

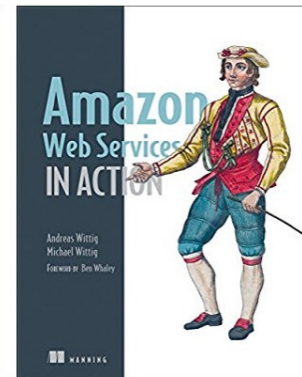
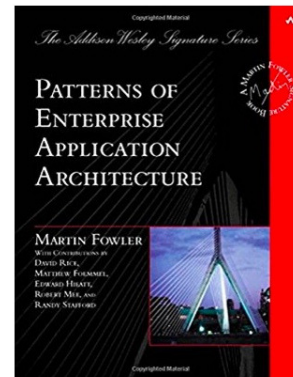
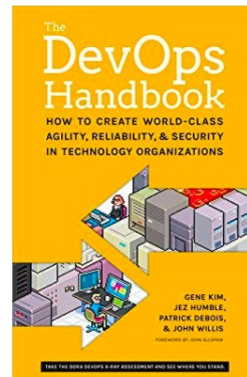
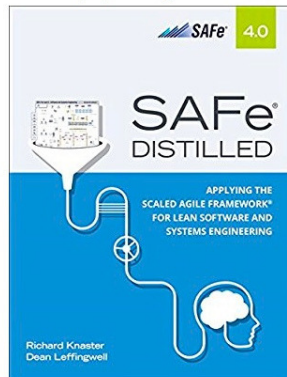


RECOMMENDER SYSTEMS VIA FACTORIZATION MACHINES

ALEXANDER HUGHES

WHAT IS A RECOMMENDER SYSTEM?

Inspired by your shopping trends



Because you watched It's Always Sunny in Philadelphia



WHY USE ONE?

- Enrich user experience
- Personalize content
- Increase click-through rate
- Lead to higher sales

