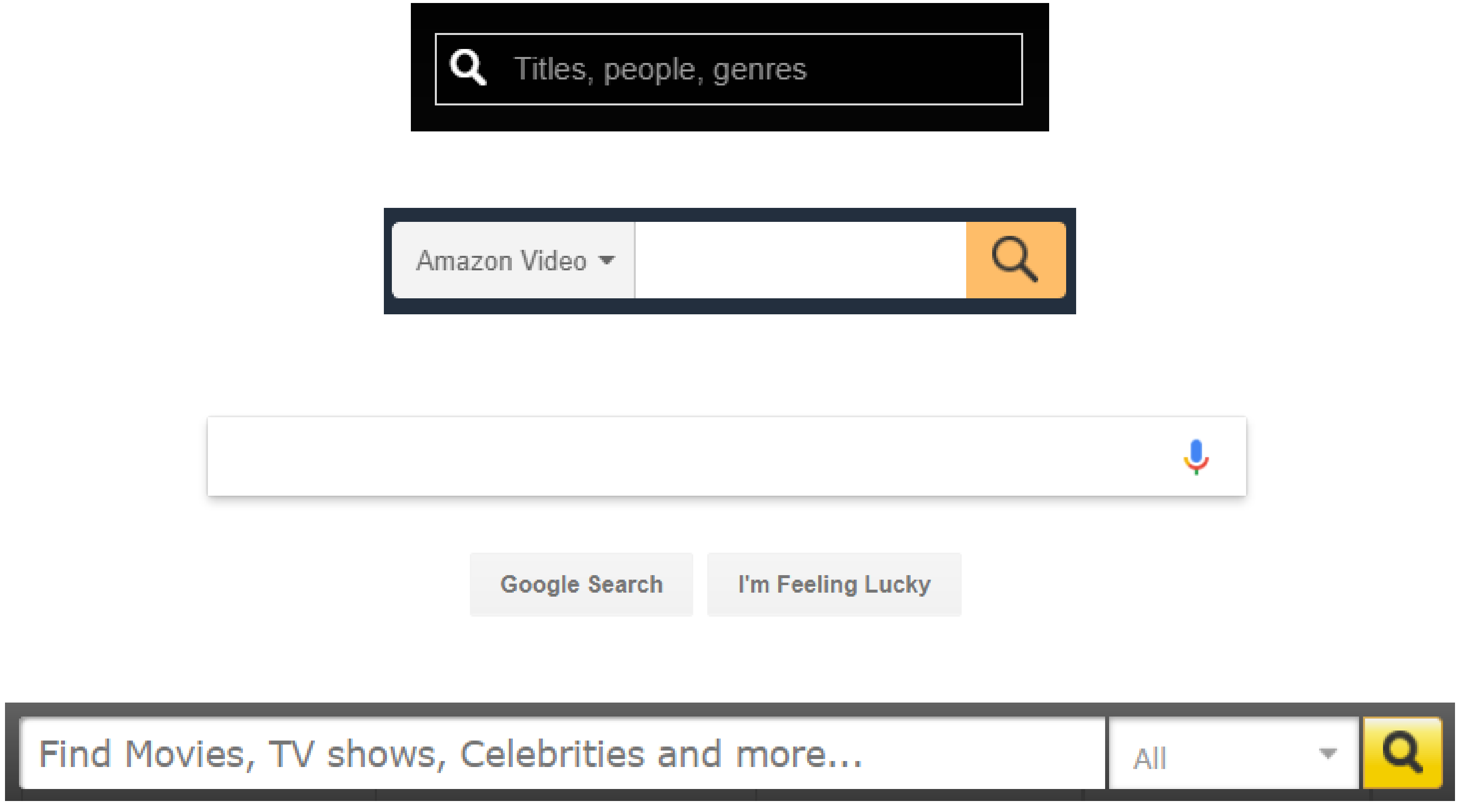
Perceptual Relational Attributes: Navigating and Discovering Shared Perspectives from User-Generated Reviews

