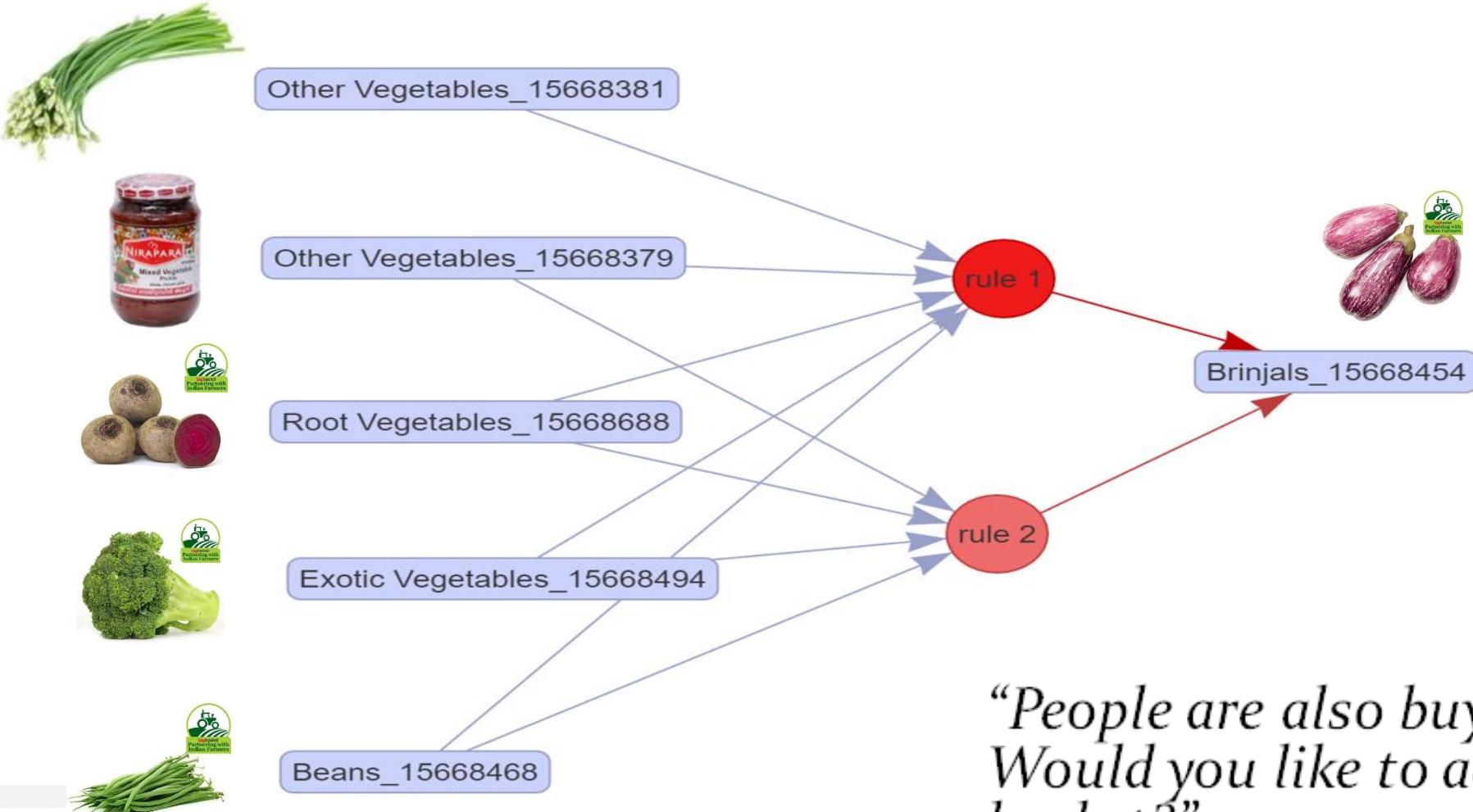
Recommenders (by Lift)