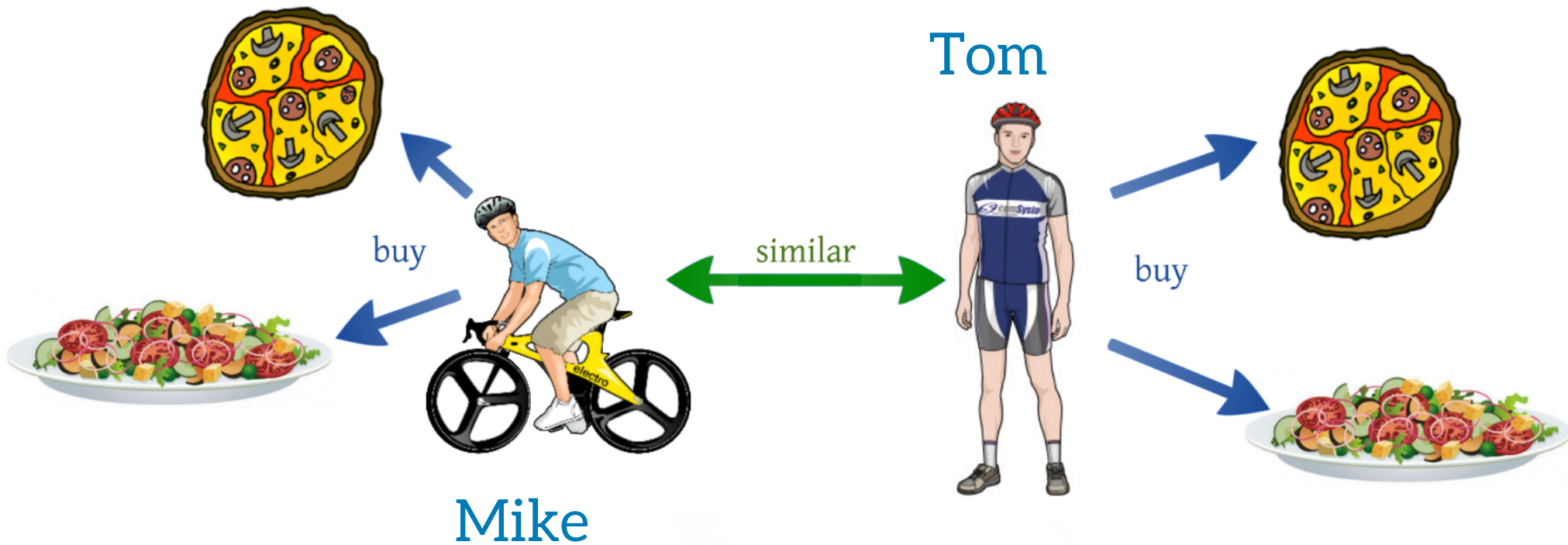
DATASET

MovieLens 20M Dataset
(movielens.org) containing:

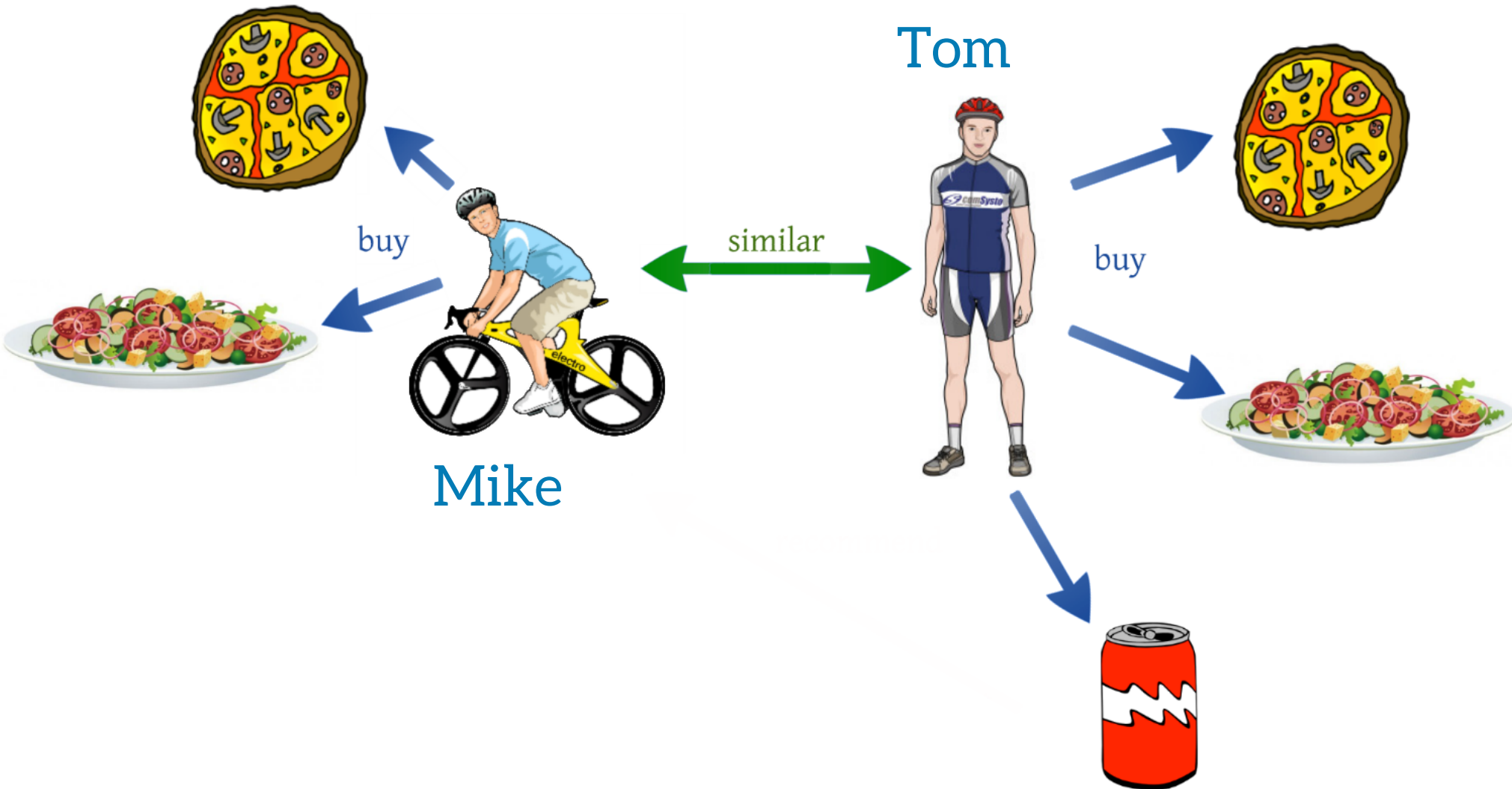
- 20 million ratings
- 27,000 movies
- 138,000 unique users



