

1-1: Introduction to Recommender Systems

Today's Learning Objectives

- Understand what a recommender system is
- Some history and background
- NOT: course details (next lecture)

A Bit of History

- Ants, Cavemen, and Early Recommender Systems
 - The emergence of critics
- Information Retrieval and Filtering
- Manual Collaborative Filtering
- Automated Collaborative Filtering
- The Commercial Era

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Information Retrieval

- Static content base
 - Invest time in indexing content
- Dynamic information need
 - Queries presented in “real time”
- Common approach: TFIDF
 - Rank documents by term overlap
 - Rank terms by frequency

Information Filtering

- Reverse assumptions from IR
 - Static information need
 - Dynamic content base
- Invest effort in modeling user need
 - Hand-created “profile”
 - Machine learned profile
 - Feedback/updates
- Pass new content through filters

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Collaborative Filtering

- Premise
 - Information needs more complex than keywords or topics: quality and taste
- Small Community: Manual
 - Tapestry – database of content & comments
 - Active CF – easy mechanisms for forwarding content to relevant readers

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Automated CF

- The GroupLens Project (CSCW '94)
 - ACF for Usenet News
 - users rate items
 - users are correlated with other users
 - personal predictions for unrated items
 - Nearest-Neighbor Approach
 - find people with history of agreement
 - assume stable tastes

Does it Work?

- Yes: The numbers don't lie!
 - Usenet trial: rating/prediction correlation
 - rec.humor: 0.62 (personalized) vs. 0.49 (avg.)
 - comp.os.linux.system: 0.55 (pers.) vs. 0.41 (avg.)
 - rec.food.recipes: 0.33 (pers.) vs. 0.05 (avg.)
 - Significantly more accurate than predicting average or modal rating.
 - Higher accuracy when partitioned by newsgroup

It Works Meaningfully Well!

- Relationship with User Behavior
 - Twice as likely to read 4/5 than 1/2/3
- Users *Like* GroupLens
 - Some users stayed 12 months after the trial!

A Bit of History

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Am

Amazon.com: Recommended for You - Mozilla Firefox

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https://www.amazon.com/gp/yourstore/home/102-9592175-0760921?ie=UTF8&p...

Google Search Check AutoLink Subscribe AutoFill Options

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Your Browsing History Recommended For You Rate These Items Improve Your Recommendations Your Profile Learn More

Search Amazon.com GO Find Gifts Web Search GO


Joseph, Welcome to Your Amazon.com™ (If you're not Joseph A. Konstan, [click here.](#))

Today's Recommendations For You

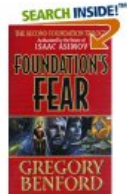
Here's a daily sample of items recommended for you. Click here to [see all recommendations.](#)



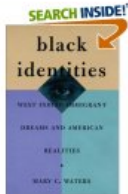
[Netgear FS105NA ProSafe 5 Port 10 / 100Mbps Des...](#)



[Choosing a Jewish Life](#) (Paperback)



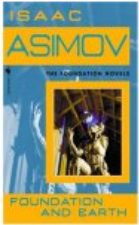
[Foundation's Fear](#) (Mass Market Paperback)



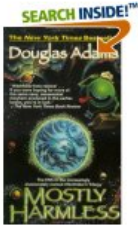
[Black Identities](#) (Paperback)

African-American Studies **All Categories** Broadway & Vocalists Business Classic Vocalists Classics Contemporary Cultural Dilbert Drama Fantasy Jazz Look Inside Art Books Look Inside Entertainment Books Look Inside History Books Look Inside Nonfiction Books Look Inside Science Fiction & Fantasy Books Management Pop Science Fiction Shakespeare, William Study Traditional Pop Traditional Vocal Pop United States Urban

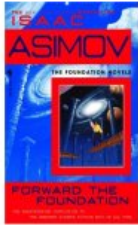
Complete Your Series



[Foundation and Earth](#) Mass Market Paperback by Isaac Asimov



[Mostly Harmless](#) Mass Market Paperback by Douglas Adams



[Forward the Foundation](#) (Foundation Novels) Mass Market Paperback by Isaac Asimov

Your Recent Shopping

[Recently Viewed Items](#) (0)
[Your Shopping Cart](#) (0)
[Open & Recently Shipped Orders](#)

Your Lists

[Your Wish List](#)
[Your Gift List](#)
[Your Shopping List](#)

Your Community

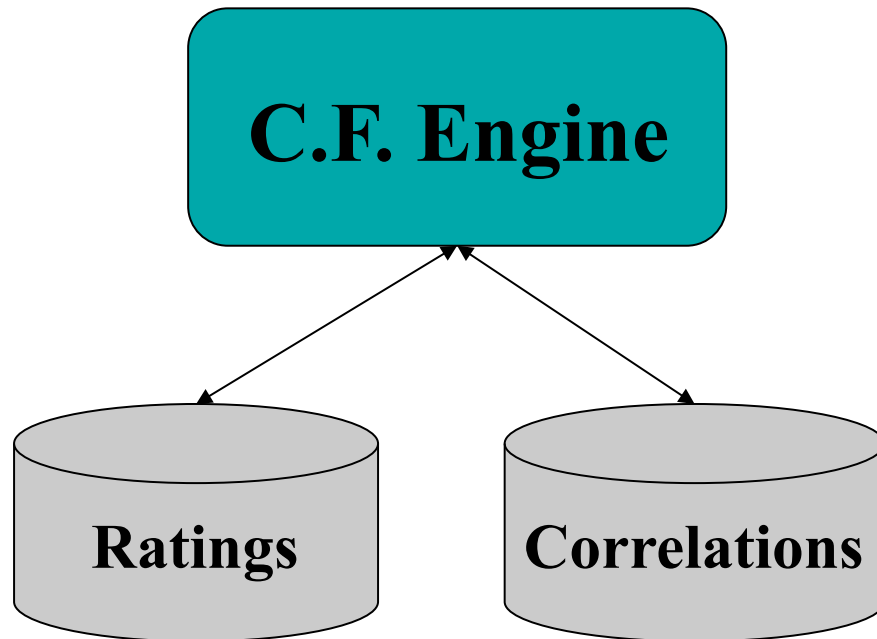
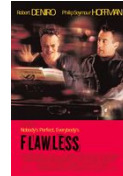
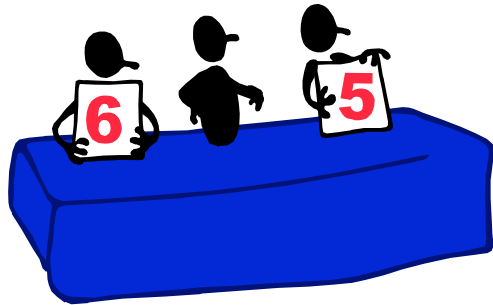
[Your Amazon Friends](#)
[Your Interesting People](#)
[Your Reminders](#)