Manuel Valle, Christoph Lofi, Mengmeng Ye

TU Delft Delft University of Technology

18. BTW 2019
Universität Rostock - 600 Jahre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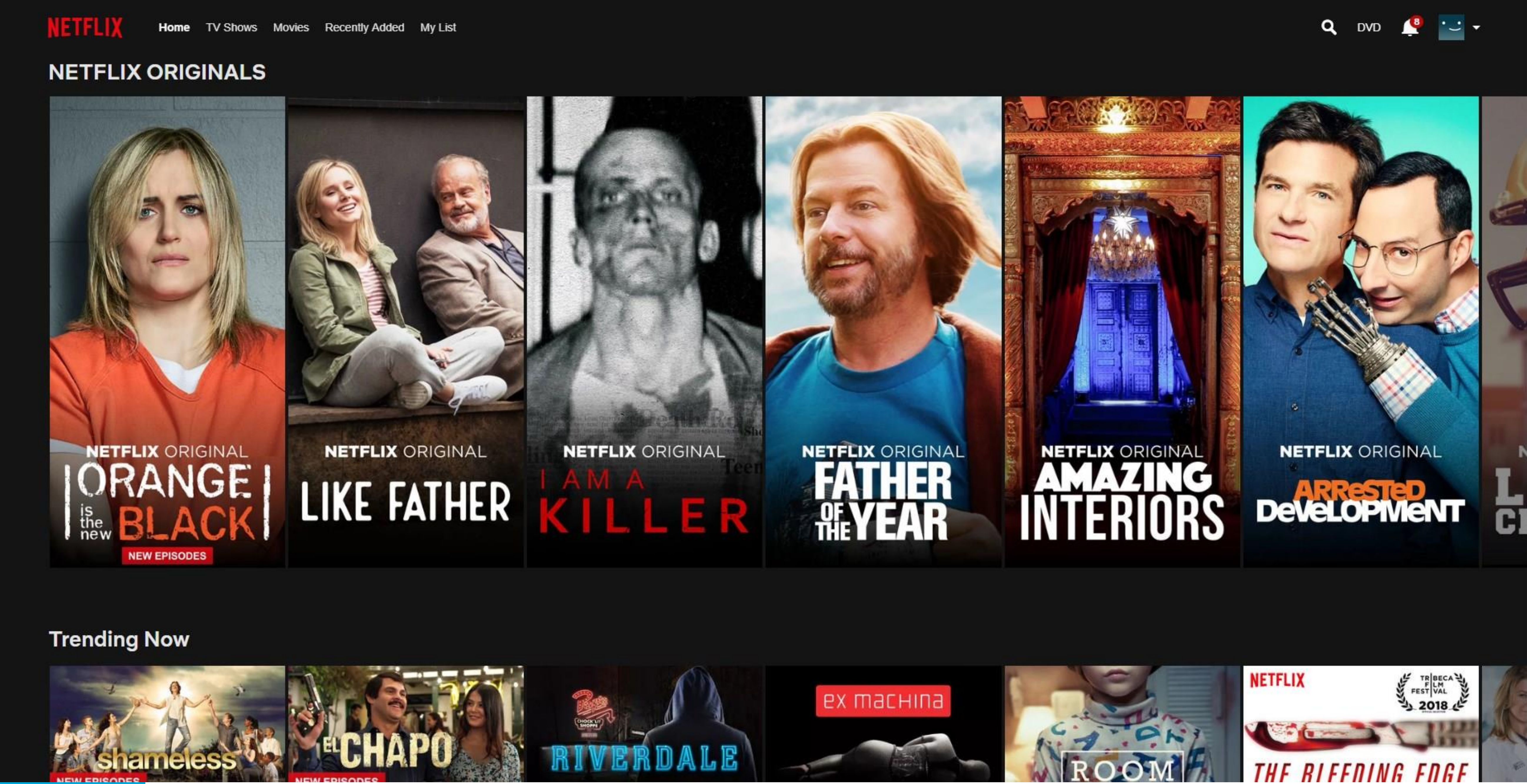
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NETFLIX ORIGINAL
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NETFLIX ORIGINAL
LIKE FATHER
NETFLIX ORIGINAL
I AM A KILLER
NETFLIX ORIGINAL
FATHER OF THE YEAR
NETFLIX ORIGINAL
