



Recommender Systems Amazon Data Analysis

Advisor: Julian McAuley

Team Members:

Nirmal Budhathoki

Chris Chen

Nolan Thomas

Toby Moreno

UC San Diego

JACOBS SCHOOL OF ENGINEERING
Computer Science and Engineering

Recommender Systems



COLLABORATIVE FILTERING



CONTENT-BASED FILTERING



Dataset

Collected by Professor McAuley.

142.8 million reviews spanning May 1996 - July 2014.

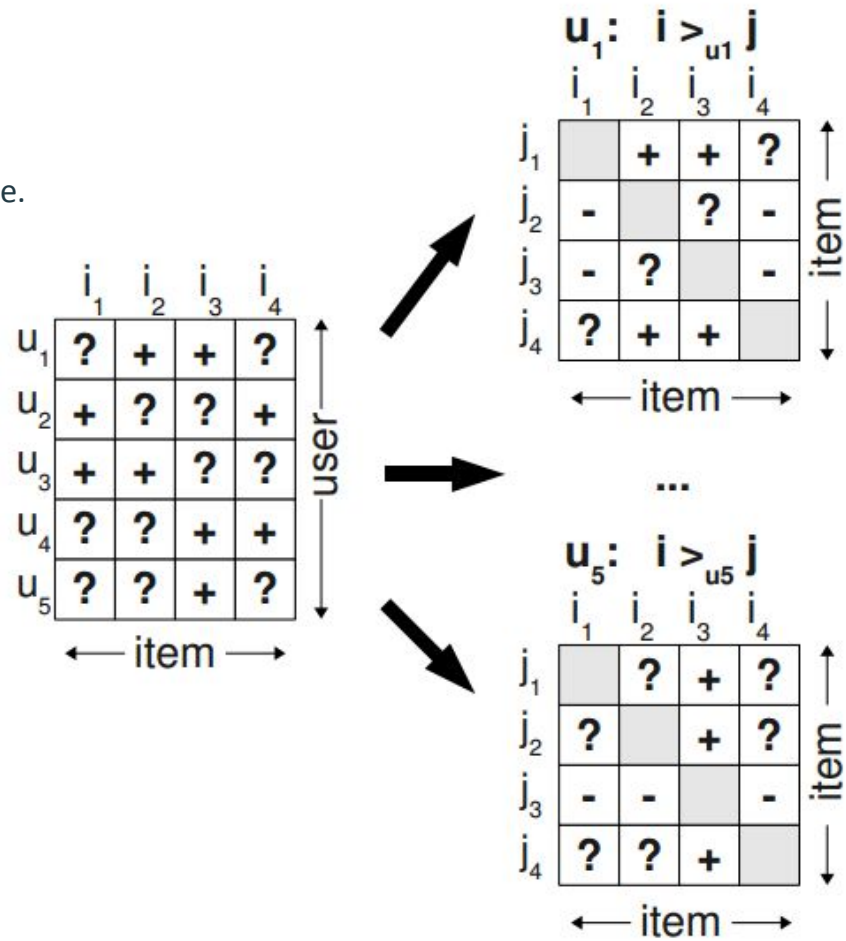
```
{
  "reviewerID": "A2SUAM1J3GNN3B",
  "asin": "0000013714",
  "reviewerName": "J. McDonald",
  "helpful": [2, 3],
  "reviewText": "I bought this for my husband who plays the
piano.  He is having a wonderful time playing these old hymns.
The music  is at times hard to read because we think the book
was published for singing from more than playing from.  Great
purchase though!",
  "overall": 5.0,
  "summary": "Heavenly Highway Hymns",
  "unixReviewTime": 1252800000,
  "reviewTime": "09 13, 2009"
}
```

Bayesian Personalized Ranking (BPR)

- Plus (+) user prefers item i over item j
- Minus (-) user prefers j over i
- Question mark (?) item pairs that have to be ranked in the future.

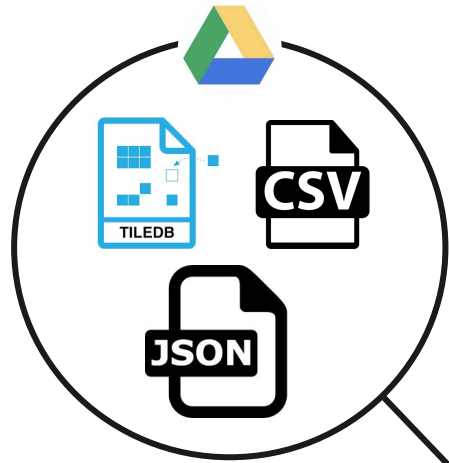
Goal: Estimate a personalized **ranking function** for each user:

$$I >_u J$$

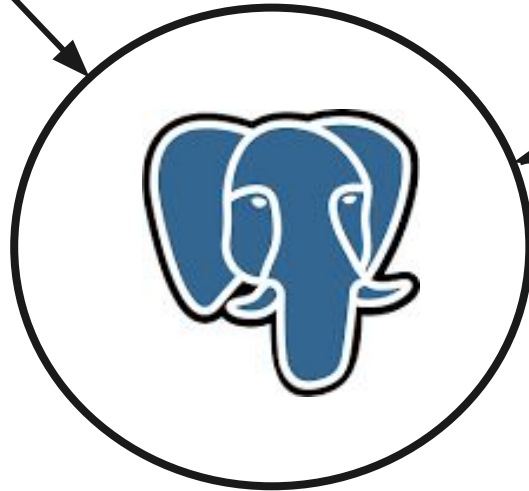


Problem Statement

Building a recommender engine that is capable of capturing customers' preferences in Women's Fashion and Electronics categories

