

You might like this, too!

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Tik Tok?

What are Recommendation Systems?

- Algorithms in place to filter content and show preferred and new material

Common Approaches

1. Content Based System
2. Collaborative Filtering System
3. Knowledge based system
4. Hybrid

How do we predict?

Machine Learning!

Content Based

- Make predictions based on past interactions
- Both explicit and implicit interactions are considered
- Unlike other approaches, this is purely based on user input

User's ratings

Movie 1	2
Movie 2	10
Movie 3	8

One Hot encoding Approach

	Comedy	Adventure	Super Hero	Sci-Fi
Movie 1	0	1	1	0
Movie 2	1	1	1	1
Movie 3	1	0	1	0

One Hot encoding

Assign 0s or 1s to the Movie if it is that genre/not



Multiply Columns by User A's Ratings

	Comedy	Adventure	Super Hero	Sci-Fi
Movie 1	0	2	2	0
Movie 2	10	10	10	10
Movie 3	8	0	8	0

Weighted Genre Matrix



Sum Columns to get User A's Preference Profile

Example – User A

	Comedy	Adventure	Super Hero	Sci-Fi
User	18	12	20	10

User Profile



Normalize by dividing each entry by the sum of the rows

	Comedy	Adventure	Super Hero	Sci-Fi
User	0.3	0.2	0.33	0.16

Normalized User Profile

User A Values Super-Hero and Comedy movies relatively highly



Now consider the following movies to recommend

	Comedy	Adventure	Super Hero	Sci-Fi
Movie 4	0.3	0.2	0	0.16
Movie 5	0	0	0.33	0
Movie 6	0.3	0	0.33	0

Normalized User Profile * Movies Matrix



Sum along the rows to get weighted recommended Matrix

Movie 4 should be recommended to User A



Movie 4	0.66
Movie 5	0.33
Movie 6	0.63

Recommendation Matrix

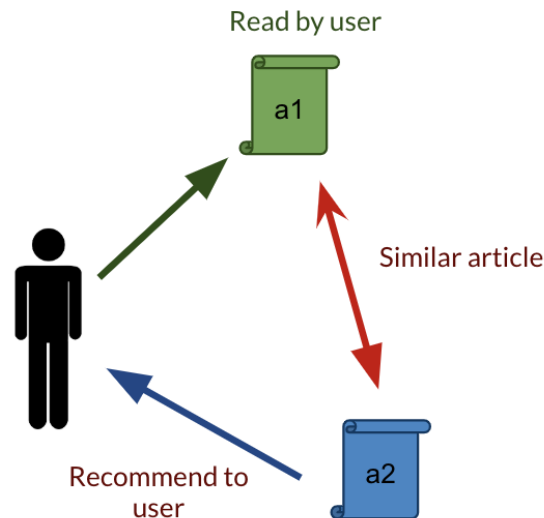
Content Based: Pros and Cons

Pros:

- Don't need info about other users
- Less expensive
- Easy to scale
- Personalized Experience

Cons:

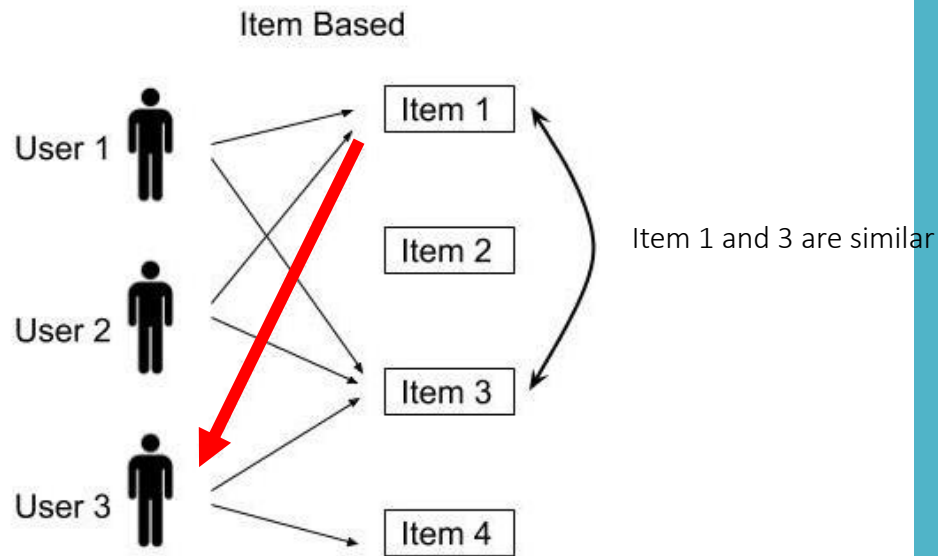
- Content you've never interacted with will hardly ever get recommended
- One-dimensional
- Cold Start