Done www.amazon.com

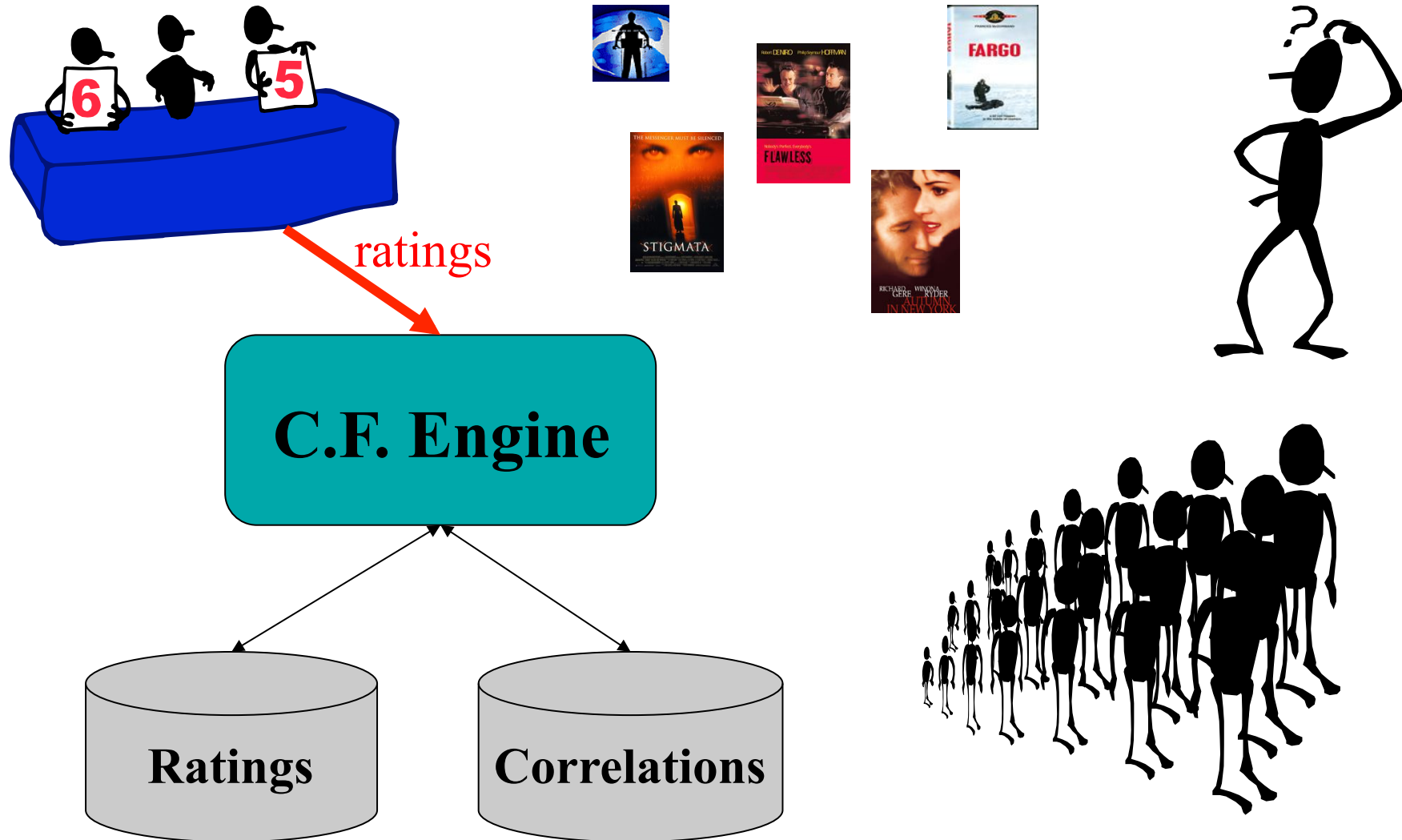
A TOUR OF MOVIELENS

(CLASSIC COLLABORATIVE FILTERING)