AMAZING INTERIORS
NETFLIX ORIGINAL
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Trending Now
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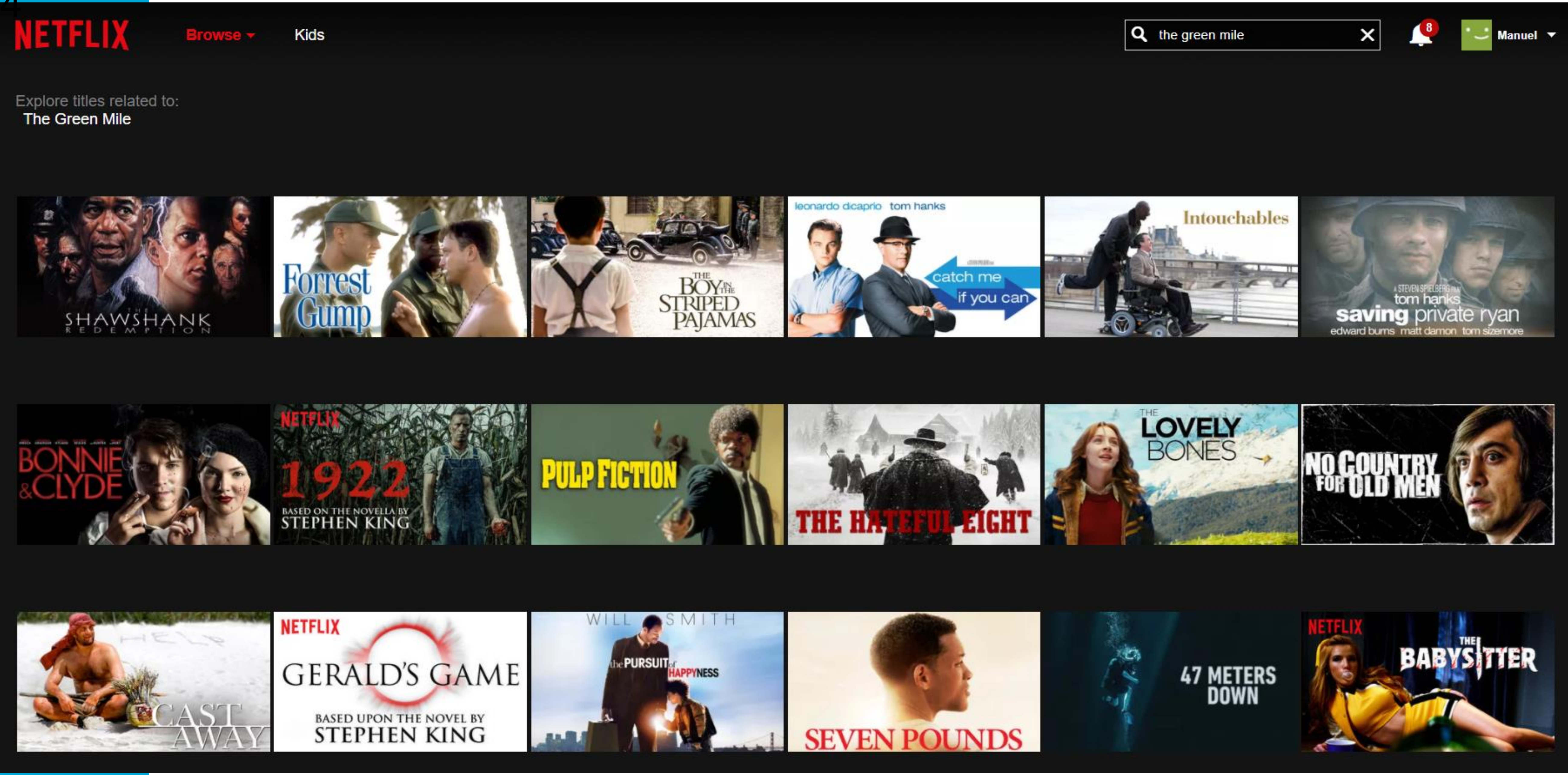
EL CHAPO
RIVERDALE
ex machina
ROOM
NETFLIX
TRIBECA FILM FESTIVAL 2018
THE BLEEDING EDGE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47 METERS DOWN
NETFLIX
THE BABYSITTER

TU Delft Web Information Systems
WIS

Modelling the video-store clerk: what do we need?