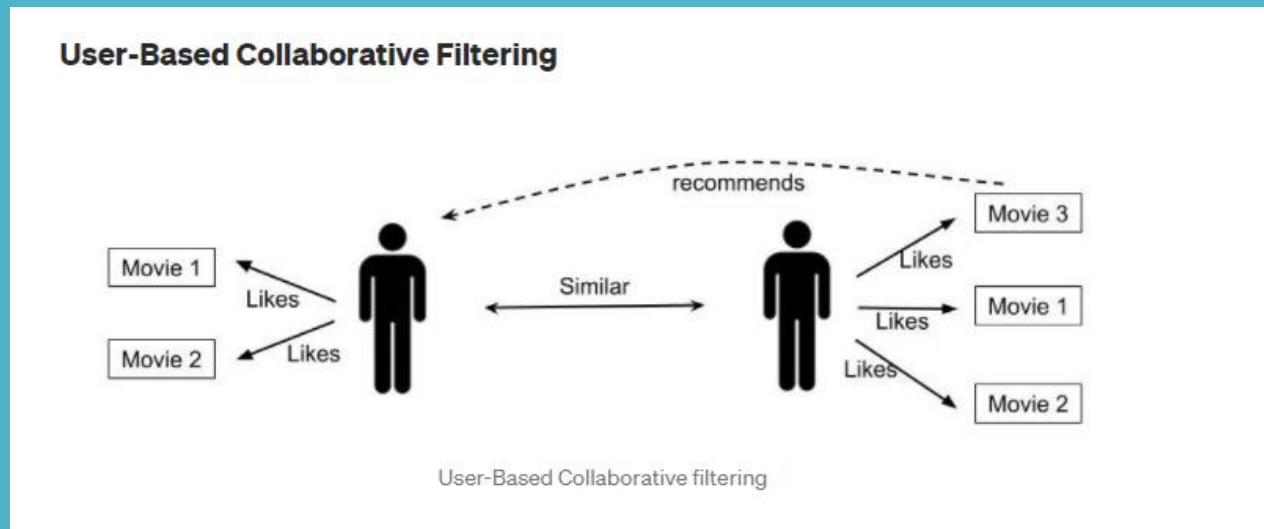
Content-based filtering

Collaborative Filtering

- Suggestions based on what similar users also prefer
- 2 ways to apply Collaborative Filtering
 1. User-Based
 - Scoring an item based on other users
 2. Item-Based
 - Scores items based on other items

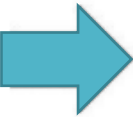


Recommend item 1
to User 3



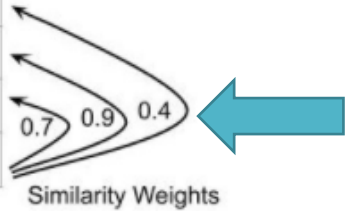
Example: Collaborative

Want to suggest either Movie 1 or 5 to User 4



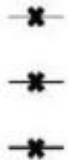
	Movie 1	Movie 2	Movie 3	Movie 4	Movie 5
User 1	9	6	8	4	
User 2	2	10	6		8
User 3	5	9		10	7
User 4	?	10	7	8	?

User's rating matrix



Weights [0,1] assigned based on similarity to other users

	Movie 1	Movie 5
User 1	9	
User 2	2	8
User 3	5	7



	Similarity Index
User 1	0.4
User 2	0.9
User 3	0.7

Weighted Rating matrix

	Movie 1	Movie 5
User 1	3.6	
User 2	1.8	7.2
User 3	3.5	4.9

Then sum these to get our total weight for each movie

Going to multiply our known scores by how similar Users 1,2,3 are to User 4



Recommendation Matrix by aggregating all of the weighted matrix

	Movie 1	Movie 5	Weighted Sum
Users 2, 3		12.1	0.9 + 0.7
Users 1, 2, 3	8.9		0.4 + 0.9 + 0.7