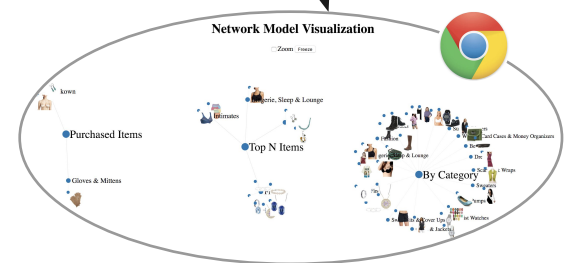
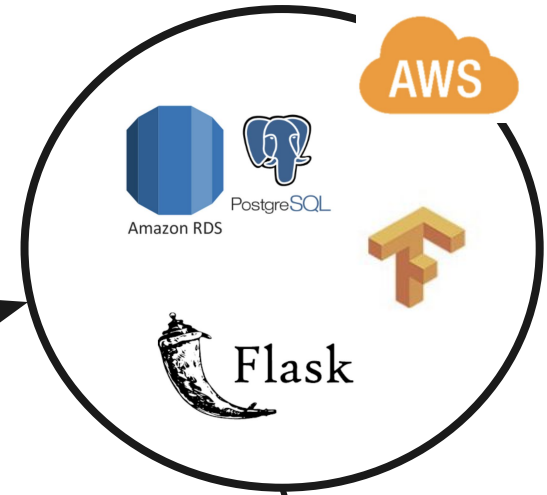


Input Data



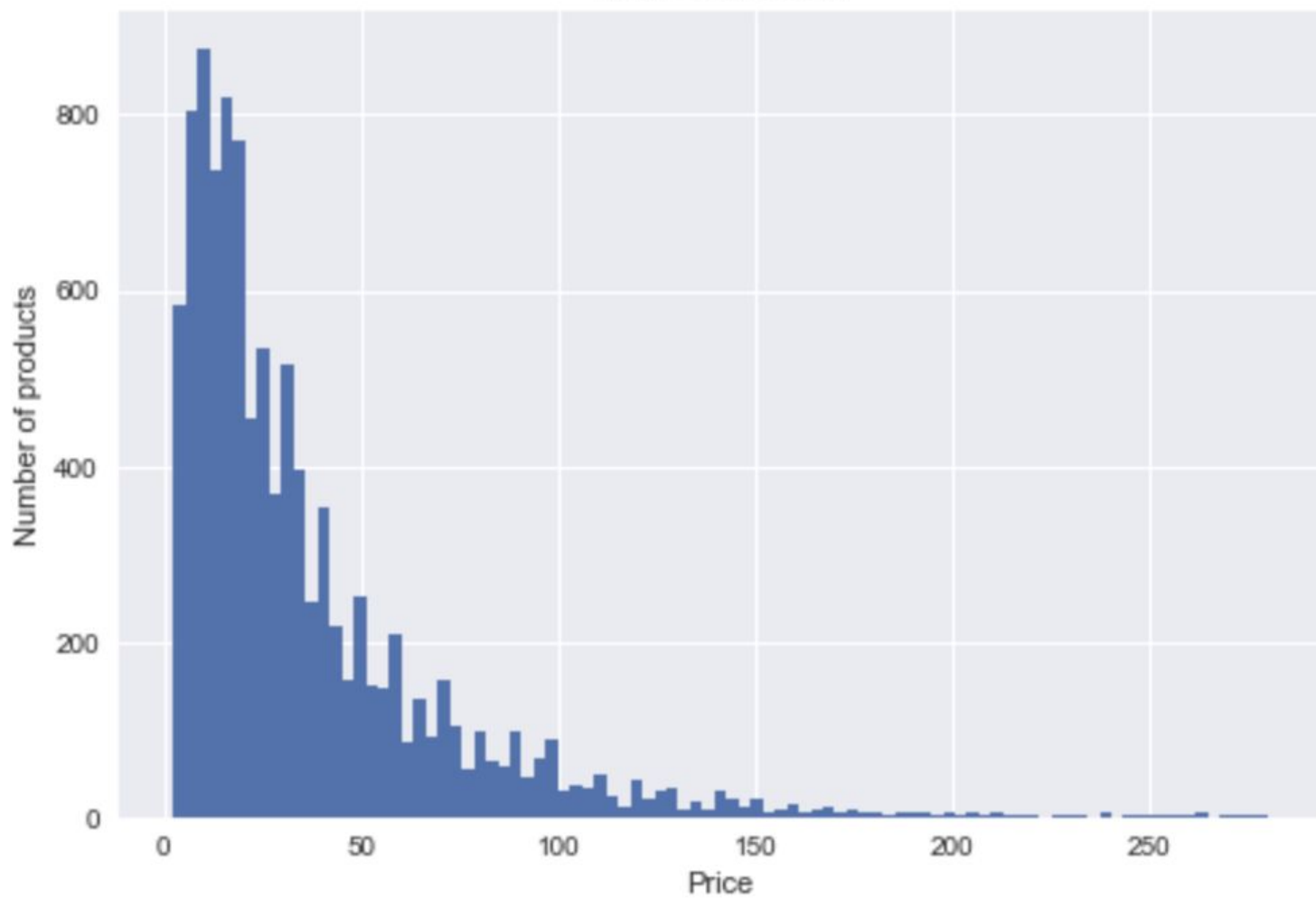
Local DB for ETL, Data for Model, Extract for AWS