- Users' **perception** of the movie
  - Viewer: "I liked the story, it's a lovely adaptation of the book"
- Major **consensus** groups in perceptions
  - Some people think it's nice and slow, while others think it's a great novel adaptation with a beautiful story
- Use one of the **multiple** shared views to find similar movies
  - Store clerk: "You want something like **X** <u>with respect to</u> good story and book adaptation, so I think you will love **Y**"

Challenges:

- Perceptual Features are inherently subjective, different and even contradicting
  - How can we model such a schema?
- There are hundreds of individual perceptions
  - Single-movie representation can't tell the whole story
- Constructing queries for perceptions is difficult, especially if the user doesn't know their target
  - How can we simplify this process?

How to get there:

- Infer customer's perception from available sources
  - Extract representation from social judgements: reviews
- Group similar perceptions together
  - Apply clustering algorithms to inferred representations
- Use Query by Example to find similar movies with respect to a specific perspective
  - Explore iteratively until the user finds the implicit target: "I'll know it when I see it"

Concepts: From Perception to Perceptual Attributes and Shared Perspectives

- Perception
- Perceptual Attribute
- Perceptual Tuple
- Shared Perspective

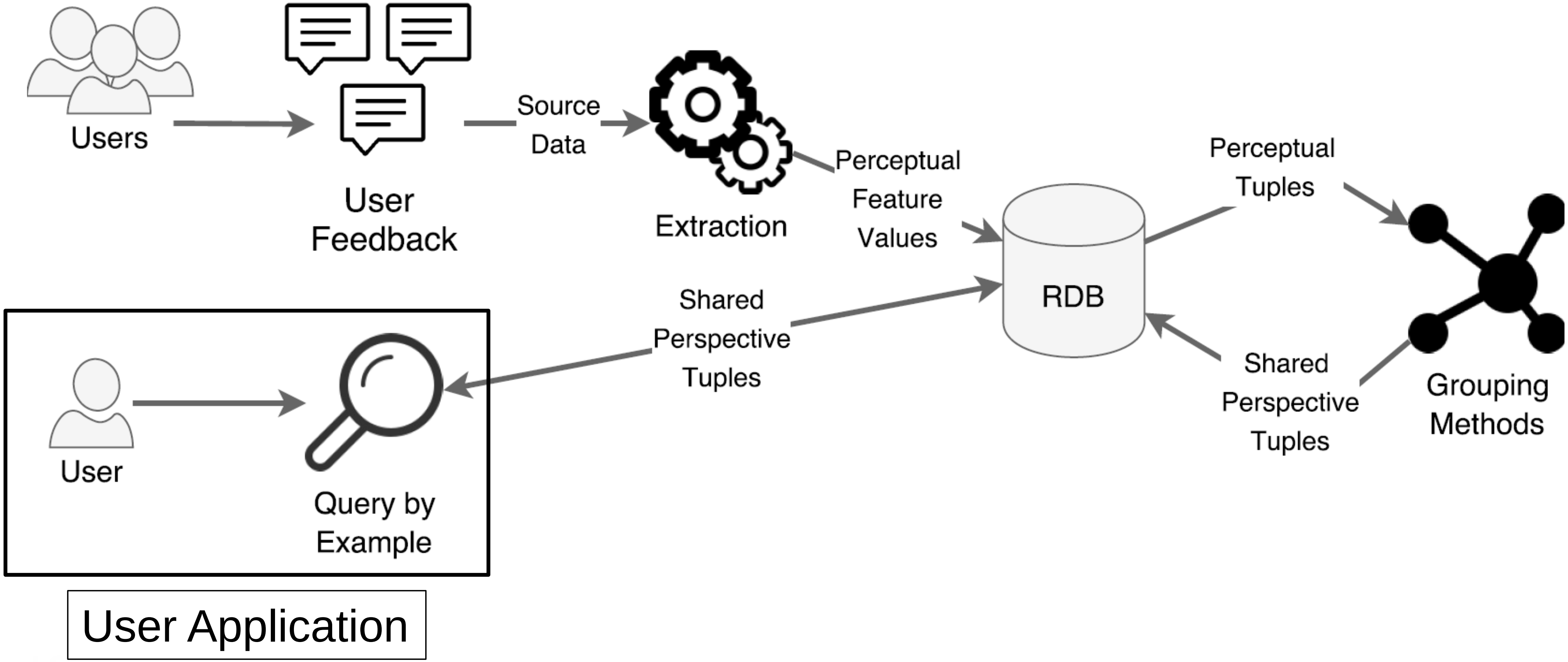
★★★★☆ **Heartwarming, shocking, and crushingly sad.**
This film will give you a wild emotional ride. It's one of those "watch only once" movies. Additionally, it has one of the most hate-able antagonists of film history!
Published 1 month ago by Trev