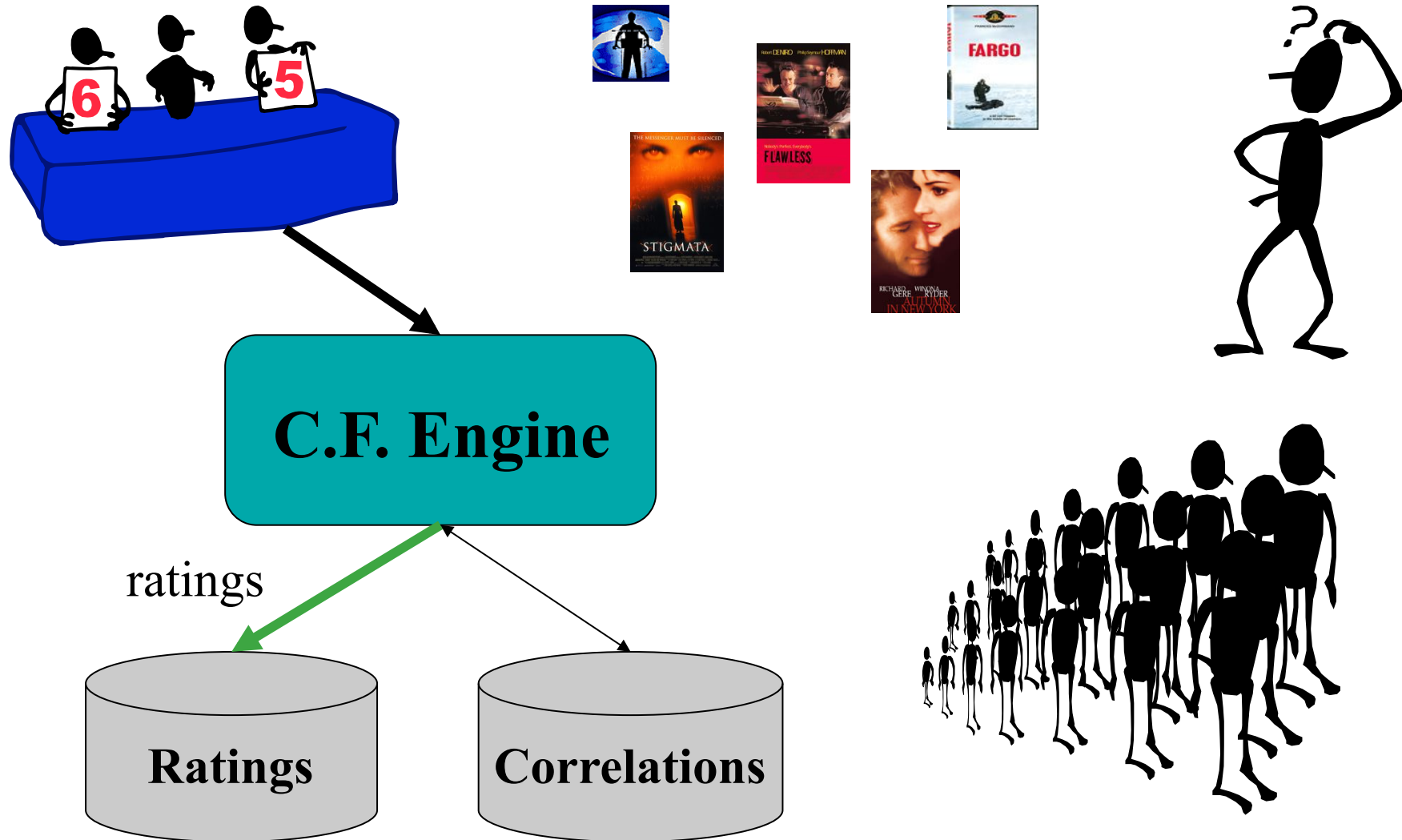
K-Nearest Neighbor User-User



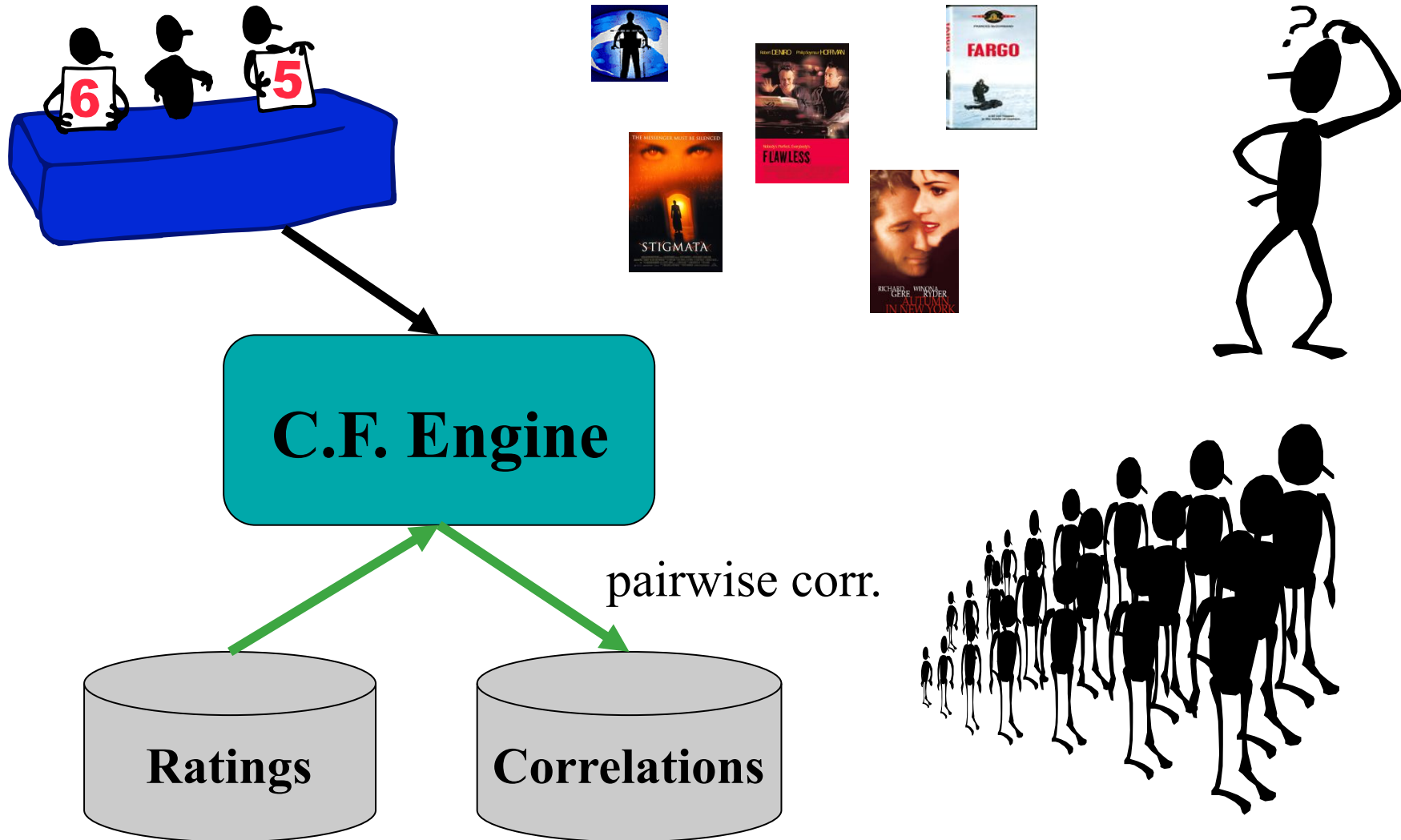
CF Classic: Submit Ratings



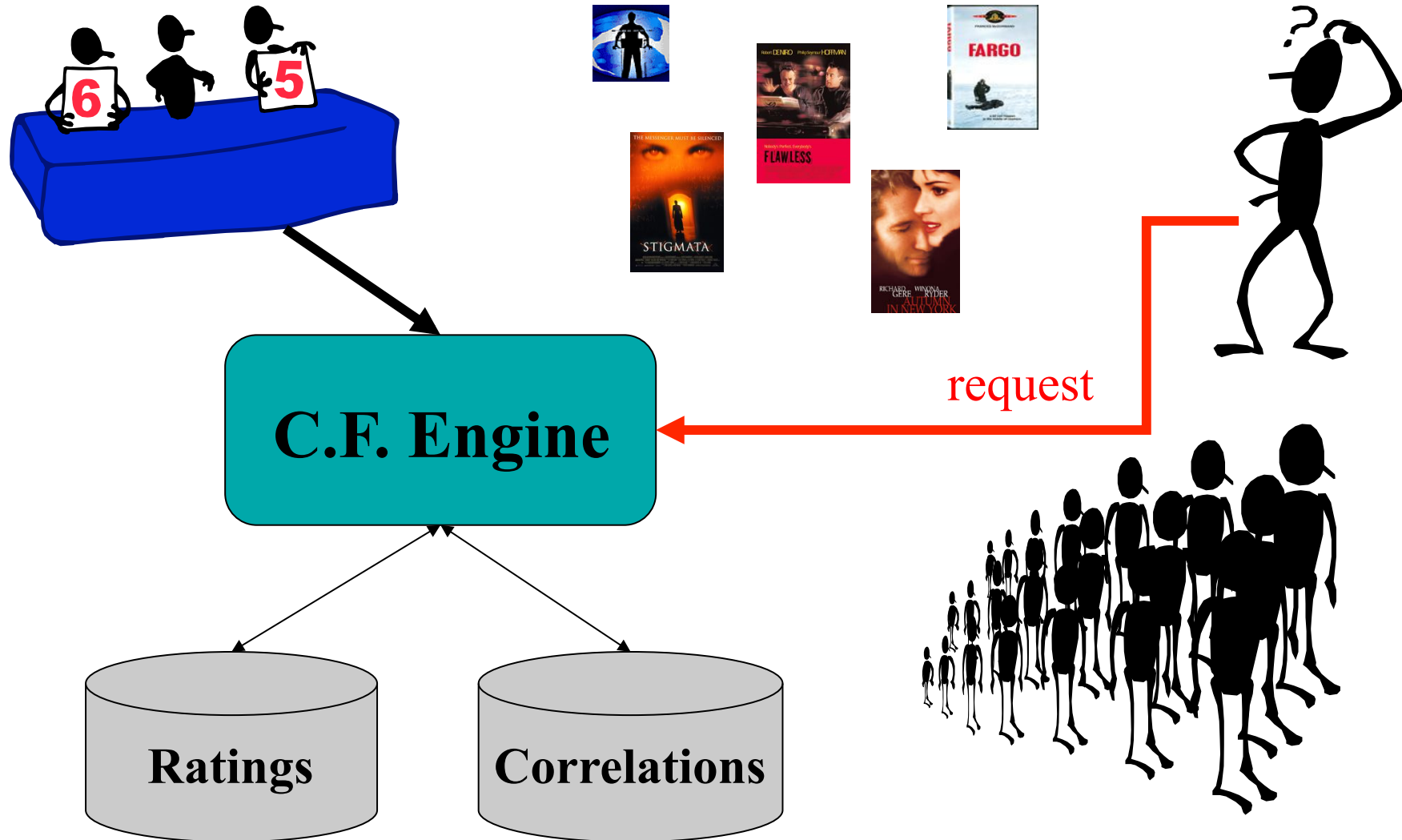
CF Classic: Store Ratings



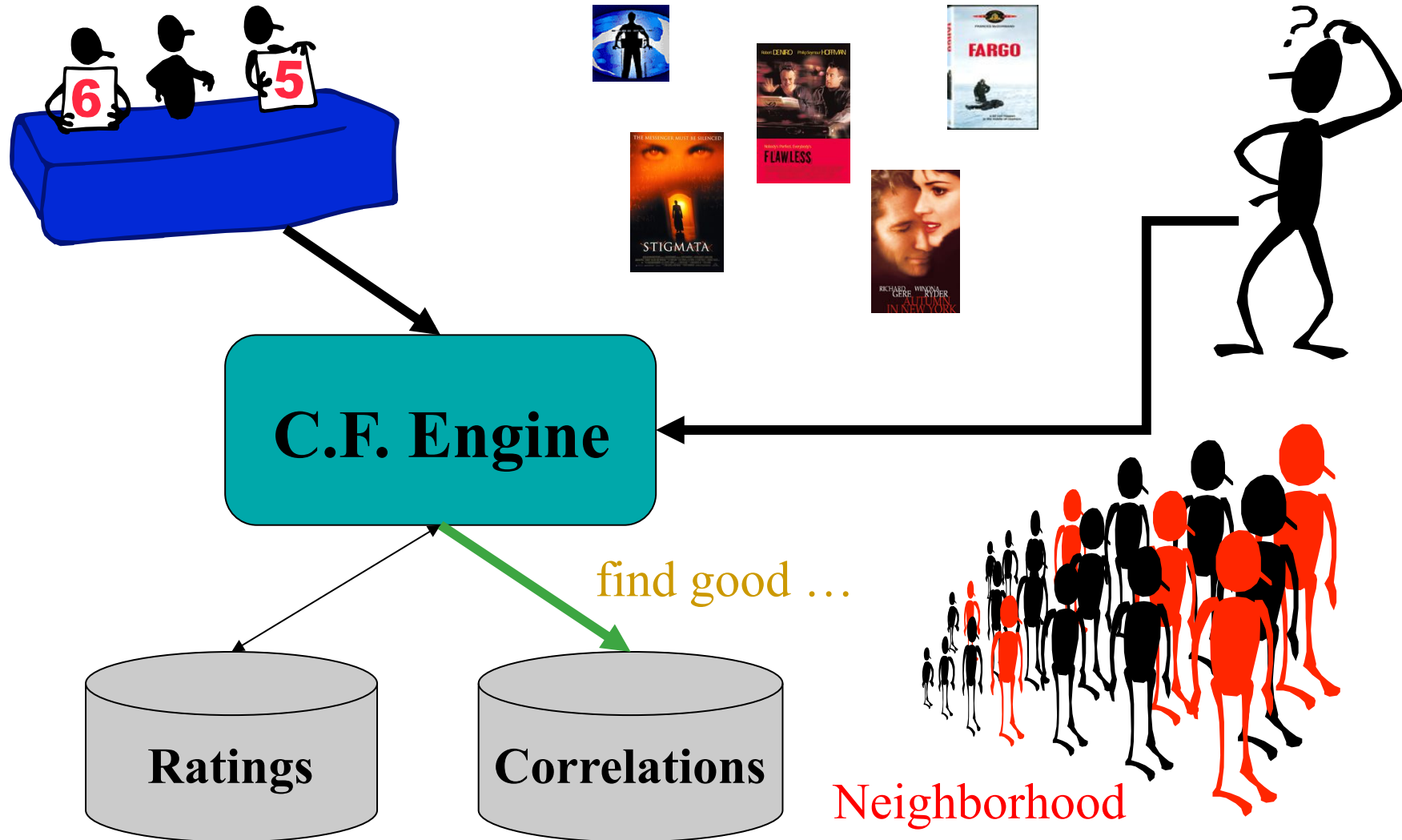
CF Classic: Compute Correlations



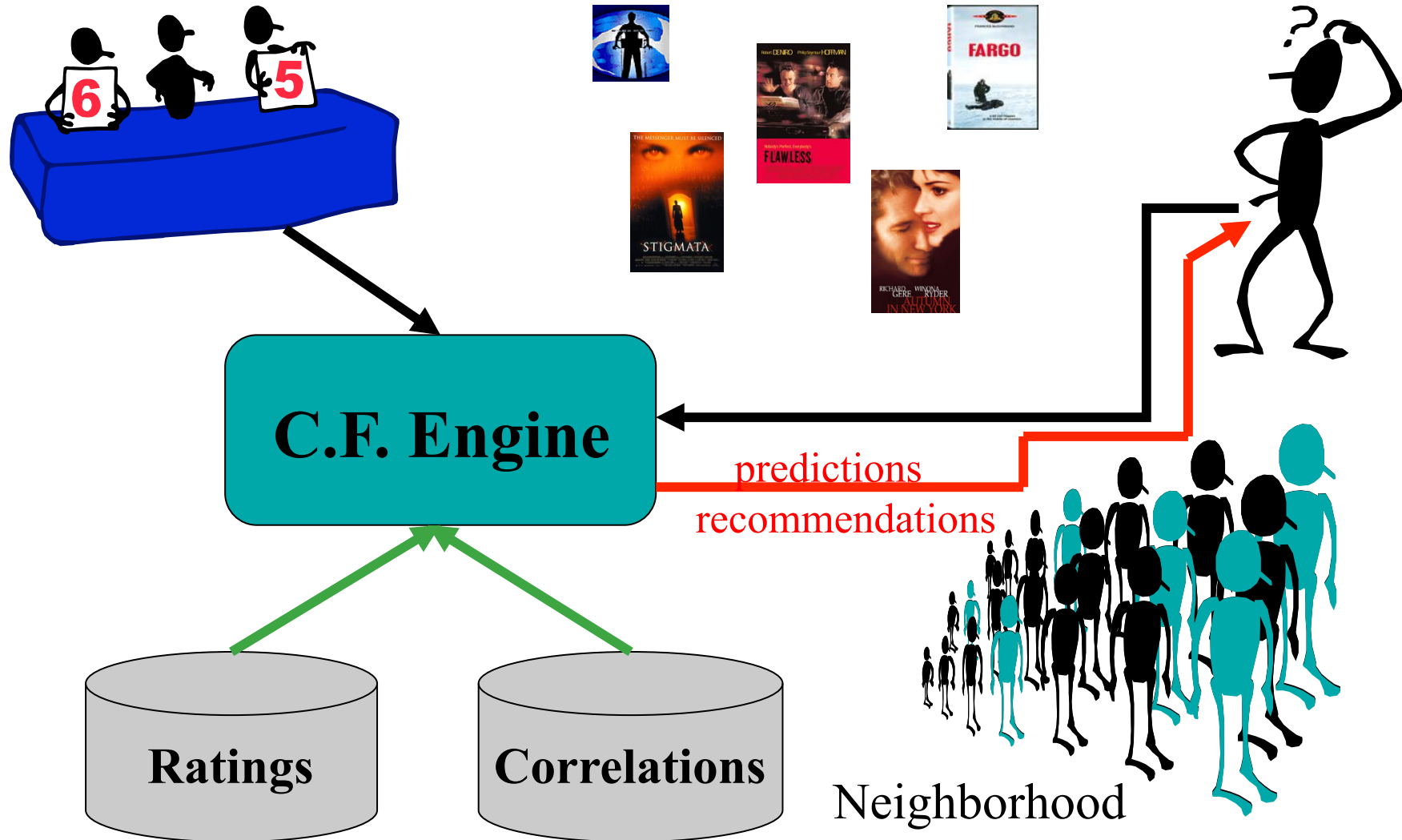
CF Classic: Request Recommendations



CF Classic: Identify Neighbors



CF Classic: Select Items; Predict Ratings