Feedback

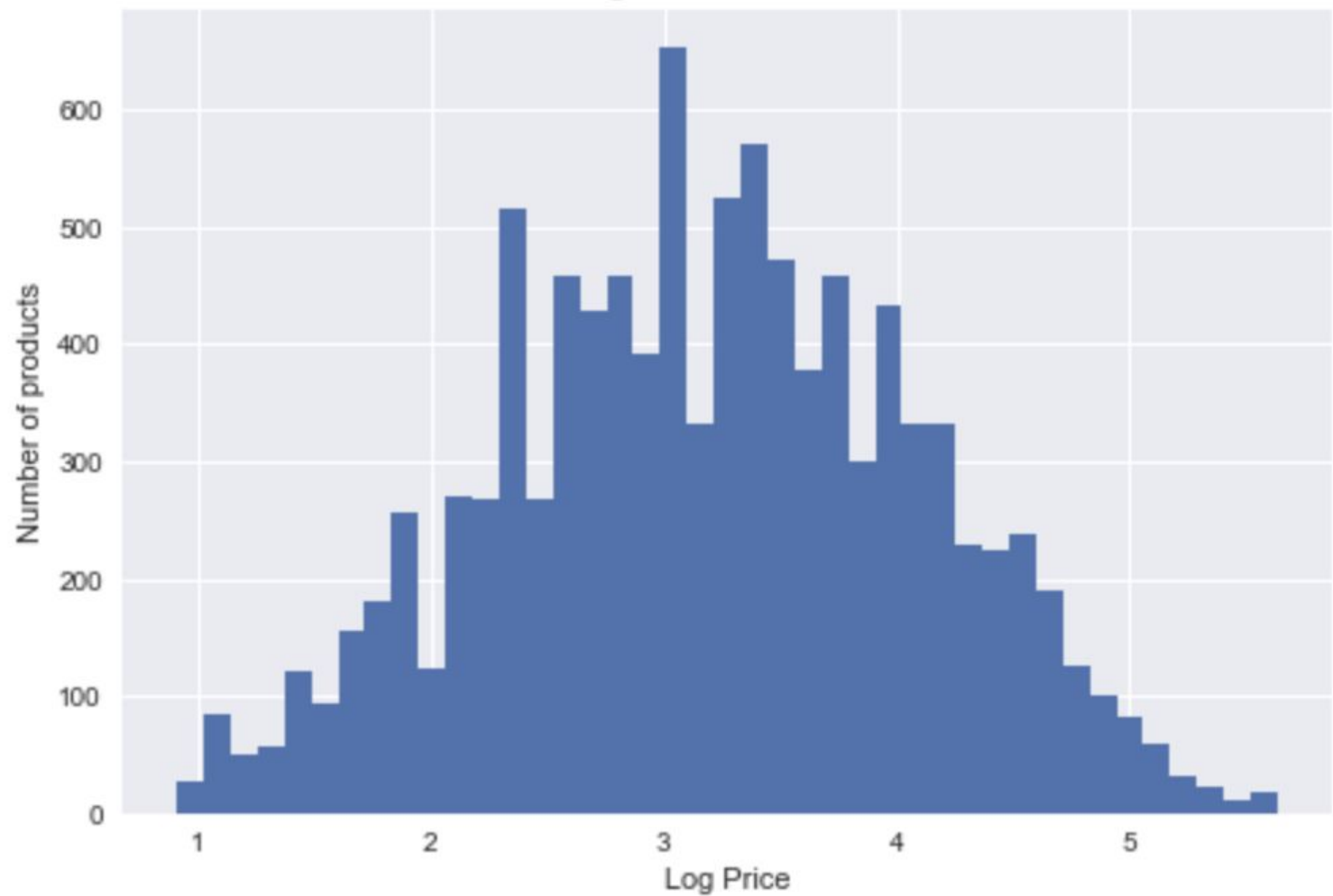


Output Data

Price Distribution



Log Price Distribution



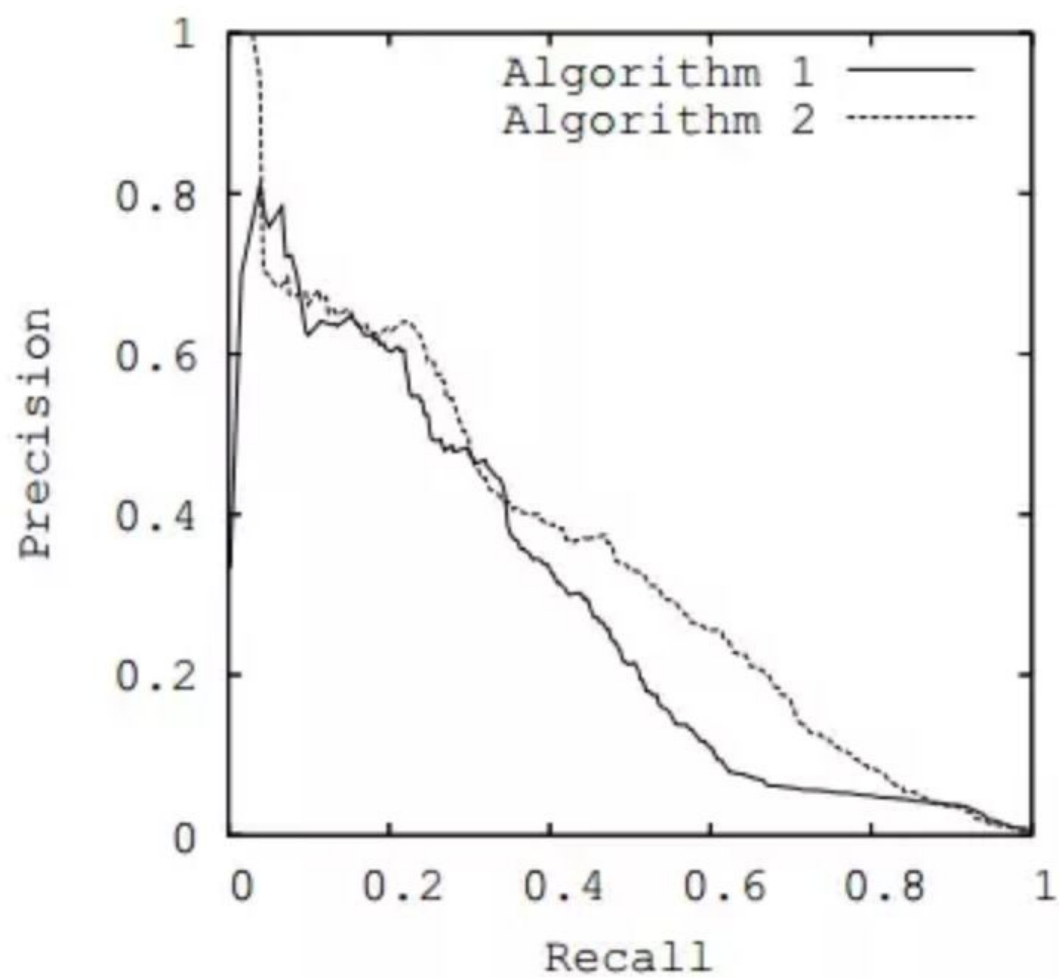
Feature Engineering

Category Tags	+
Subcategory (Level 4)	+
Sentiment/Polarity	-
Overall Rating	-
Price	+