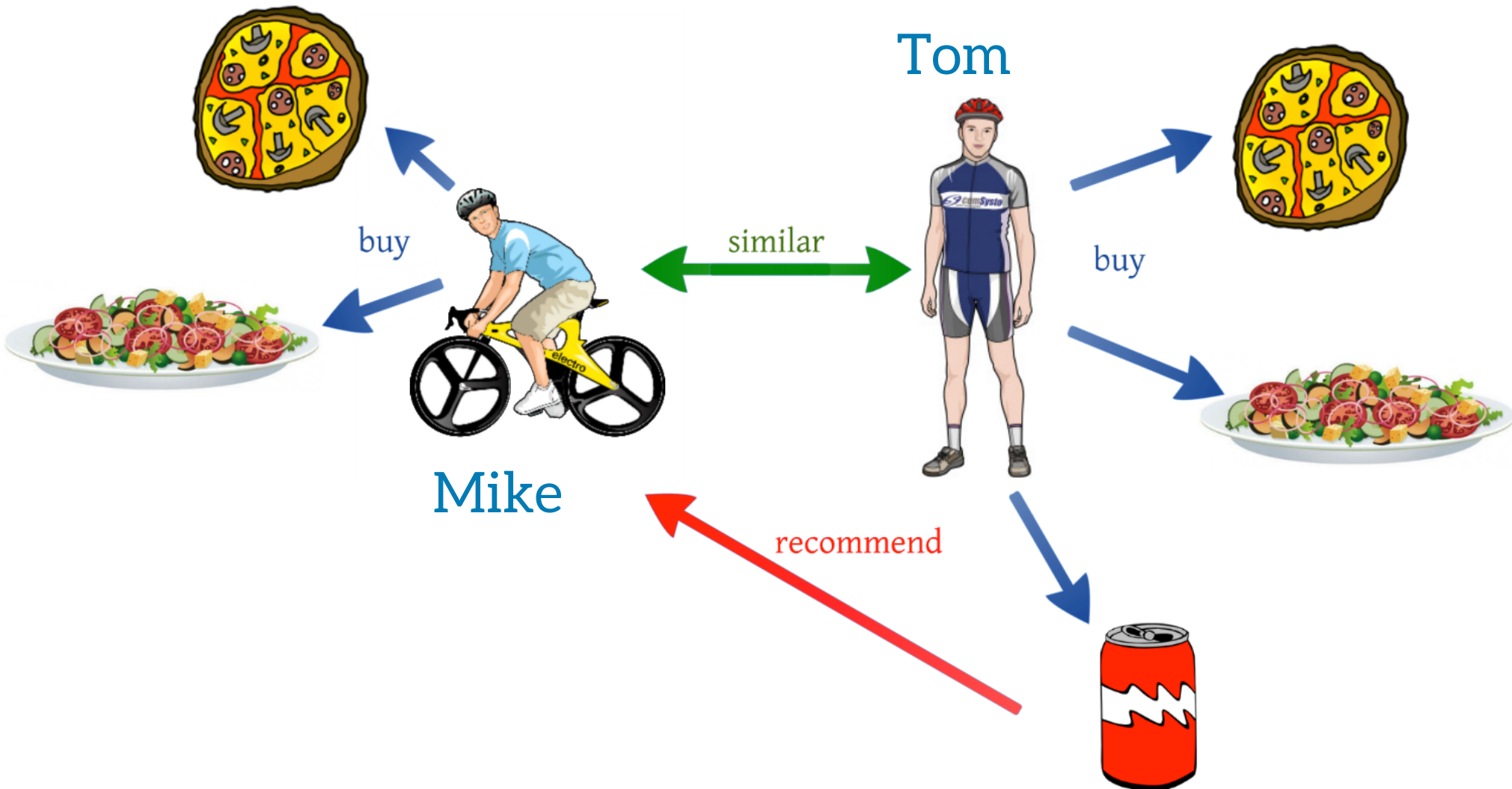
COLLABORATIVE FILTERING



COLLABORATIVE FILTERING



COLLABORATIVE FILTERING



COLLABORATIVE FILTERING

	Titanic	Toy Story	Kill Bill	Silence of the Lambs
Mike	5	4.5	?	1
Sam	?	?	4	5
Joe	?	?	3	5
Lauren	5	4	2	?

Mike and Lauren both highly enjoyed Titanic and Toy Story. Mike didn't like Silence of the Lambs. Lauren did not like Kill Bill.