Understanding the Computation

	Hoop Dreams	Star Wars	Pretty Woman	Titanic	Blimp	Rocky XV
Joe	D	A	B	D	?	?
John	A	F	D		F	
Susan	A	A	A	A	A	A
Pat	D	A		C		
Jean	A	C	A	C		A
Ben	F	A				F
Nathan	D		A		A	

Understanding the Computation

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Pat	D	A		C		
Jean	A	C	A	C		A
Ben	F	A				F
Nathan	D		A		A	

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Pat	D	A		C		
Jean	A	C	A	C		A
Ben	F	A				F
Nathan	D		A		A	

Understanding the Computation

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Jean	A	C	A	C		A
Ben	F	A				F
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Understanding the Computation

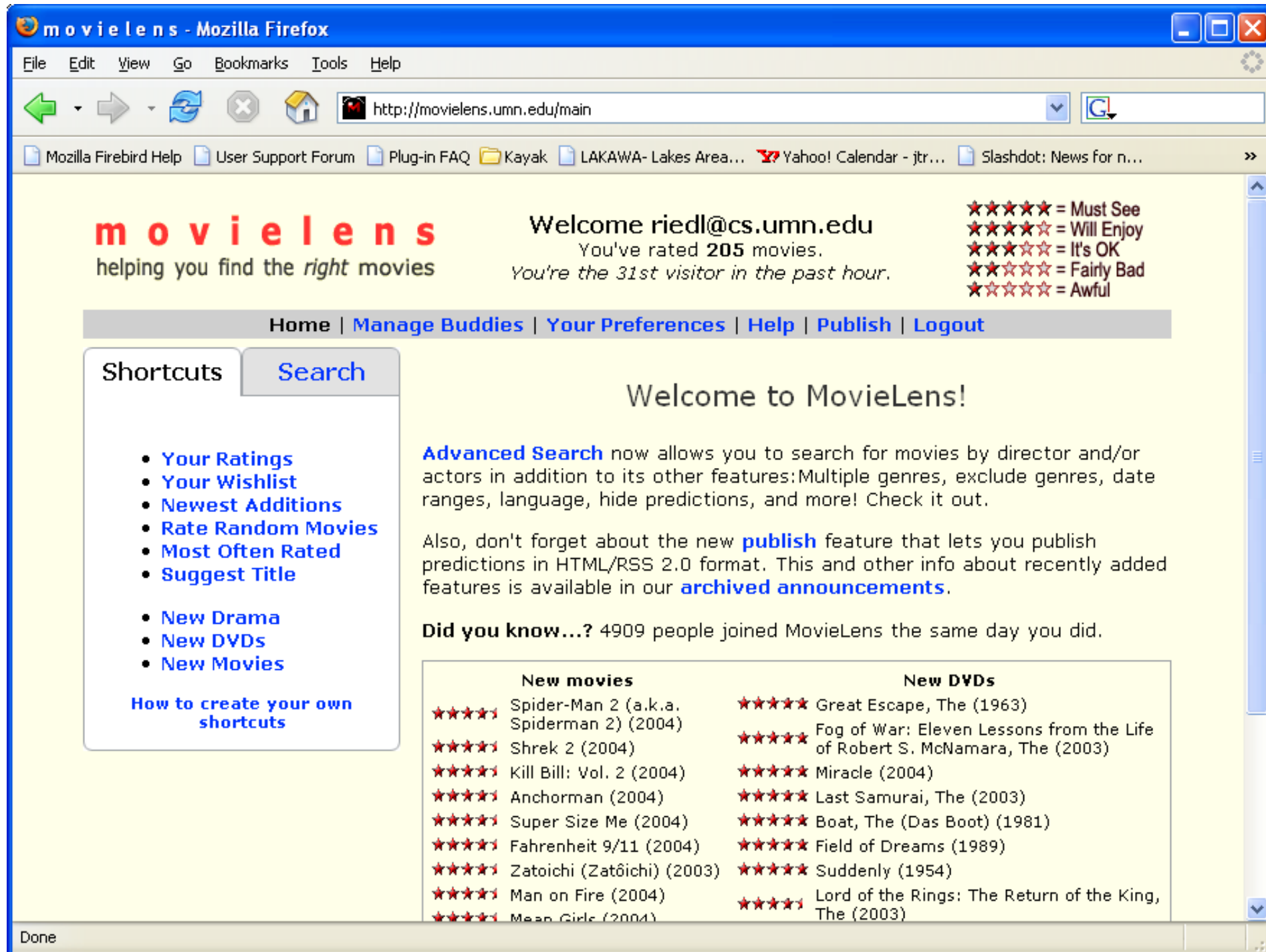
	Hoop Dreams	Star Wars	Pretty Woman	Titanic	Blimp	Rocky XV
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Ben	F	A				F
Nathan	D		A		A	

