

# Cart Recommendations

# Agenda

1. Module
2. Model
3. Co-purchases Feature
4. Co-purchases candidates
5. Validation
6. Status + Future Plans

# Module

1. Bottom of the cart page
2. Based on listings in the cart

You might also like...



French Vintage 1990s  
Patent Leather Chunky  
Heel Ankle Boots / 90's  
Chelsea Zipper Block  
Heel MINT Minimal ...  
By FrancetteVintag...

\$73.17

Add to cart



Brown Mary Jane Flats -  
Handmade Leather  
Shoes - Minimalist Shoes  
Made in USA - Adult  
Softstar "Merry Jan...  
By SoftstarShoes

\$90.00

Add to cart



Brown Leather  
Moccasins - Handmade  
Moccasins - Soft Elk  
Leather - Adult Softstar  
"Roo Moccasin" Styl...  
By SoftstarShoes

\$95.00

Add to cart



Chukka Boots in Tan  
Suede  
By TheGothicShoeCo

\$111.19

Add to cart



Chukka Boot (Tan)  
By MilesandLouie

\$127.74

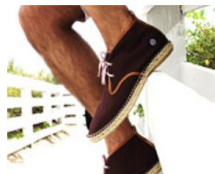
Add to cart



Handmade Men's  
Leather Chukka boot  
By AtitlanLEATHER

\$84.95

Add to cart



EGGPLANT SENDAS |  
Handmade Vegan  
Espadrille Chukka Boots  
for Men  
By VogasBarcelona

\$83.00

Add to cart



90s minimal t strap  
shoes / navy blue suede  
block heel shoes /  
vintage mary janes /  
womens 9  
By ImprovGoods

\$46.00

Add to cart



Willow - Womens Chukka  
Boots, Leather Boots, Fall  
Boots, Suede Chukka,  
Laceup boots, Custom  
boots, FREE custom...  
By JuliaBoShoes

\$120.00

Add to cart

# Model

1. Uses the recsys ensemble framework
2. Two features:
  - a. historical clicks
  - b. feature based on historical co-purchases.
3. Target listing id is the last added listing to the cart
4. Older model: blended/interleaving model based on recommendations from multiple listings in the cart
5. Older model: cascade of three datasets; related to coverage

# Co-purchases Feature

	Listing 1	Listing 2	Listing 3
Listing 1	0 (/1)	2	3
Listing 2	2	0 (/1)	4
Listing 3	3	4	0 (/1)

1. Values represent times a row listing has been co-purchased with a column listing:
  - a. Across visits begun in a 12 hour period
  - b. Aggregated over 6 months
2. Rows in table represent row vectors
3. Co-purchase feature: cosine similarity between the target listing and the candidate recommendation listing
4. Diagonal elements replaced by 1s to capture similarity between actual co-purchased items
5. Calculate this on the fly for selected candidates (instead of calculating for all pairs which is not possible without using approximate k-NN techniques)

# Co-purchases Candidates

1. Base candidate set: TFIDF similar listings (approx. k-NN)
2. Two new co-purchases based candidate sets:
  - a. Directly co-purchased listings (count > 1; 6 months)
  - b. Candidates with highest cosine similarity (score  $\geq 0.1$ ; 2 months; top 100 listing ids per vector):
    - i. re-purposed pre-existing optimized code that calculates tfidf-similar-listings
    - ii. Hashed each listing-id in vector, and used that for bucketing (50 million to 50k buckets)
    - iii. Calculated NN for each listing in each bucket
    - iv. Not straightforward to convert 0s to 1s in diagonal in existing code.

# Validation

1. Trained to optimize clicks on the module
2. Positive label to the click on module; negative labels to unclicked listings.
3. 2 weeks training + testing on latest date
4. AUC numbers:
  - a. Current production baseline = 0.499
  - b. Only clicks feature = 0.578
  - c. Model (clicks + co-purchases) AUC = 0.596
5. Co-purchases feature coverage: 55%
  - a. Non-zero cosine-similarity coverage: 27%

# Status + Future Work

1. Experiment launched on 9/28.
2. Going beyond 12 hours definition of co-purchases
3. Directionality: 1 purchased after 2 vs 2 purchased after 1
4. Candidate selection improvements:
  - a. Reconsidering thresholds
  - b. Diagonal element zeros
5. Last added item requirement