COLLABORATIVE FILTERING

	Titanic	Toy Story	Kill Bill	Silence of the Lambs
Mike	5	4.5	2.1	1
Sam	?	?	4	5
Joe	?	?	3	5
Lauren	5	4	2	1.5

The goal is to predict a rating for movies that a user has not seen.



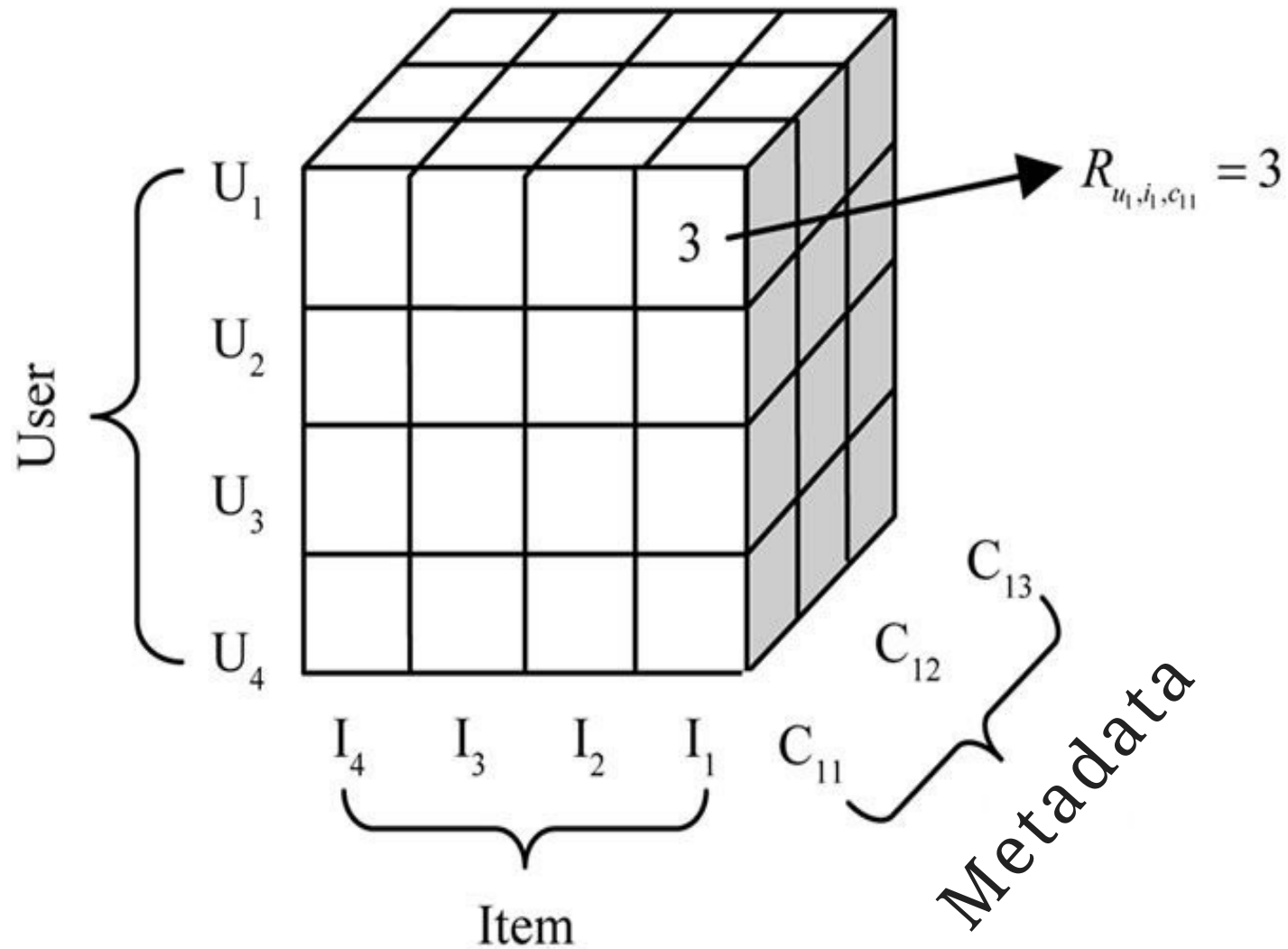
Traditional Systems using SVD (context-blind)