emotionality, funniness, action, romanticism

9, 0, 5, 8

9, 0, 5, 8
8, 1, 5, 7
10, 0, 4, 9

5, 2, 5, 1
6, 1, 5, 0
5, 0, 4, 1


Users
User Feedback
Source Data
Extraction
Perceptual Feature Values
RDB
Perceptual Tuples
Grouping Methods
Shared Perspective Tuples
Shared Perspective Tuples
User
Query by Example
User Application

Social Judgements: Reviews

- Rich perceptions
- Important for online decisions
- Commonly used in research
  - Analysis per item, feature, review
- Our dataset:
  - 375K reviews
  - 2041 movies
  - 100-300 reviews per movie

Five Stars
Great movie
Published 9 days ago by James Wolf

Five Stars
One of the few movies that's better than the book
Published 13 days ago by dstroyer71

Five Stars
Another favorite of Tom Hanks!
Published 16 days ago by Amazon Customer

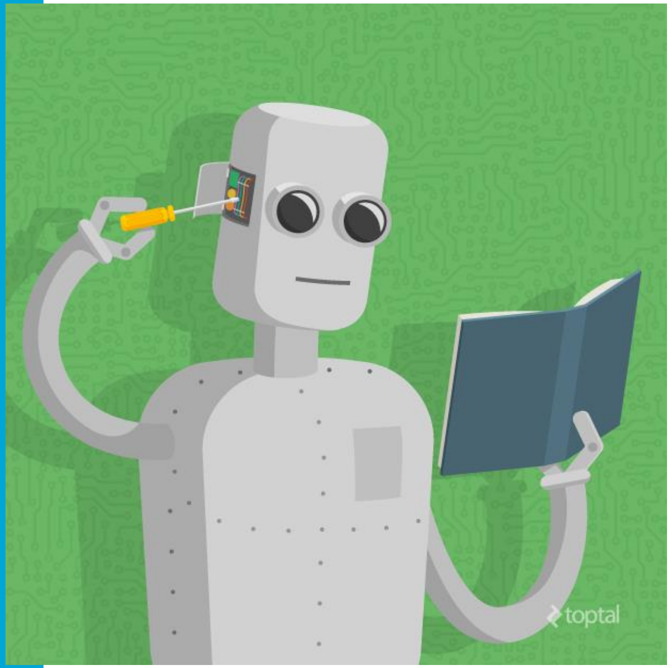
amazon

A Phenomenal Movie! A great buy with prime as well!
Published 29 days ago by Darnell and Crista Hines

Heartwarming, shocking, and crushingly sad.
This film will give you a wild emotional ride. It's one of those "watch only once" movies. Additionally, it has one of the most hate-able antagonists of film history!
Published 1 month ago by Trev

Three Stars
The movie have stop playing mid way this is two movie.
Published 1 month ago by Amazon Customer

Perceptual Attributes: Modelling



Ok, so it did not deserve best picture. It was still excellent. It has great performances in it. Particularly the guy who never was very famous Michael Jeter or whatever his name is. I love the visuals. I cried at the end. Michael Clarke Duncan is great.

