Team 07 - Update 1

CS6220 - Data Mining Techniques - Fall 2017

Northeastern University

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1 Introduction

Our team is using "The Instacart Online Grocery Shopping Dataset 2017" to build a Recommender System.
Instacart is an American company that operates as a same-day grocery delivery service. This anonymized dataset contains a sample of over 3 million grocery orders from more than 200,000 Instacart users, spread over 6 .csv files. For each user, the dataset has 4 to 100 of their orders, with the sequence of products purchased in each order. The week and hour of the day the order was placed, and a relative measure of time between orders is also available.

2 Data Analysis

2.1 The Dataset

Orders from Instacart are available in four .csv files: "orders.csv", "order_products__train.csv", "order_products__prior.csv" and "sample_submission.csv". The key to understand the dataset and the train / test split is the orders table ("orders.csv").

Take for example User 1[Fig 1] , who happens to be a train user. User 1 has 10 prior orders, and 1 train order whose details are provided in "order_products__prior.csv" and in "order_products__train.csv" respectively.

order_id	user_id	eval_set	order_number	order_dow	order_hour_of_day	days_since_prior_order
2539329	1	prior	1	2	08	
2398795	1	prior	2	3	07	15.0
473747	1	prior	3	3	12	21.0
2254736	1	prior	4	4	07	29.0
431534	1	prior	5	4	15	28.0
3367565	1	prior	6	2	07	19.0
550135	1	prior	7	1	09	20.0
3108588	1	prior	8	1	14	14.0
2295261	1	prior	9	1	16	0.0
2550362	1	prior	10	4	08	30.0
1187899	1	train	11	4	08	14.0

(a) User 1

3343014	4	prior	1	6	11	
2030307	4	prior	2	4	11	19.0
691089	4	prior	3	4	15	21.0
94891	4	prior	4	5	13	15.0
2557754	4	prior	5	5	13	0.0
329954	4	test	6	3	12	30.0

(b) User 4

Figure 1: Train/Test Split

	order_id	product_id	add_to_cart_order	reordered	product_name	aisle_id	department_id	aisle	department
0	2	33120	1	1	Organic Egg Whites	86	16	eggs	dairy eggs
1	2	28985	2	1	Michigan Organic Kale	83	4	fresh vegetables	produce
2	2	9327	3	0	Garlic Powder	104	13	spices seasonings	pantry
3	2	45918	4	1	Coconut Butter	19	13	oils vinegars	pantry
4	2	30035	5	0	Natural Sweetener	17	13	baking ingredients	pantry

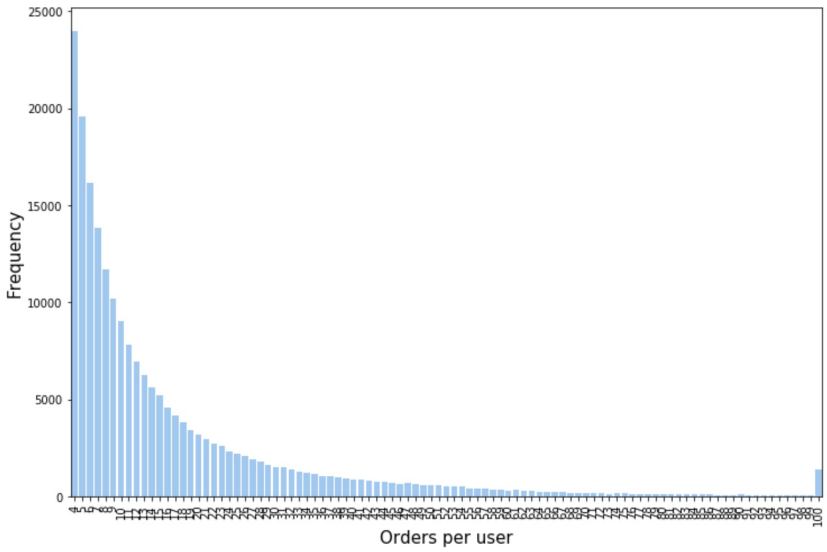
Figure 2: Merged Prior Orders

Similarly, User 4 is a test user. He has 5 prior orders, and his 6th is a test order. Their details are available in "order_products__prior.csv" and "sample_submission.csv" respectively.