RHS Items	Description of Items	Lift	Count
Brinjals_15668454	Brinjals - Varikatri Eggplant	83.86	2
Cream Biscuits_7579697	Cream Biscuits	73.86	5
Snacky Nuts_7586526	Snacky Nuts	64.96	1
Exotic Vegetables_15668494	Broccoli	35.75	20
Exotic Vegetables_15668594	Lettuce - Iceberg	32.15	21
Brinjals_15668453	Brinjals - Bottle Shape Eggplant	27.18	3
Root Vegetables_15668466	Potatos	20.14	1
Organic F&V_15670157	Organic F&V - Banana	19.11	1
Sooji & Rava_15669880	Sooji & Rava	15.34	1
Organic F&V_15670251	Organic F&V - Tomatos	11.62	1
Brinjals_15668458	Brinjals - Long Green Eggplant	11.19	2
Root Vegetables_15668465	Root Vegetables - Beat Root	7.74	4
Beans_15668468	Beans - Haricot	7.38	20



# People are also buying...



*“People are also buying Brinjals.  
Would you like to add it to your  
basket?”*



# Cross-selling opportunity



Cream Biscuits\_7579698



Gourd & Cucumber\_15668460



Brinjals\_15668458

rule 3

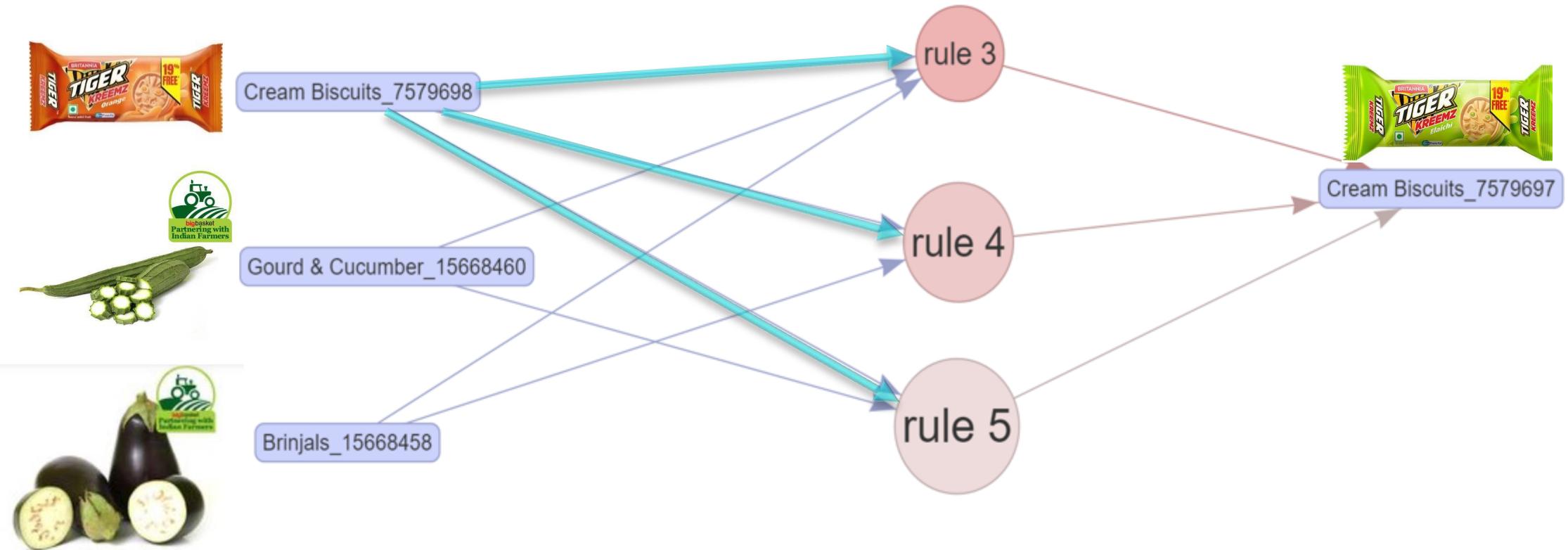


Cream Biscuits\_7579697

*“People also love the mint flavoured biscuit. Would you like to add this to your basket?”*



# Cross-selling opportunity



To further prove our cross-selling opportunity, Rule 4 & 5 are baskets with different combination of vegetables from Rule#3 , but they all have the same SKU of biscuit on the left leading to the same SKU of biscuit on the right. Our Rule #3 takes care of all combination of the previously mentioned items.



