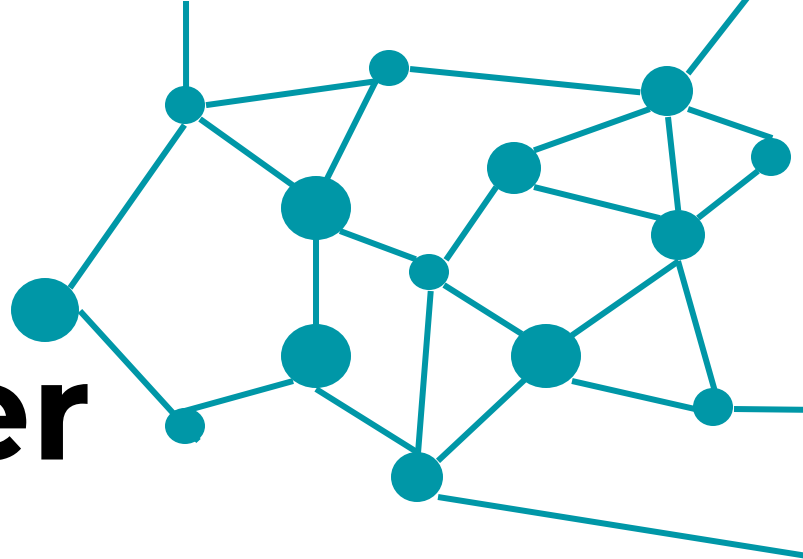


Intelligent User Interfaces

Recommender Systems

Jesse Grootjen, Thomas Weber, Xuedong Zhang



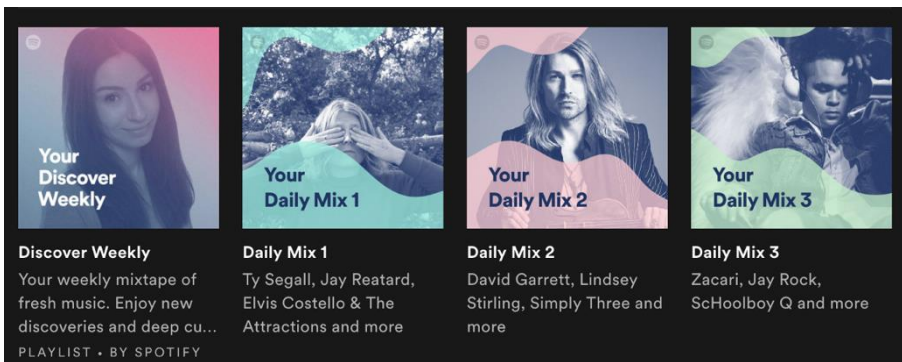


Recommender Systems



**Name a recommender system
you've interacted with last week**

Recommenders in the Wild



Spotify's recommendation interface for music. It features four main sections: 'Your Discover Weekly' (a weekly mixtape of fresh music), 'Your Daily Mix 1', 'Your Daily Mix 2', and 'Your Daily Mix 3'. Each section includes a cover image and a list of artists and songs. The 'Discover Weekly' section also includes a description: 'Your weekly mixtape of fresh music. Enjoy new discoveries and deep cuts... PLAYLIST • BY SPOTIFY'.

Your Discover Weekly
Your weekly mixtape of fresh music. Enjoy new discoveries and deep cuts...
PLAYLIST • BY SPOTIFY

Your Daily Mix 1
Ty Segall, Jay Reatard, Elvis Costello & The Attractions and more

Your Daily Mix 2
David Garrett, Lindsey Stirling, Simply Three and more

Your Daily Mix 3
Zacari, Jay Rock, ScHoolboy Q and more

Customers Who Bought This Item Also Bought



Amazon's recommendation interface for books. It shows a list of books recommended to customers who bought a specific item. The books are displayed with their covers, titles, authors, and prices. The recommended books include 'The Little Schemer', 'Instructor's Manual t/a Structure and Interpretation of Computer Programs...', 'The Pragmatic Programmer', 'Introduction to Algorithms, 3rd Edition (MIT Press)', 'An Introduction to Functional Programming Through Lambda Calculus', and 'Purely Functional Data Structures'.