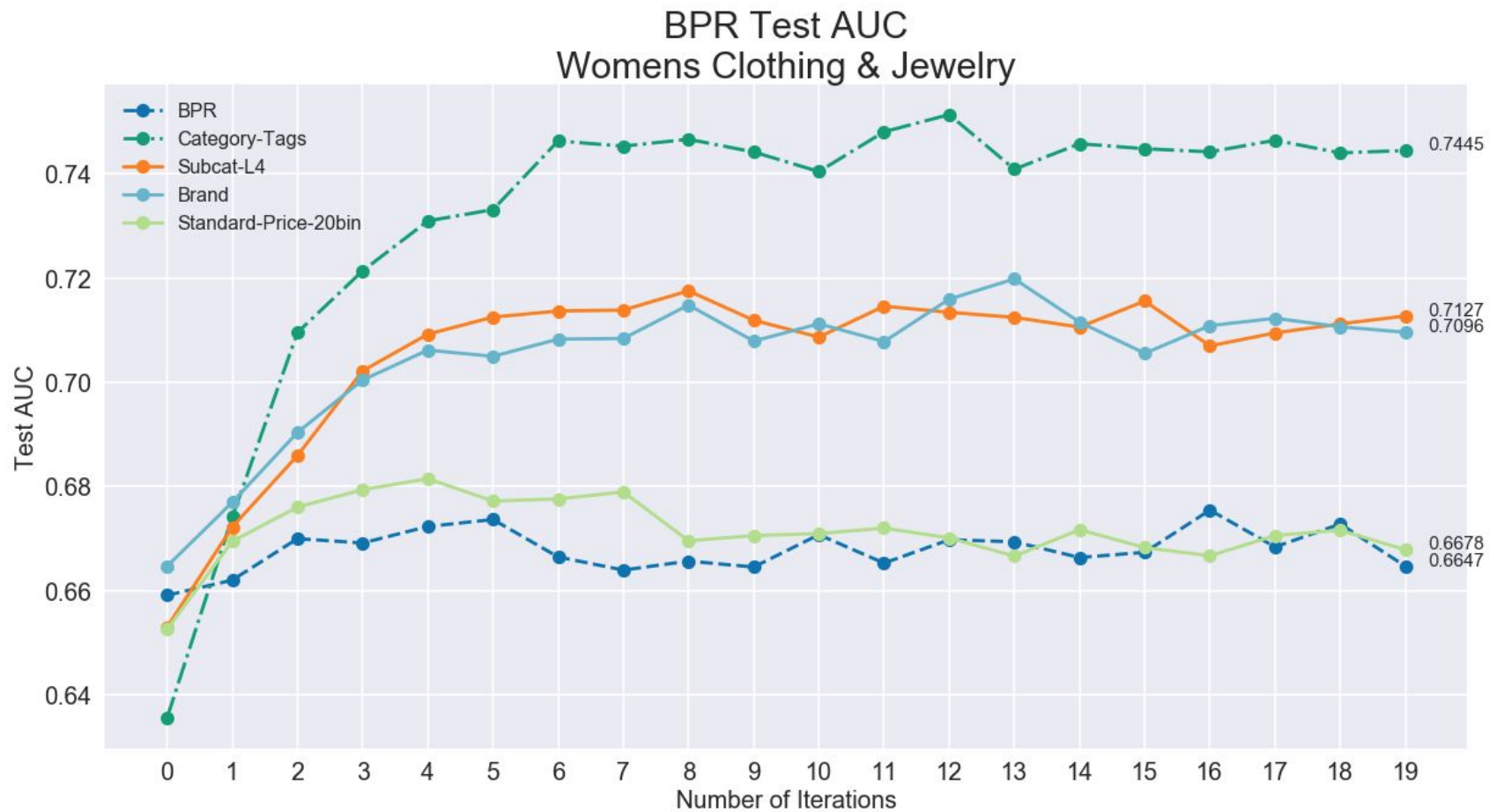
BPR Is Not An Algorithm



Optimizing BPR loss => Maximizing AUC

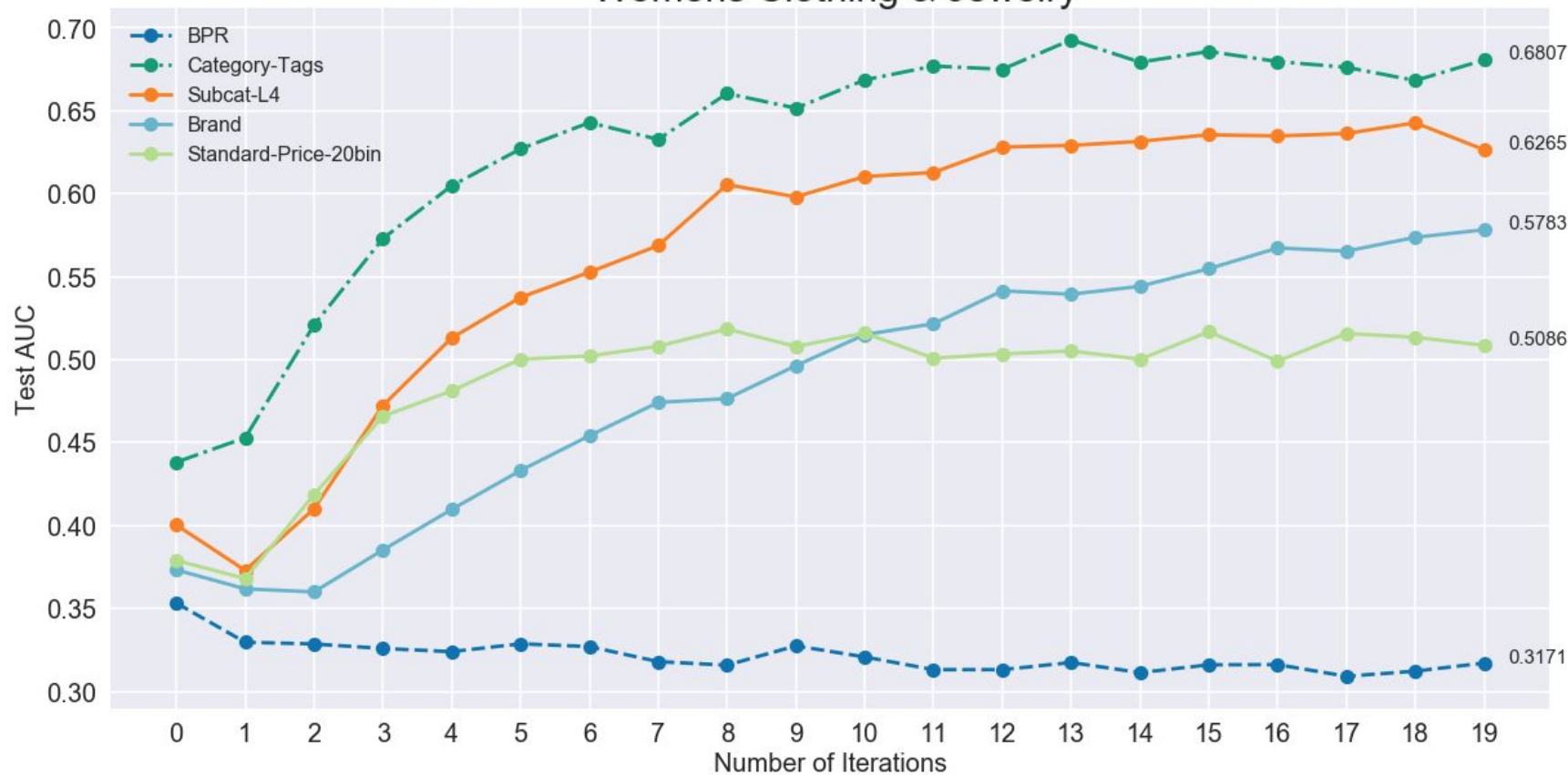


Single Feature



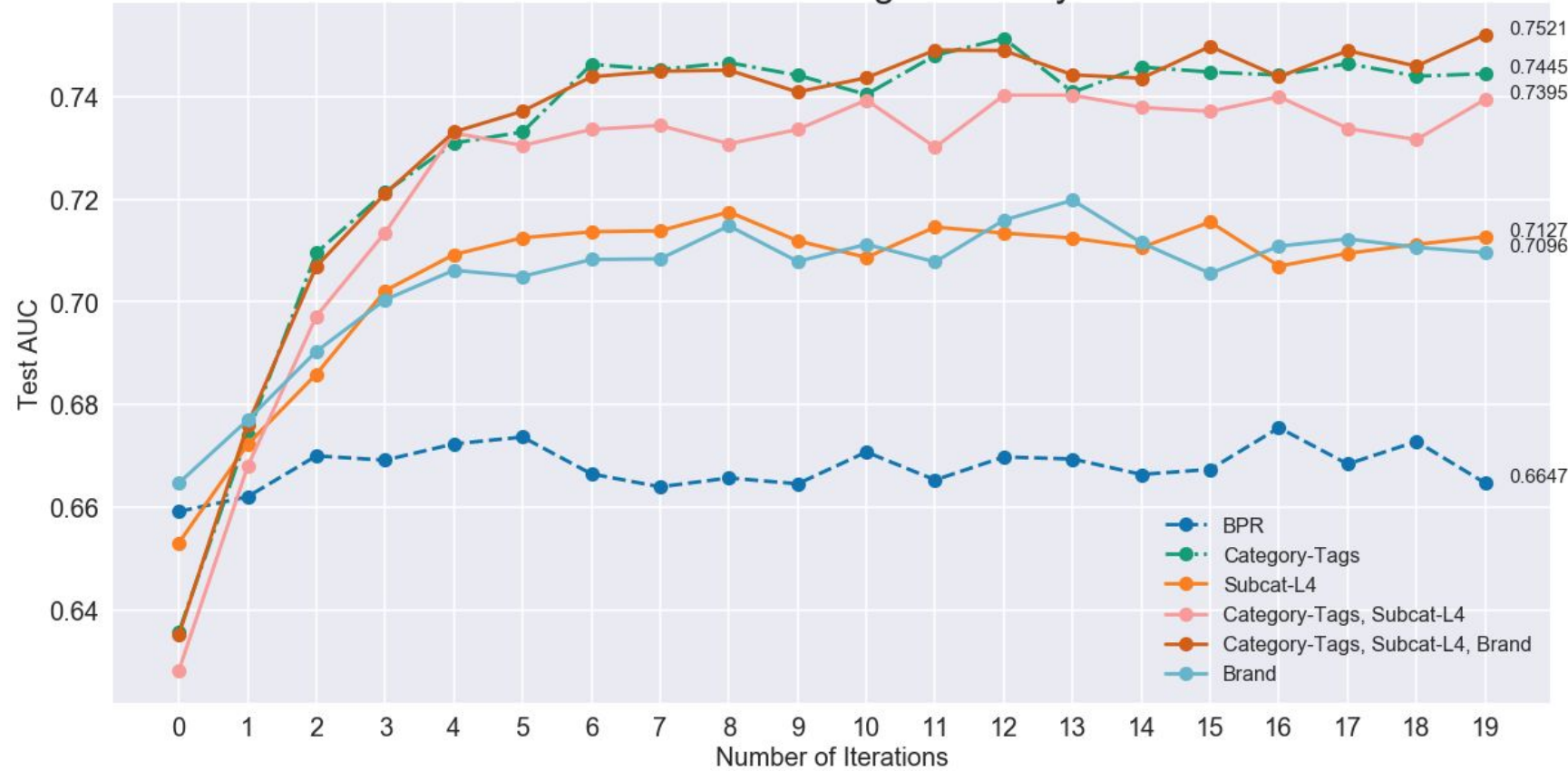
Single Feature Cold Start

BPR Low Purchase History
Womens Clothing & Jewelry



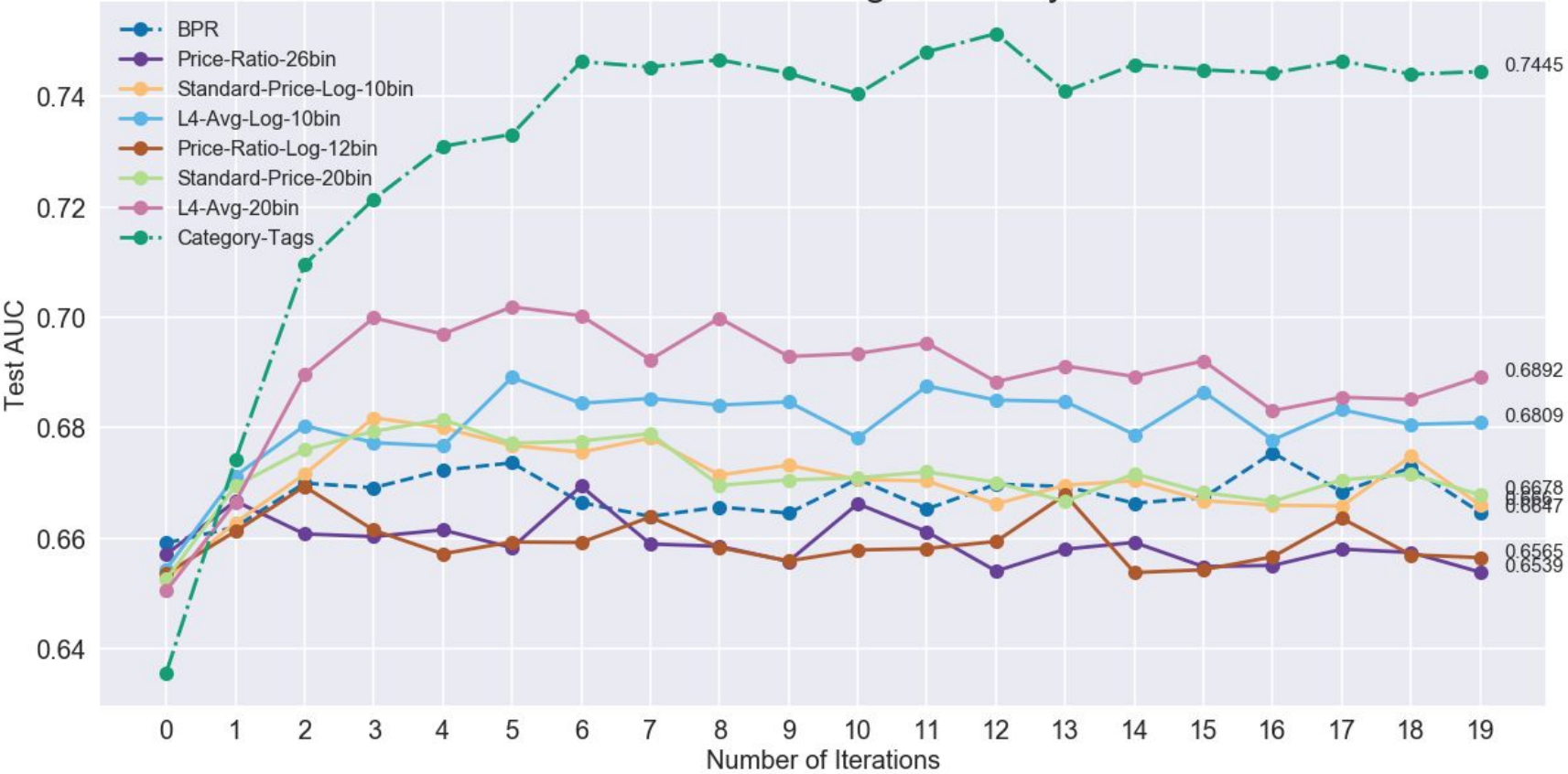
Combined Features

BPR Test AUC - Feature Combinations