Perceptual Attributes - *Explicit* vs Implicit

Acting: 3.43/5

Directing: None

Scenery: 3.12/5

Character: 3.43/5

Storyline: None

Ok, so it did not deserve best picture. It was still excellent. It has **great performances** in it. Particularly the guy who never was very famous Michael Jeter or whatever his name is. I **love** the **visuals**. I cried at the end. **Michael Clarke Duncan** is **great**.

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Storyline: None

Ok, so it did not deserve

Modelling perceptual attributes is hard!

- Subjective
- Usually contradictory
- Constantly changing

love the visuals. I cried at the end. Michael Clarke Duncan is great.

Movie Modelling Experiment

- 180 second year university BSc students (in pairs)
- Create a ranked list of **perceptual attributes** for movies – *What is IMDB missing?*
- Results:
  - 6.5 average attributes per team (min 4 – max 10)
  - 74 teams mentioned “storyline”
  - 72 mentioned “acting”
  - Roughly 50% “scenery”, “character”, or “directing”

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Lots of complaints

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d_0: 0.00548

d_1: -1.02489

…

d_98: 0.58937

d_99: 1.25607

Perceptual Attributes - Explicit vs *Implicit*

- Hundreds of perceptions
- Implicit values have no meaning for humans
  - Impossible to query

Michael Jeter or whatever his name is. I love the visuals. I cried at the end. Michael

I love the visuals. I cried at the end. Michael Clarke Duncan is great.

Clarke Duncan is great.

d_0: 0.00548

d_1: -1.02489

...