Understanding the Computation

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Jean	A	C	A	C		A
Ben	F	A				F
Nathan	D		A		A	



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http://movielens.umn.edu/main

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movie lens

helping you find the *right* movies

Welcome riedl@cs.umn.edu

You've rated **205** movies.

You're the 31st visitor in the past hour.

★★★★★ = Must See

★★★★☆ = Will Enjoy

★★★☆☆ = It's OK

★★☆☆☆ = Fairly Bad

★☆☆☆☆ = Awful

Home | [Manage Buddies](#) | [Your Preferences](#) | [Help](#) | [Publish](#) | [Logout](#)

Shortcuts

Search

Search Titles

Go!

☐ Use selected buddies!

Search Genres

Sci-Fi 2000s

Domain: All movies

☐ Use selected buddies!

Search Genres!

Advanced Search

Welcome to MovieLens!

[Advanced Search](#) now allows you to search for movies by director and/or actors in addition to its other features: Multiple genres, exclude genres, date ranges, language, hide predictions, and more! Check it out.

Also, don't forget about the new [publish](#) feature that lets you publish predictions in HTML/RSS 2.0 format. This and other info about recently added features is available in our [archived announcements](#).

Did you know...? 4909 people joined MovieLens the same day you did.

New movies

★★★★★ Spider-Man 2 (a.k.a. Spiderman 2) (2004)

★★★★★ Shrek 2 (2004)

★★★★★ Kill Bill: Vol. 2 (2004)

★★★★★ Anchorman (2004)

★★★★★ Super Size Me (2004)

★★★★★ Fahrenheit 9/11 (2004)

★★★★★ Zatoichi (Zatôichi) (2003)

★★★★★ Man on Fire (2004)

★★★★★ Mean Girls (2004)

New DVDs

★★★★★ Great Escape, The (1963)

★★★★★ Fog of War: Eleven Lessons from the Life of Robert S. McNamara, The (2003)

★★★★★ Miracle (2004)

★★★★★ Last Samurai, The (2003)

★★★★★ Boat, The (Das Boot) (1981)

★★★★★ Field of Dreams (1989)

★★★★★ Suddenly (1954)

★★★★★ Lord of the Rings: The Return of the King, The (2003)

javascript:showTab("Search")

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Search

☐ Use selected buddies!☐ Use selected buddies!

Advanced Search

Found **71** movies, sorted by **Prediction**
 Genres: **Sci-Fi** | Exclude Genres: **None**
 Dates: **2000s** | Domain: **All** | Format: **All** | Language: **All**
[Show Printer-Friendly Page](#) | [Download Results](#) | [Suggest a Title](#)

Page 1 of 5

page 2>

Wish
List

5



5

Spider-Man (a.k.a. Spiderman)

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Search Genres!

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[Show Printer-Friendly Page](#) | [Download Results](#) | [Suggest a Title](#)

Page 1 of 5

page 2>

Predictions for you ↴

Your Ratings

Movie Information

Wish
List

★★★★★



Not seen

Eternal Sunshine of the Spotless Mind (2004) [info](#)[imdb](#)
Comedy, Drama, Romance, Sci-Fi

11

★★★★★

Not seen

X-Men 2 (a.k.a. X2: X-Men United)  
(2003) [DVD](#), [VHS](#), [info](#) | [imdb](#)
Action, Adventure, Sci-Fi

★★★★★

Not seen
Hide this

Donnie Darko (2001) [DVD](#), [VHS](#), [info](#) | [imdb](#)
Drama, Mystery, Romance, Sci-Fi

7

★★★★★

2.0 stars
2.5 stars
3.0 stars

Dune (miniseries) (2000) DVD, VHS,
[info](#) | [imdb](#)
Drama, Fantasy, Sci-Fi

★★★★★

3.5 stars
4.0 stars
4.5 stars
5.0 stars

Spider-Man (a.k.a. Spiderman)

movie lens - Mozilla Firefox

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http://movielens.umn.edu/search?searchPhrase=matrix&titleSearchBtn=Go%21&action=newSe

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Yahoo! Calendar - jtr...

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Shortcuts

Search

Search Titles

matrix

Go!

☐ Use selected buddies!

Search Genres

All Genres

All Dates

Domain:

All movies

☐ Use selected buddies!

Search Genres!

Advanced Search

You've searched for titles matching: **matrix**

Show Printer-Friendly Page

Download Results

Suggest a Title

Page 1 of 1

Predictions for you ↴	Your Ratings	Movie Information	Wish List
★★★★★	4.5 stars	Matrix Reloaded, The (2003) DVD, VHS, info imdb Action, Sci-Fi, Thriller	<input type="checkbox"/>
★★★★☆	4.0 stars	Matrix Revolutions, The (2003) DVD, VHS, info imdb Action, Sci-Fi, Thriller	<input type="checkbox"/>
★★★★★	5.0 stars	Matrix, The (1999) DVD, VHS, info imdb Action, Sci-Fi, Thriller	<input type="checkbox"/>

Page 1 of 1

Create a shortcut to this search!

Enter a name then press "Create!"