Recommendation Matrix

	Movie 1	Movie 5
Active User	4.4	7.5

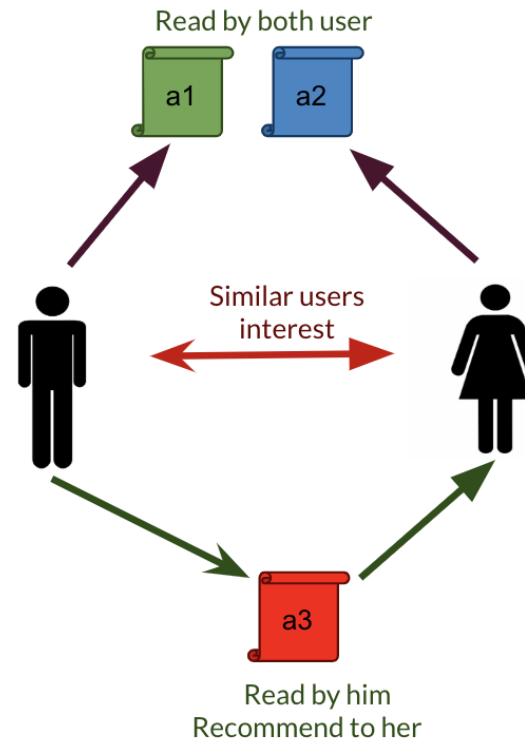
This gives us that Movie 5 should be recommended to User 4

Then normalize the weighted score for the movie by dividing by sum of the similarities

Collaborative Pros/Cons

Pros

- Fixes the restricted suggestions problem from Content Filtering
- Better understanding of item popularity
- Or other comparisons



Collaborative filtering

Cons

- Scalability
 - **Very** costly
 - Cold Start
 - Data Sparsity
- Can't interact with *everything*

Knowledge Based Systems

- Makes predictions based on info provided by a user
- *Looking for a house or car online (ex)*
- Used when Content / Collaborative filtering can't be applied

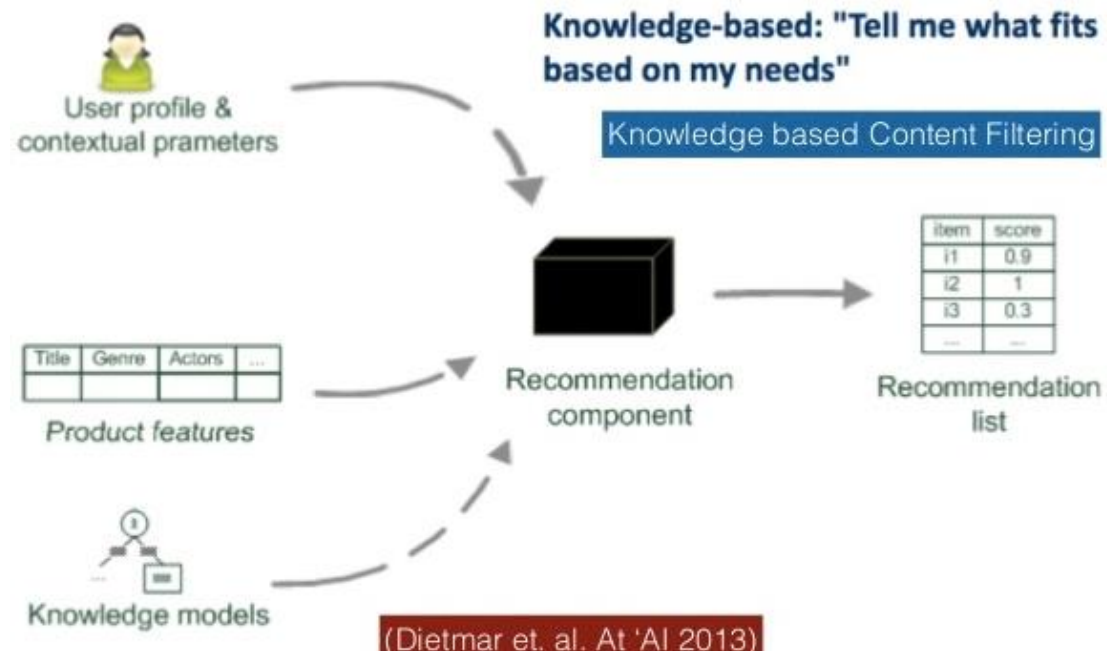
Knowledge Based Pros/Cons

Pros

- No cold start problem

Cons

- Still need direct data acquisition



A note on a
common
issue:
Missing Data

Matrix factorization

Cosine Similarity

Probabilistic Modeling

How does Netflix show you content?

Important Figures:

>200 million users

>5400 movies and TV shows combined

Finding Shows

Combination of the methods described above

- Ratings, genres and other attributes of shows (content)
- Similar viewers' preferences (Collab)

Also:

- Time you spend watching
- Device
- Time of day

Displaying Shows

Row rankings of suggestions

New content

Other platforms / connections

Tik Tok

Amazon

Instagram

Spotify

Analytic Hierarchy Process (AHP)

Any others come to mind?

Discussion

Do you think the effectivity of these algorithms need to be improved ?

Perhaps they're good enough already? (Maybe too good sometimes?)

To what extent are our decisions and interests really ours?

Do we have less control of the media we consume daily because of good algorithms?

Free will?

Privacy issues? Do big tech companies have too much data about us?

Or gather it too discretely?

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