The Little Schemer
4th Edition
Daniel P. Friedman
★★★★☆ 64
Paperback
\$36.00 ✓Prime

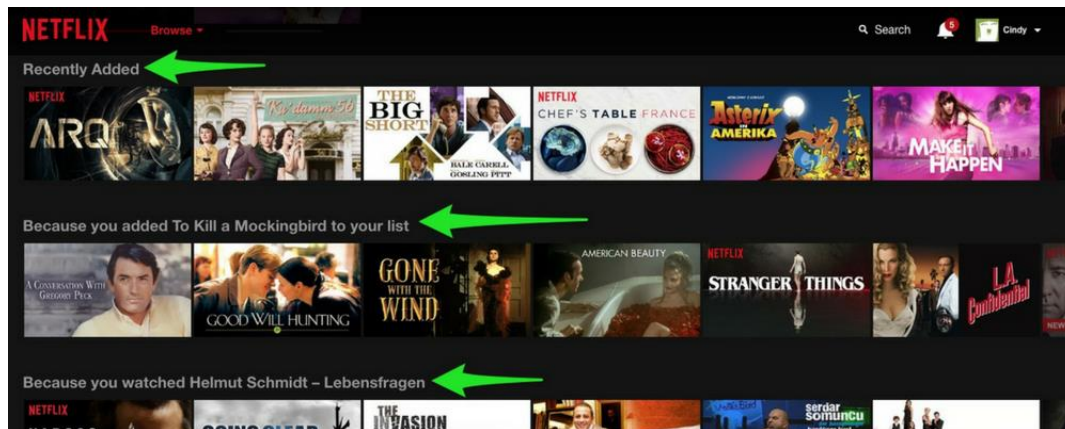
Instructor's Manual t/a Structure and Interpretation of Computer Programs...
Gerald Jay Sussman
★★★★☆ 5
Paperback
\$28.70 ✓Prime

The Pragmatic Programmer: From Journeyman to Master
Andrew Hunt
★★★★☆ 328
Paperback
\$32.59 ✓Prime

Introduction to Algorithms, 3rd Edition (MIT Press)
Thomas H. Cormen
★★★★☆ 313
#1 Best Seller in Computer Algorithms
Hardcover
\$66.32 ✓Prime


An Introduction to Functional Programming Through Lambda Calculus
Greg Michaelson
★★★★☆ 23
Paperback
\$20.70 ✓Prime

Purely Functional Data Structures
Chris Okasaki
★★★★☆ 19
Paperback
\$40.74 ✓Prime



Netflix's recommendation interface. It shows a grid of movie and TV show thumbnails. The interface includes a 'Recently Added' section, a 'Because you added To Kill a Mockingbird to your list' section, and a 'Because you watched Helmut Schmidt – Lebensfragen' section. Green arrows point to these sections. The thumbnails include titles like 'ARQ', 'The Big Short', 'Chef's Table: France', 'Asterix & Obelix: The Big Game', 'Make It Happen', 'A Conversation With Gregory Peck', 'Good Will Hunting', 'Gone With the Wind', 'American Beauty', 'Stranger Things', 'L.A. Confidential', 'The Invasion', and 'Sonderbundstag'.

NETFLIX — Browse —

Search  Cindy

Recently Added

Because you added To Kill a Mockingbird to your list

Because you watched Helmut Schmidt – Lebensfragen

How to make recommendations?

- Content-based
- Based on user preferences (collaborative filtering)
- Session-based
- Reinforcement learning

Collaborative Filtering

User Based

- Similarity between users
 - Based on how they've rated items
- Suggest items liked by similar users

Item Based

- Similarity between items
 - Similarity based on user ratings
- Suggest items similar to an item the user likes

Collaborative Filtering

Pros

- Does not need to know anything about the movie content (genre, etc.)
- Community contributes to recommendations

Cons

- Cold start for new users
- Cold start for new items

How to make a recommendation?