Womens Clothing & Jewelry



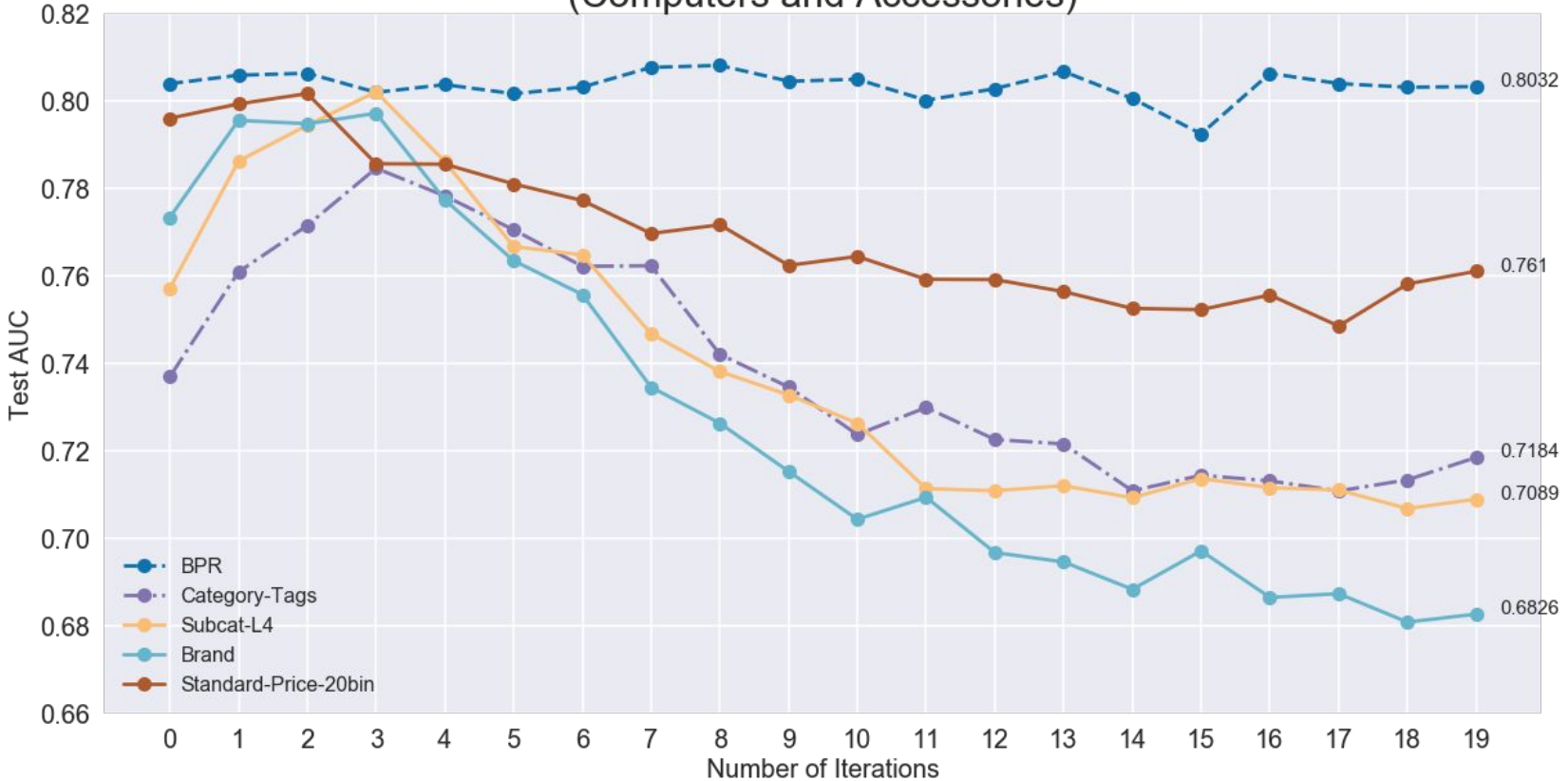
Price Features

BPR Test AUC - Price Features
Womens Clothing & Jewelry



Electronics Combined Features

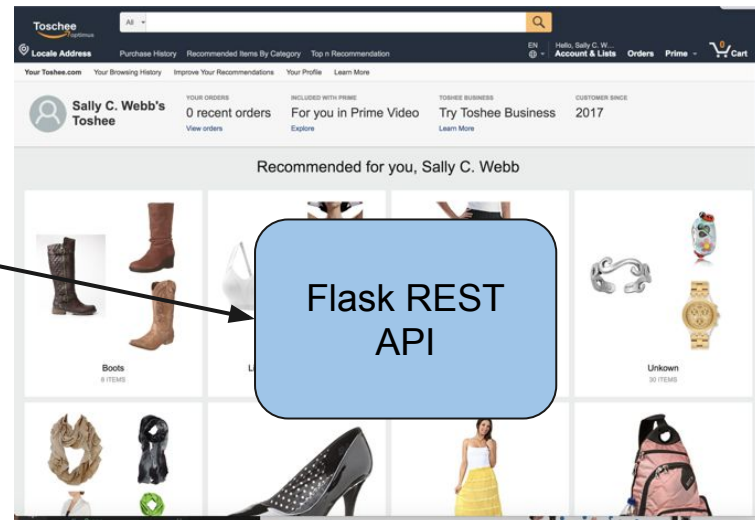
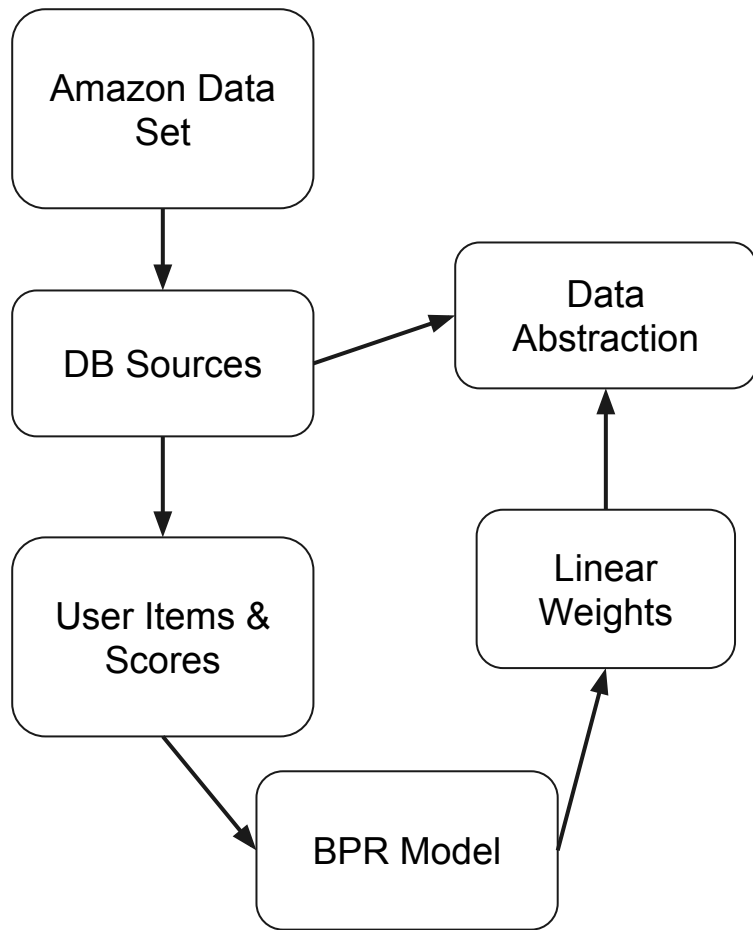
BPR Test AUC
Electronics
(Computers and Accessories)



Summary Women's Clothing

	Baseline	Best Outcome