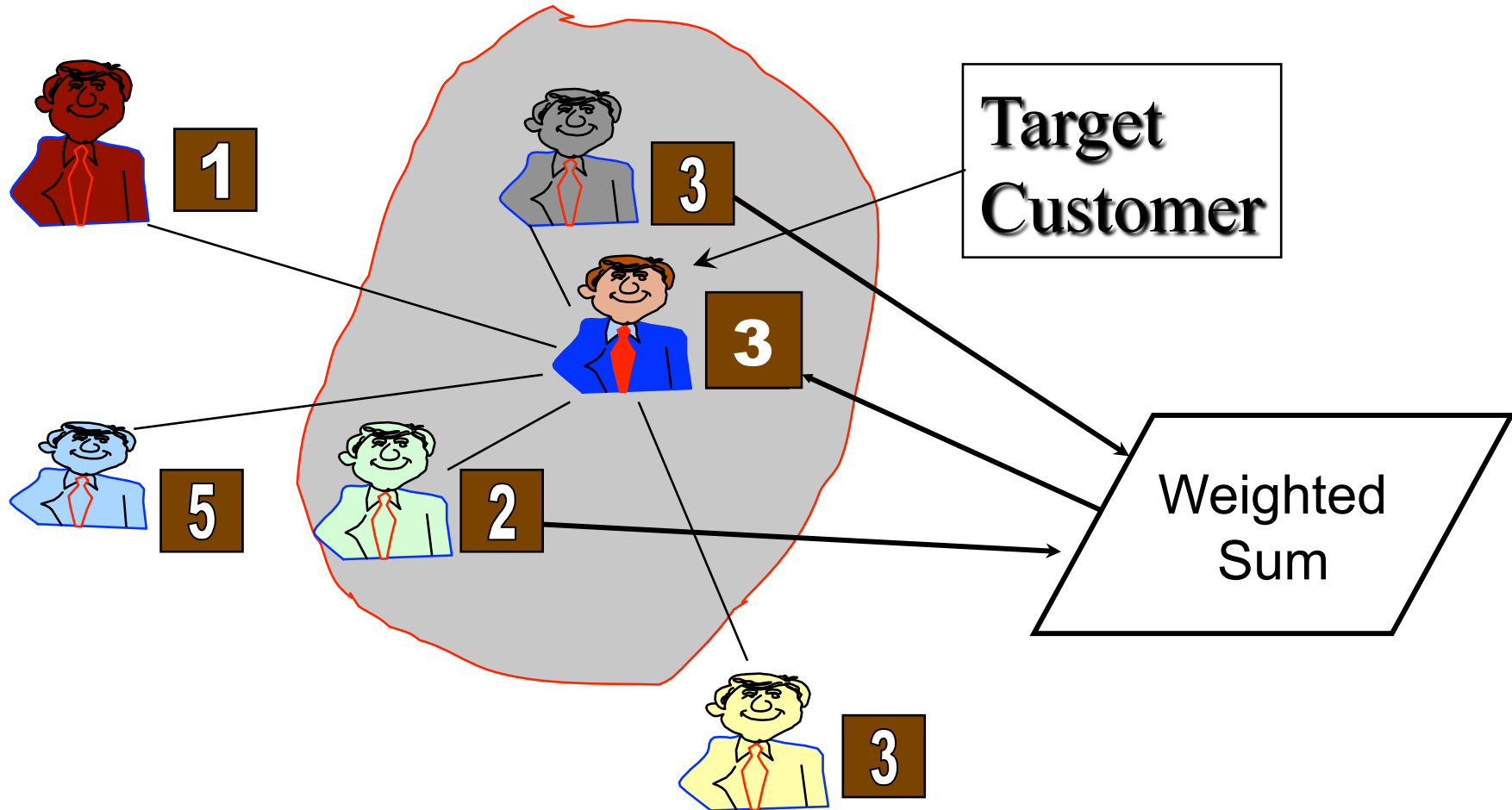
Create!

[What are shortcuts?](#)

Done

Done

User-User Collaborative Filtering



Recommenders

- Tools to help identify worthwhile stuff
 - Filtering interfaces
 - E-mail filters, clipping services
 - Recommendation interfaces
 - Suggestion lists, “top-n,” offers and promotions
 - Prediction interfaces
 - Evaluate candidates, predicted ratings

A Little Vocabulary

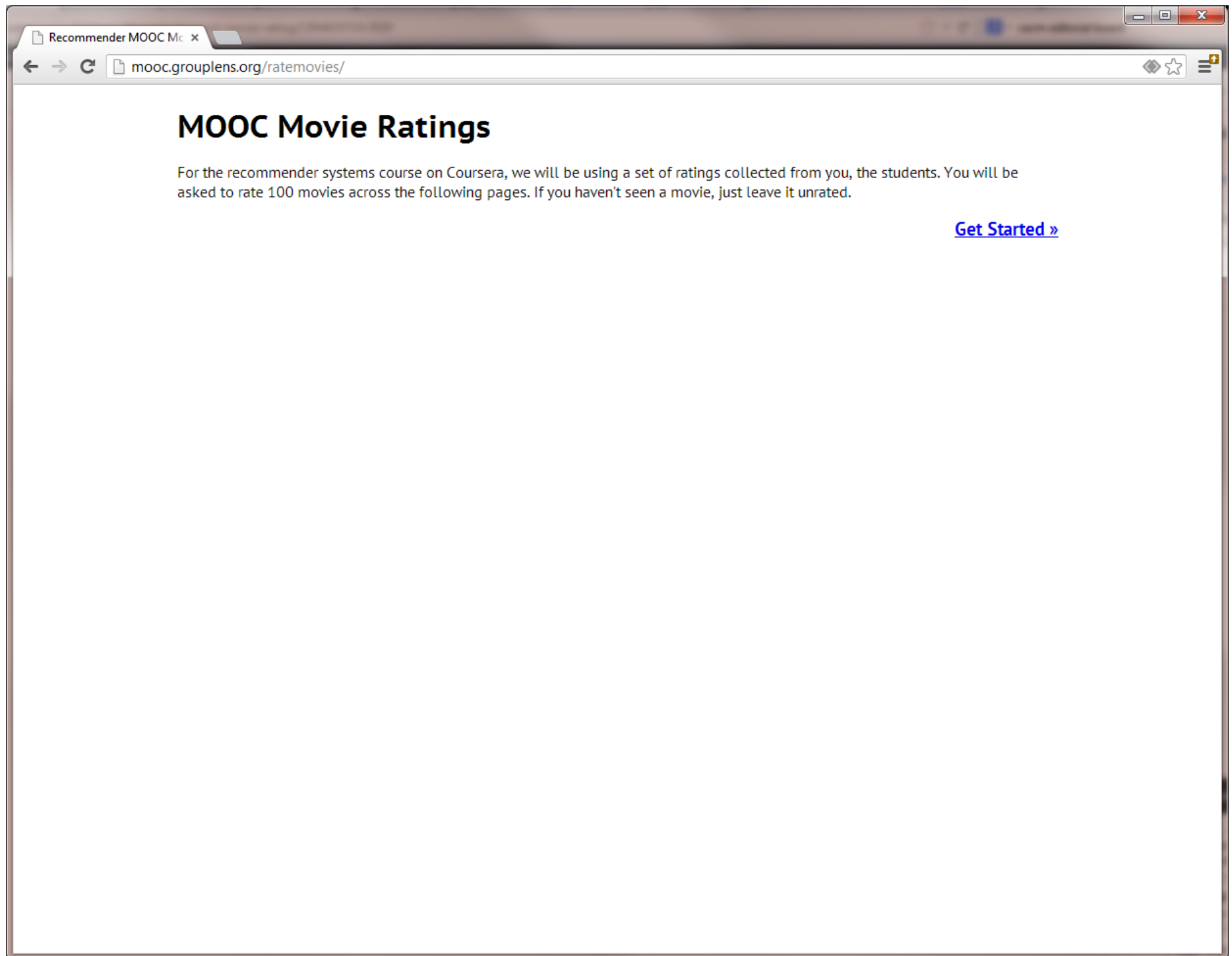
- Rating – expression of preference
 - Explicit rating (direct from the user)
 - Implicit rating (inferred from user activity)
- Prediction – estimate of preference
- Recommendation – selected items for user
- Content – attributes, text, etc.
- Collaborative – using data from other users