	Item A	Item B	Item C	Item D	Item E
User 1	1	3	3	5	5
User 2	5	5	3	4	3
User 3	3	3	4	4	?

How to make a recommendation?

	Item A	Item B	Item C	Item D	Item E
User 1	1	3	3	5	5
User 2	5	5	3	4	3
User 3	3	3	4	4	?

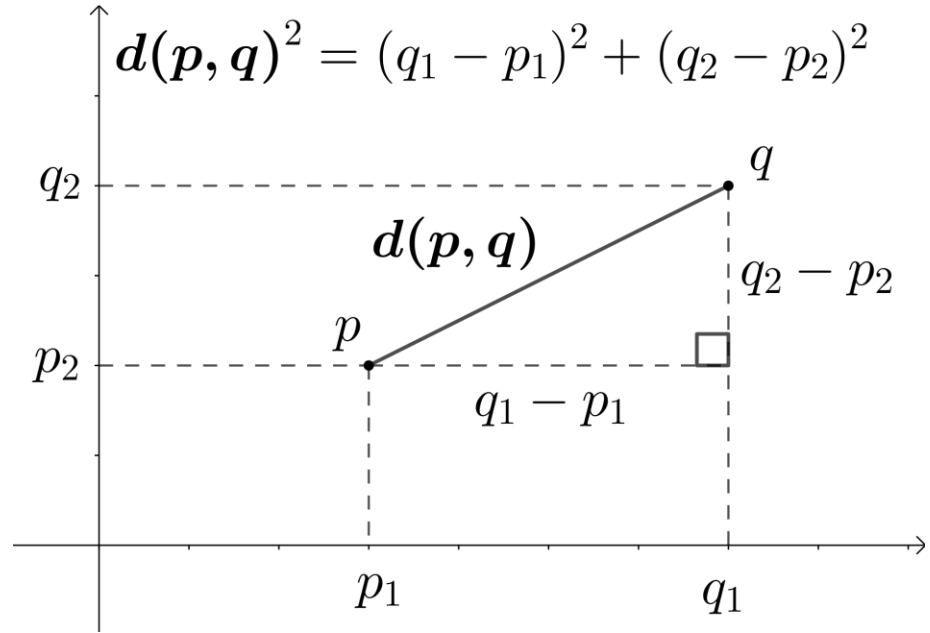
How to make a recommendation?

	Item A	Item B	Item C	Item D	Item E
User 1	1	3	3	5	5
User 2	5	5	3	4	3
User 3	3	3	4	4	?

How to calculate similarity?

Euclidean Distance

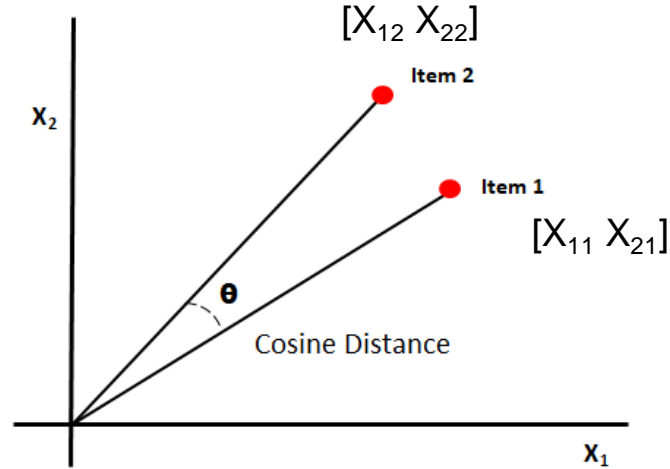
$$d(p, q) = |p - q|.$$



How to calculate similarity?

Cosine Similarity

$$\text{similarity}(A,B) = \frac{A \cdot B}{\|A\| \times \|B\|} = \frac{\sum_{i=1}^n A_i \times B_i}{\sqrt{\sum_{i=1}^n A_i^2} \times \sqrt{\sum_{i=1}^n B_i^2}}$$





Questions?



Live Coding