# “Did you forget?” Demo at Check-Out

**Scenario:** Customer is shopping for ingredients for a Masala recipe



Top 5 “Did you forget?” suggested items

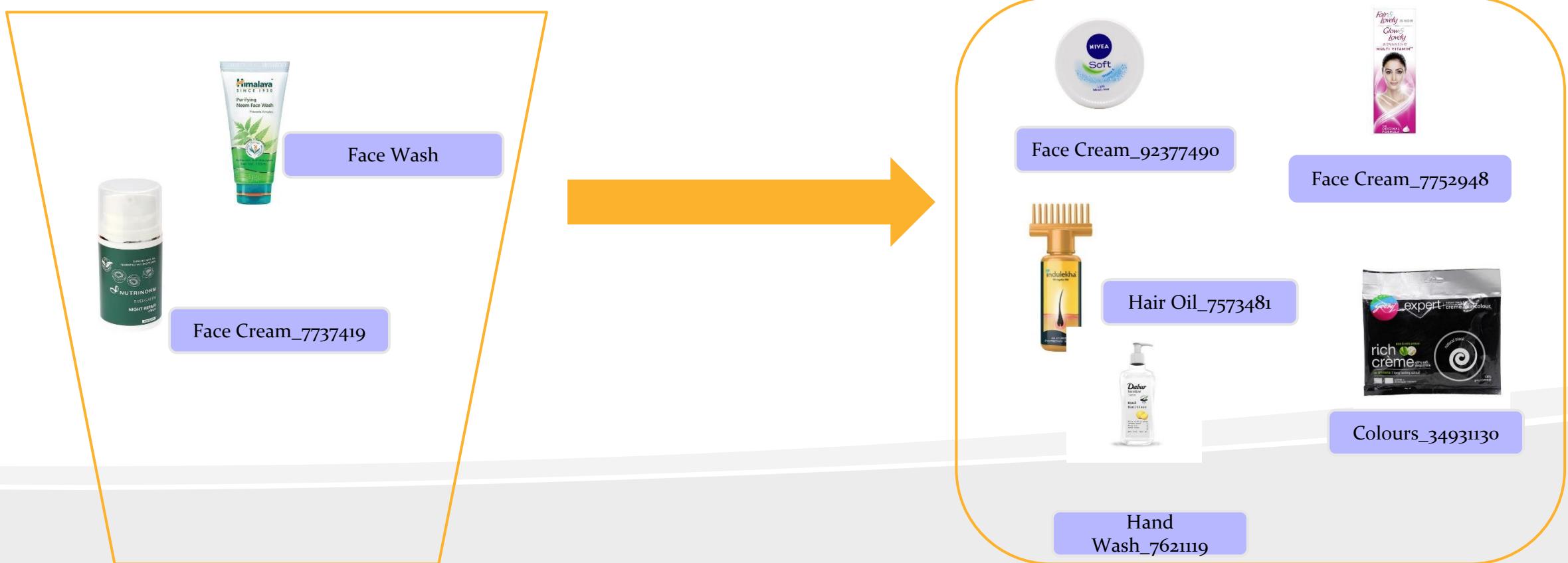




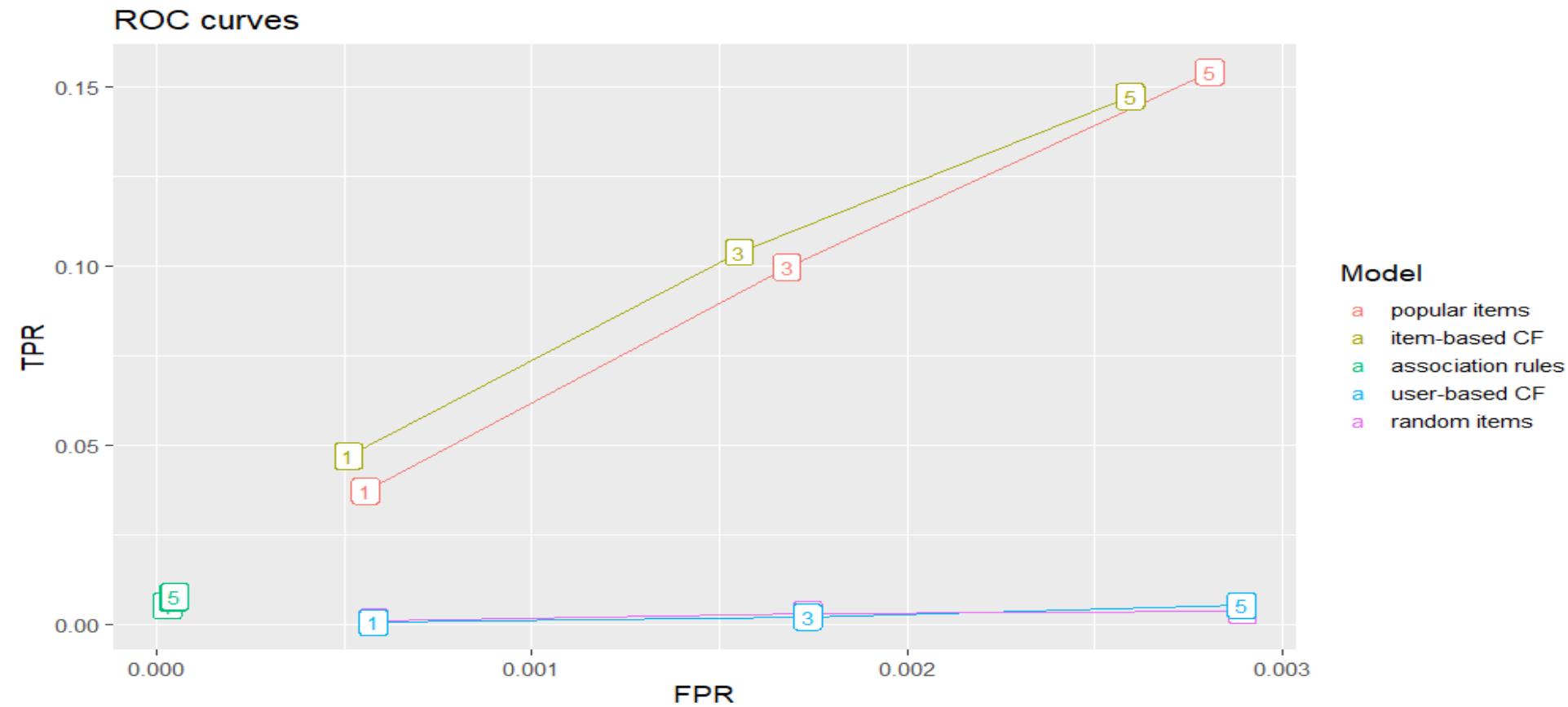
# “Did you forget?” Demo at Check-Out

**Scenario:** Customer's is shopping for personal care items

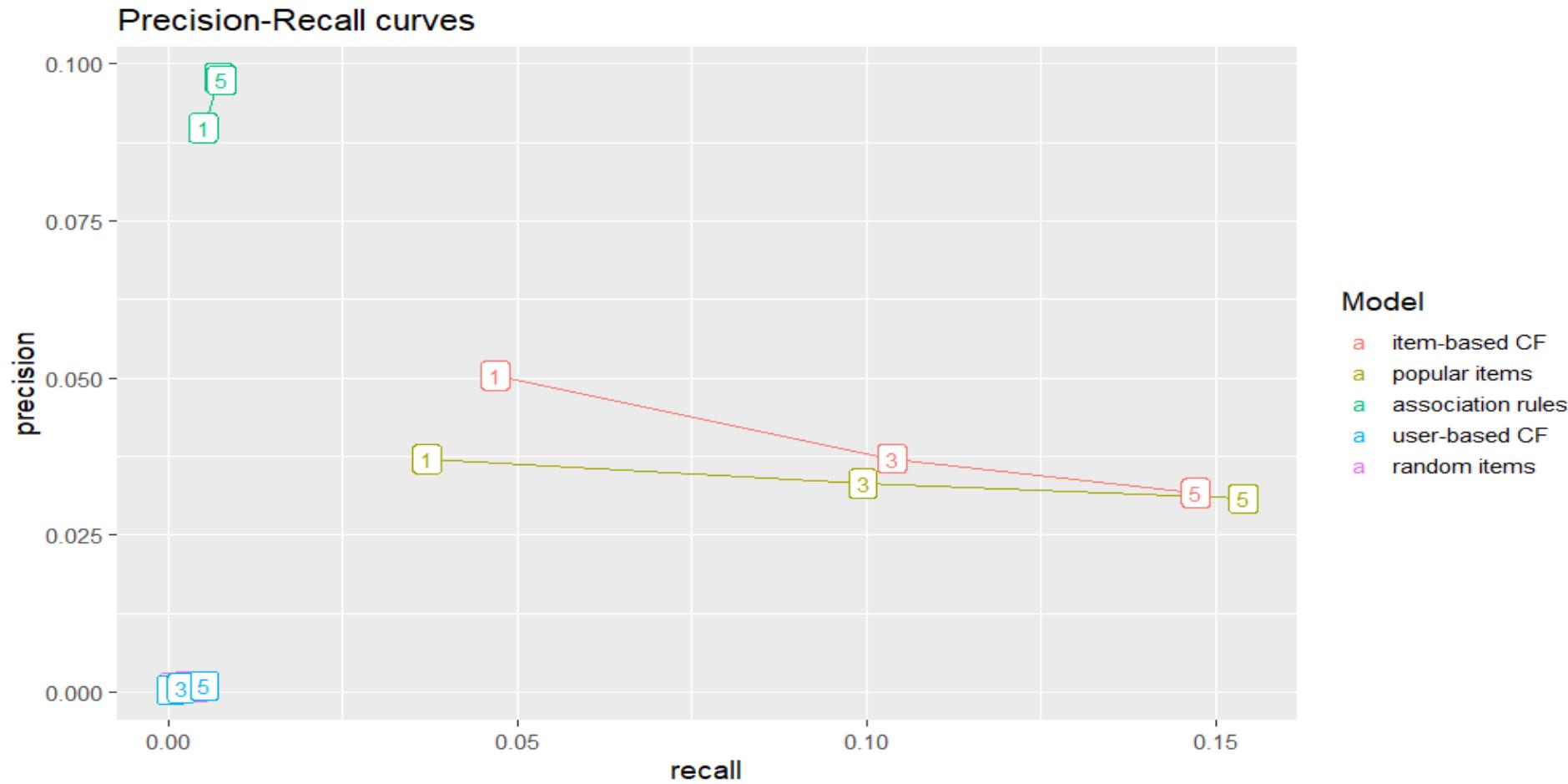
Top 5 “Did you forget?” suggested items



# ROC Curves to Evaluate “Did You Forget” Recommenders



# Precision-Recall Curves for “Did You Forget” Recommenders





# Conclusion – Estimations based on Assumptions

1

## Estimated Costs:

- Analysis & Model dev: 100 hours @ \$100/hr = \$10,000
- Deployment: 50 hours @ \$100/hr = \$5,000
- Total estimated cost = \$15,000

2

## Average order growth rate:

- Increase average basket size from 6 to 10 items
- % Increase: (10 items – 6 items) / 6 items = 67%
- 30% growth x (1 + 0.67) = 50% growth every month

3

## Delivery efficiency rate:

- Lower delivery costs by reducing from 4 to 2 deliveries per day
- % Decrease: (4 deliveries – 2 deliveries) / 4 deliveries = 50%

### \*Note:

Due to the lack of data factual to the case, our estimations required a number of assumptions to validate the efficiency rate (%) such as the number of items increased in average basket and the number of deliveries made per day.