- 2-D Matrix with only users' movie ratings

Context-Aware Systems using Factorization Machines

- 3-D Tensor incorporating user/movie metadata as well
- 

FACTORIZATION MACHINE



DATASET

MovieLens 20M Dataset
(movielens.org) containing:

- 20 million ratings
- 27,000 movies
- 138,000 unique users

+

metadata:

- genre & tags
- user demographic
- time of rating





BASIC COLLABORATIVE-FILTERING SYSTEM

Used SVD matrix decomposition



CONTEXT BASED SYSTEM

Included metadata and used Factorization Machines



EVALUATION

Mean square error of 0.33 for context-aware system

RESULTS

Top Rated Movies:

- 1) The Fly - horror, sci-fi, thriller
- 2) Payback - action, thriller
- 3) Brazil - fantasy, sci-fi
- 4) The Matrix - action, sci-fi, thriller
- 5) E.T. the Extra-Terrestrial - children, sci-fi

RESULTS

Top Rated Movies:

- 1) The Fly - horror, sci-fi, thriller
- 2) Payback - action, thriller
- 3) Brazil - fantasy, sci-fi
- 4) The Matrix - action, sci-fi, thriller
- 5) E.T. the Extra-Terrestrial - children, sci-fi

Top Predicted Movies (SVD):

- 1) What Women Want - comedy, romance
- 2) Miss Congeniality - drama, comedy
- 3) 10 Things I Hate About You - comedy
- 4) The Craft - drama, horror, thriller
- 5) Little Women - drama

RESULTS

Top Rated Movies:

- 1) The Fly - horror, sci-fi, thriller
- 2) Payback - action, thriller
- 3) Brazil - fantasy, sci-fi
- 4) The Matrix - action, sci-fi, thriller
- 5) E.T. the Extra-Terrestrial - children, sci-fi

Top Predicted Movies (SVD):

- 1) What Women Want - comedy, romance
- 2) Miss Congeniality - drama, comedy
- 3) 10 Things I Hate About You - comedy
- 4) The Craft - drama, horror, thriller
- 5) Little Women - drama

Top Predicted Movies (FM):

- 1) Dracula
- 2) The Texas Chainsaw Massacre
- 3) Alien
- 4) Eraser
- 5) Black Mask (Hak Hap)

THANKS!



[linkedin.com/in/hughesac](https://www.linkedin.com/in/hughesac)



[@alexandercameronh](https://github.com/alexandercameronh)



[alexandercameronh](https://www.google.com/search?q=alexandercameronh)

Alexander Hughes
B.S. Applied Mathematics
San Francisco State University