Historical Challenges

- Collecting Opinion and Experience Data
- Finding the Relevant Data for a Purpose
- Computing the Recommendations
- Presenting the Data in a Useful Way

Your First Assignment

- We are building a class ratings dataset using the MovieLens infrastructure
 - This will be used for several of the assignments
- Your assignment is to rate movies through our interface:
 - <http://mooc.grouplens.org/ratemovies/>



MOOC Movie Ratings

For the recommender systems course on Coursera, we will be using a set of ratings collected from you, the students. You will be asked to rate 100 movies across the following pages. If you haven't seen a movie, just leave it unrated.

[Get Started »](#)

Movie Page 1



The Incredibles (2004)

Pixar Animation Studios and Walt Disney Pictures

Directed by Brad Bird

No gut, no glory



Gone In Sixty Seconds (2000)

Jerry Bruckheimer Films

Directed by Dominic Sena

Ice Cold, Hot Wired.



Lost in Translation (2003)

American Zoetrope

Directed by Sofia Coppola

Everyone wants to be found.



Iron Man (2008)

Paramount Pictures, Marvel Entertainment and Marvel Studios

Directed by Jon Favreau

Heroes aren't born. They're built.



28 Days Later... (2002)

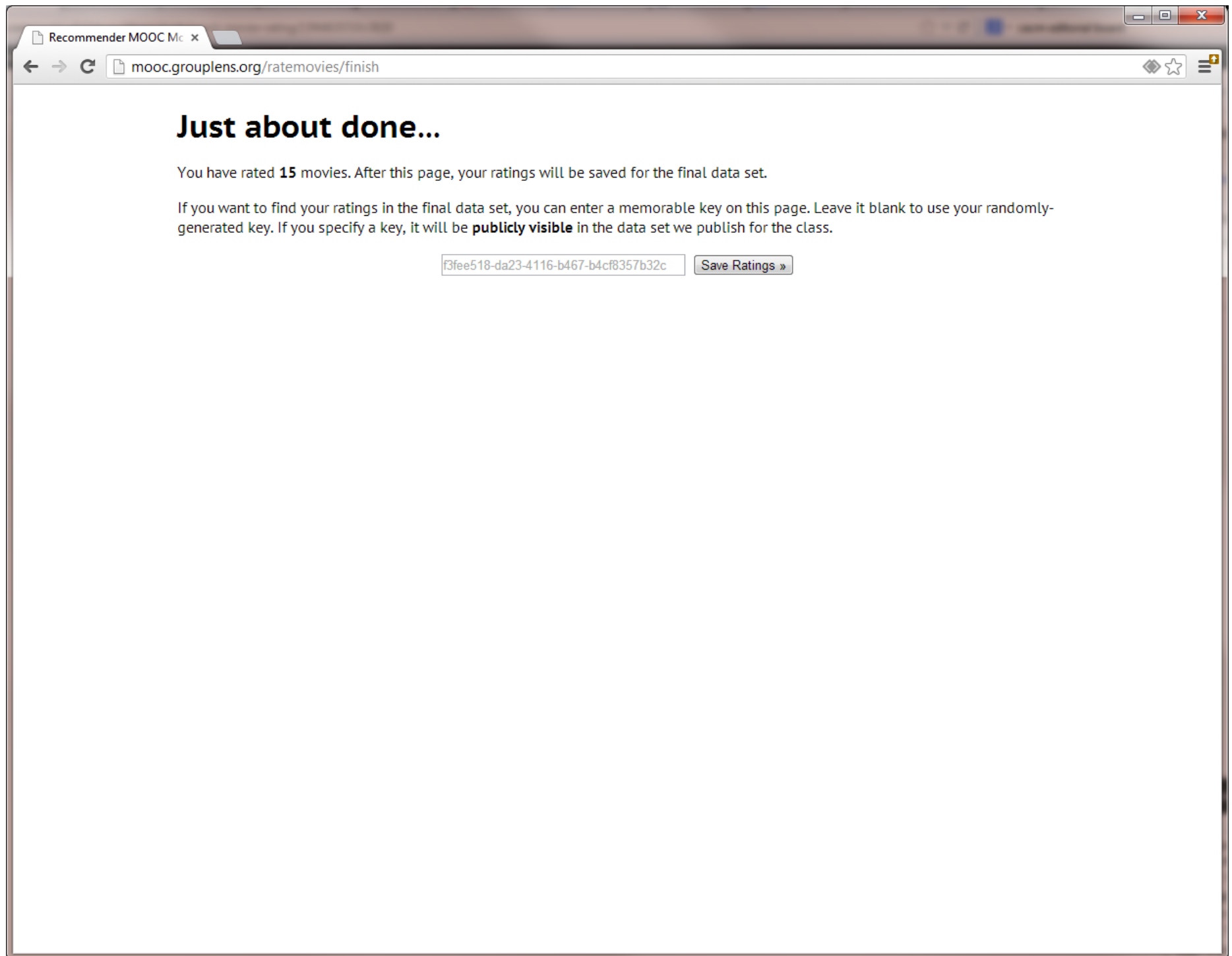
British Film Council, Fox Searchlight Pictures and DNA Films

Directed by Danny Boyle

His fear began when he woke up alone. His terror began when he realised he wasn't.



My Big Fat Greek Wedding (2002)



Just about done...

You have rated **15** movies. After this page, your ratings will be saved for the final data set.

If you want to find your ratings in the final data set, you can enter a memorable key on this page. Leave it blank to use your randomly-generated key. If you specify a key, it will be **publicly visible** in the data set we publish for the class.

Your First Assignment

- We are building a class ratings dataset using the MovieLens infrastructure
 - This will be used for several of the assignments
- Your assignment is to rate movies through our interface:
 - <http://mooc.grouplens.org/ratemovies/>
 - Only rate movies you've seen
 - You can create a key to follow your preferences forward (or save the random key)

Moving Forward ...

- Next Lecture: Formal Course Introduction
- Rest of this Week
 - Technical details for programmers
 - Taxonomy
 - Tour of Recommenders in Amazon.com
- If not familiar with recommenders at all:
 - Spend some time using them (movielens.org)

1-1: Introduction to Recommender Systems