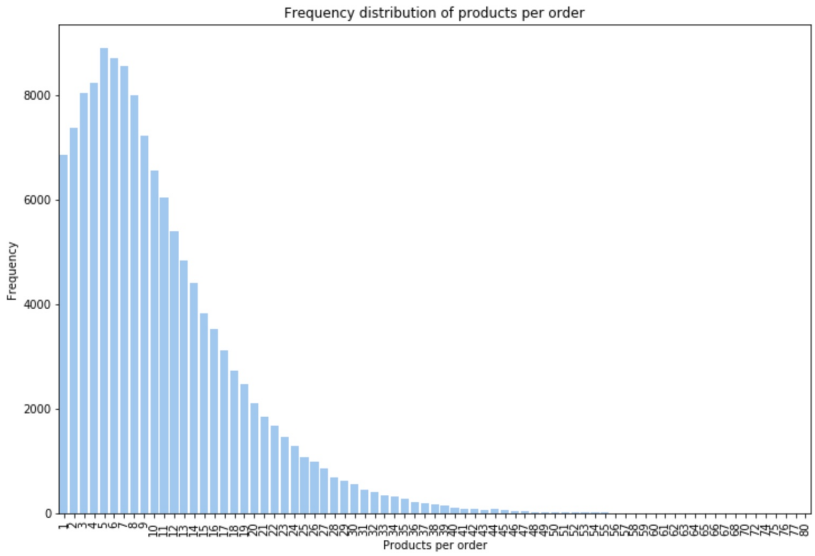
Figure 2 is a glimpse at "order_products__prior.csv" when merged with three other .csv files that represent products, aisles and departments. The format of "sample_submission.csv" and "order_products__train.csv" is exactly the same.

2.2 Exploration and Analysis

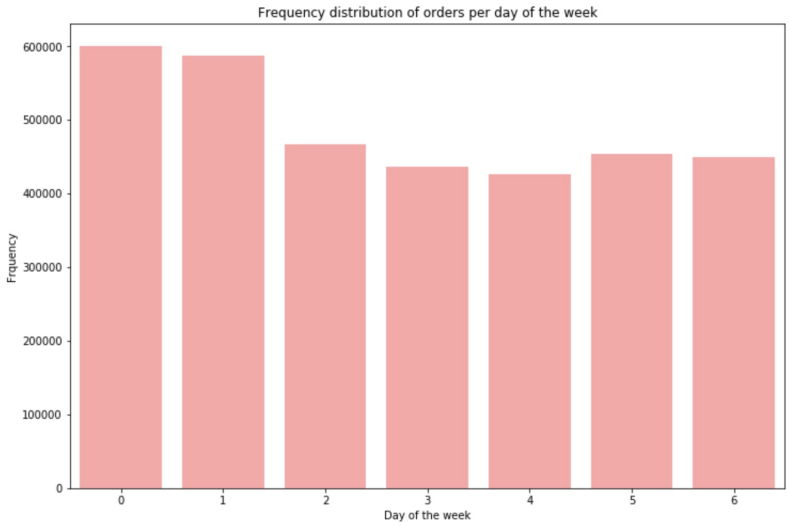
How many orders have users placed?
The below histogram validates the claim that 4 to 100 orders of a customer are given.



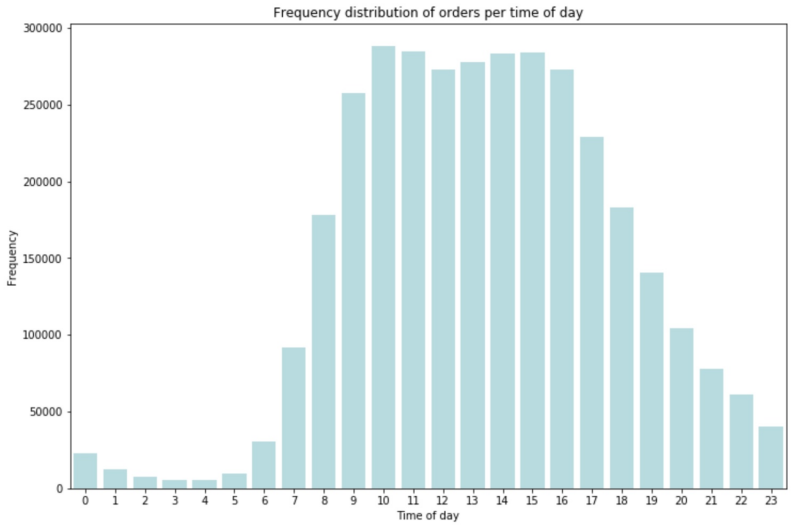
How many products does an order have??
The "long tail" phenomenon is clearly visible here.