High interactions (>5)	0.6647	0.7521
Cold Start	0.3171	0.6945

Scalability



Network Model Visualization

☒ Zoom



[Your Account](#) > [Recorded Purchase History](#)

Purchase History

[Search Orders](#)[Orders](#)[Open Orders](#)[Digital Orders](#)[Cancelled Orders](#)

Recorded Orders placed in

2017 ▾

2017 ▾

[Go](#)ORDER PLACED
Date Not Shown

TOTAL

SHIP TO
Name of User ▾ORDER # 114-0249279-1674674
[Order Details](#) | [Invoice](#)

Clarks Women's Charlie Zip Boot

Sold by: [Seller Name](#)

\$99.99

[Buy it again](#)ORDER PLACED
Date Not Shown

TOTAL

SHIP TO
Name of User ▾ORDER # 114-0249279-1674674
[Order Details](#) | [Invoice](#)

Foxcroft Women's Taylor Essential Shirt

Sold by: [Seller Name](#)

\$63.5

[Buy it again](#)

**Sally C. Webb's
Toschee**

YOUR ORDERS

0 recent orders[View orders](#)

INCLUDED WITH PRIME

For you in Prime Video[Explore](#)

TOSCHEE BUSINESS

Try Toschee Business[Learn More](#)

CUSTOMER SINCE

2017

Recommended for you, Sally C. Webb

**Boots**
8 ITEMS**Lingerie, Sleep & Lounge**
92 ITEMS**Pants & Capris**
16 ITEMS**Unknown**
30 ITEMS

Demo

<https://youtu.be/lwbfgTe6nOo>

THANK YOU