

The History of Amazon's Recommendation Algorithm

By: Team 1



Problem Statement

Recommendation systems are an important application of AI and machine learning in the e-commerce industry, and understanding how they work can provide insights into how AI is being used to improve customer experience and drive business success.





AMAZON.COM RECOMMENDATIONS: ITEM-TO-ITEM COLLABORATIVE FILTERING

Linden et al.

Traditional Recommendation Systems

Traditional CF

Uses Cosine Similarity to compare customers, recommends items that one customer bought to the customer that hasn't bought it

Cluster Models

Assigns customers to a cluster, then uses purchases and ratings from customers in the cluster to generate recommendations

Search-based

Uses the customer's purchases and ratings to search for items by the same author, manufacturer, artist, etc.



Item-to-Item Collaborative Filtering

Uses cosine similarity to compare items as opposed to customers



Advantages

VS. Traditional CF

- Computed offline rather than online
- More personalized recommendations
- Perform much better with limited data

VS. Cluster Models

- Higher quality recommendations
- Less computationally expensive

VS. Search-based

- Better scaling with limited data
- More personalized recommendations

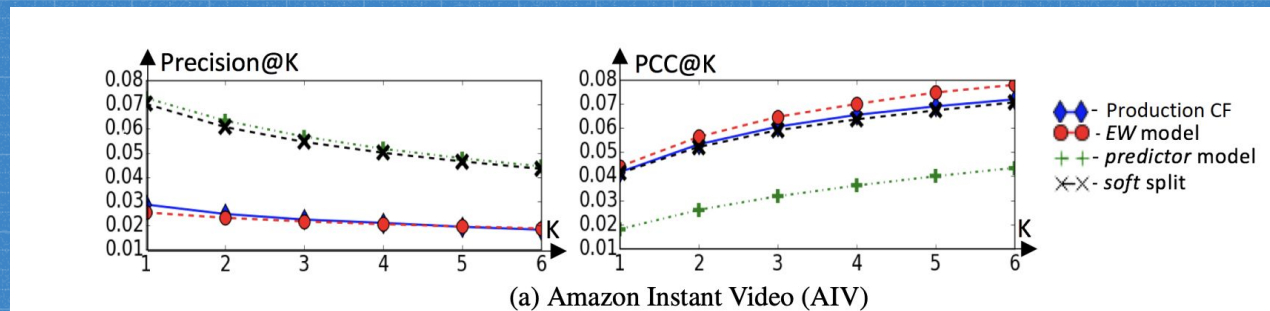


THE EFFECTIVENESS OF A TWO-LAYER NEURAL NETWORK FOR RECOMMENDATIONS

Rybakov et al.

Time Decay to improve timing of recommendations

- Autoencoder based model
- Regular autoencoder performed worse than the item-item cf model and a simple ranked list
- The base model was updated to be a combination of a predictor model (short term recommendations) and an autoencoder (long term recommendations)
- Time decay function added to capture recent activity
- The final 2-layer NN model outperformed item-item CF by a factor of 2



Coding Demo

Item-to-Item Collaborative Filtering Recommender

The screenshot displays four recommendation sections on an Amazon product page:

- Customers who bought this item also bought**: Shows four items including Amazon Essentials Men's 2-Pack Loose-Fit Short-Sleeve Crewneck T-Shirts, Gildan Men's Crew T-Shirt Multipack, Gildan Men's Heavy Blend Fleece Hooded Sweatshirt, and World's Best Cozy-Soft Microfleece Travel Blanket.
- What other items do customers buy after viewing this item?**: Shows five items including Amazon Essentials Men's 2-Pack Loose-Fit Short-Sleeve Crewneck T-Shirts, Gildan Men's Ultra Cotton Adult T-Shirt, Fruit of the Loom Men's Stay Tucked Crew T-Shirt, and Goodthreads Men's Short-Sleeve Crewneck Cotton T-Shirt.
- Your recently viewed items and featured recommendations**: Includes a sub-section "inspired by your browsing history" showing four items like Amazon Essentials Men's Crewneck Fleece Sweatshirt and Amazon Essentials Men's 58% Fit Long-Sleeve Pocket T-Shirt. Below it is a "Related to items you viewed" section showing items like Kindle Oasis E-reader and Amazon SW USB Official OEM Charger.

At the bottom, there is a "YOU VIEWED" section with icons for recently viewed items.

An example of Amazon recommender system.

Ethical Concerns

Bias/Discrimination

- Societal biases
- Advantage/disadvantage certain groups
- Could increase social inequalities



"Amazon Effect"

- Market power/dominance of certain brands
- Advantage to some brands over others
- May disadvantage smaller/lesser-known brands



Future Developments

- Improving customer experience
 - diverse data sets(include social background)
 - Integrate customer feedback/preferences into algorithm
- New Recommendation Techniques
 - graph neural networks
 - item-based recommendation algorithms that incorporate additional factors beyond purchase history

Concerns

- Reinforcing existing Bias and inequality
 - Relies too heavily on historical data
- Potential Limit customer selection
 - Algorithm becomes “too strong”
- Maintaining Data Transparency
 - Aids customer relationship