Does day of the week influence user order habits?
There is a clear effect of day of the week. Most orders are on days 0 and 1. However, there is no information about which values represent which day, but, it's reasonable to assume they are weekends.

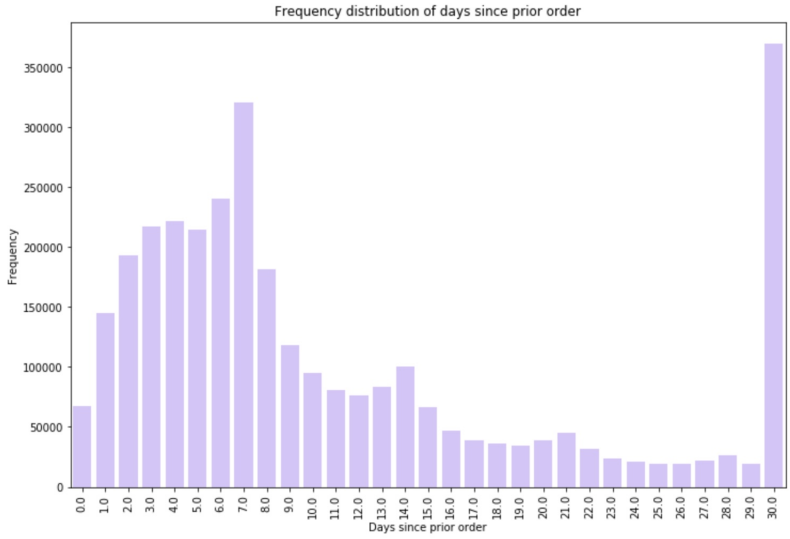


Does time of day influence user order habits?
There is a clear effect. Most of the orders are placed between 7.00 am and 10.00pm.

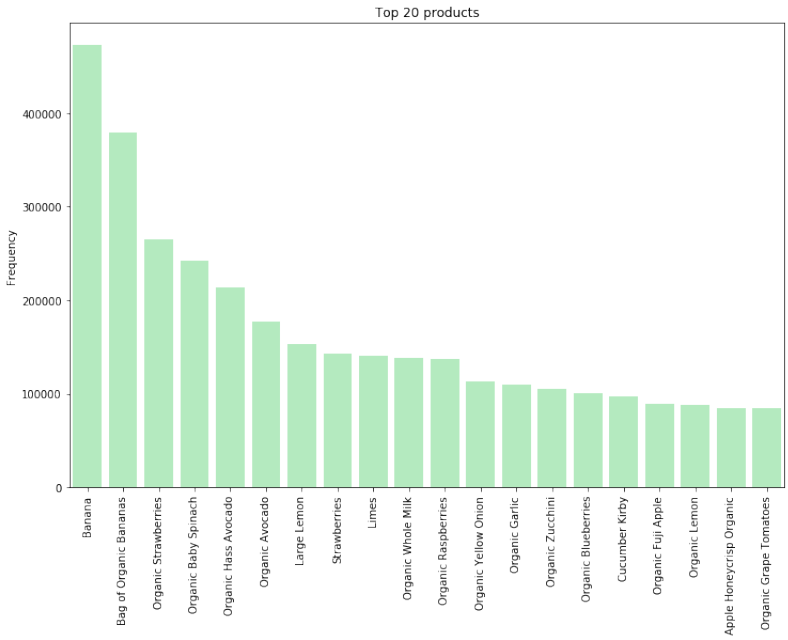


When do users reorder?

Users seem to order on a weekly and monthly basis.



What are the top 20 Products?



3 Next Steps

We will be following a Collaborative Filtering based approach to build our recommender system. We initially decided against at a content-based approach since our dataset does not have enough metadata information to profile each product.

Roughly, these are the steps we'd like to follow

- Represent the given data in the form of a $user \times products$ matrix, where each entry would represent frequency of product purchase by a certain user.
- Normalize each entry in the matrix to fit into 0-1 range.
- Explore three algorithms either separately or in combination: User/Item based Collaborative Filtering, Matrix Factorization and Association Rules.
- For every model above, validate it against the test set using the F1 measure as an accuracy metric.
- Evaluate models by comparing them against a baseline model which returns the most popular products.