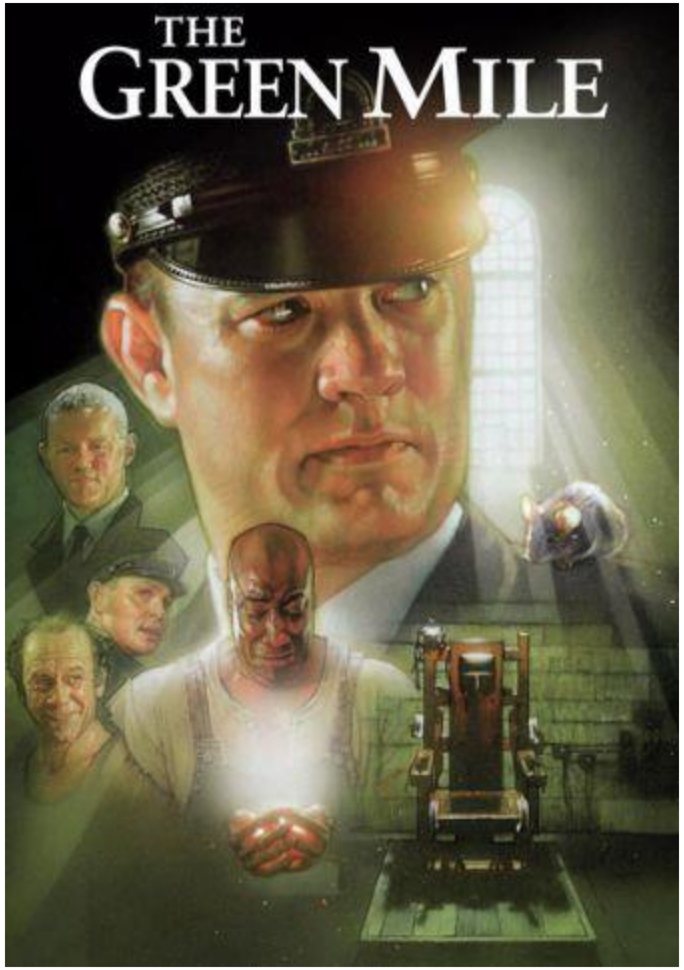
d_98: 0.58937

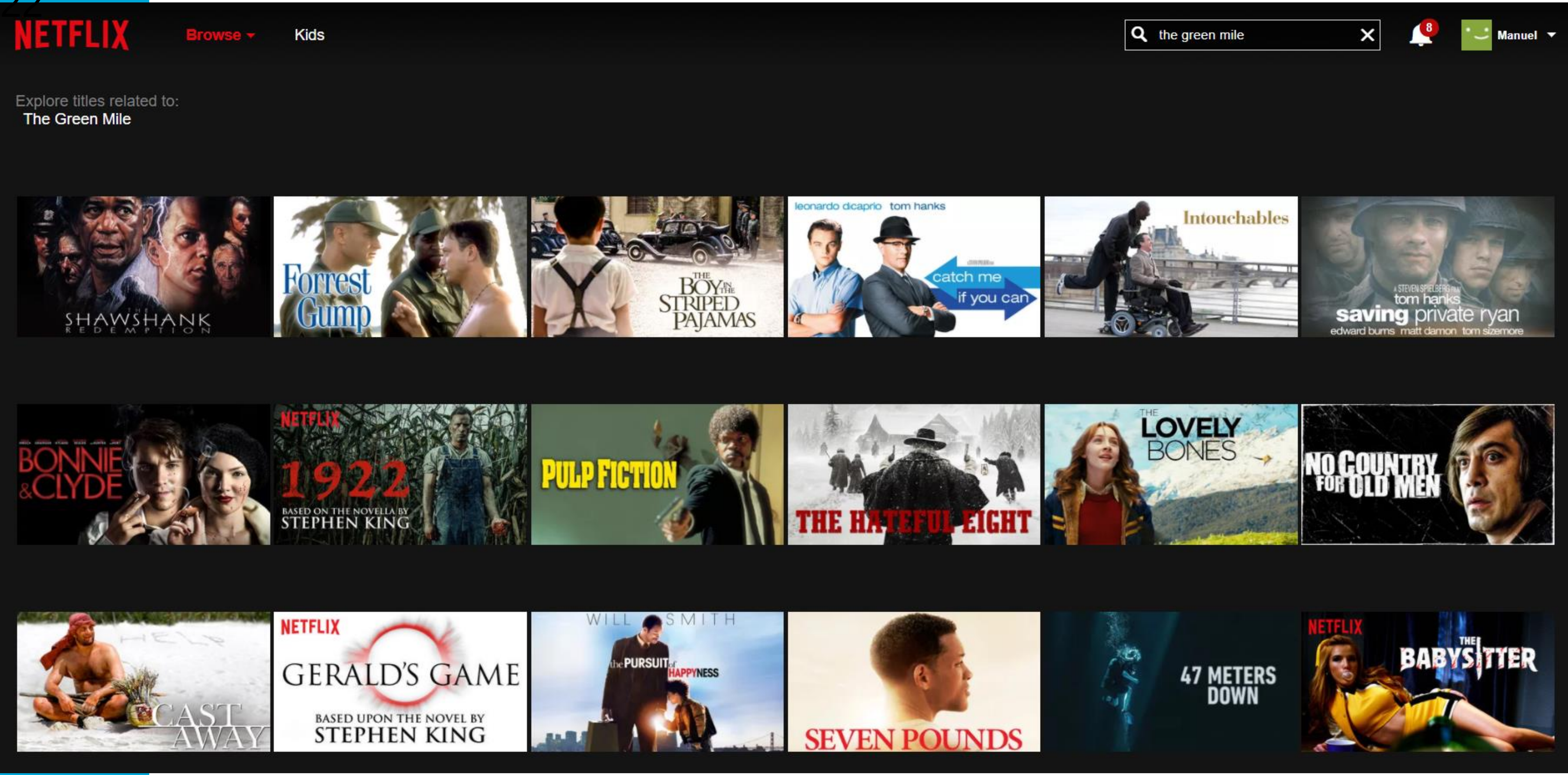
d_99: 1.25607

Constructing Shared Perspectives

- Current - Single representation, seems counterintuitive
  - Twilight: powerful romance or shame to vampires?
- Proposal - Group together similar perceptions = with similar *perceptual tuples*
  - Twilight: Why not both?
- Algorithm that can leverage similarity between Perceptual Tuples to create groups, use centers
  - Cool…still un-queryable

iCarly Wiki


THE
GREEN MILE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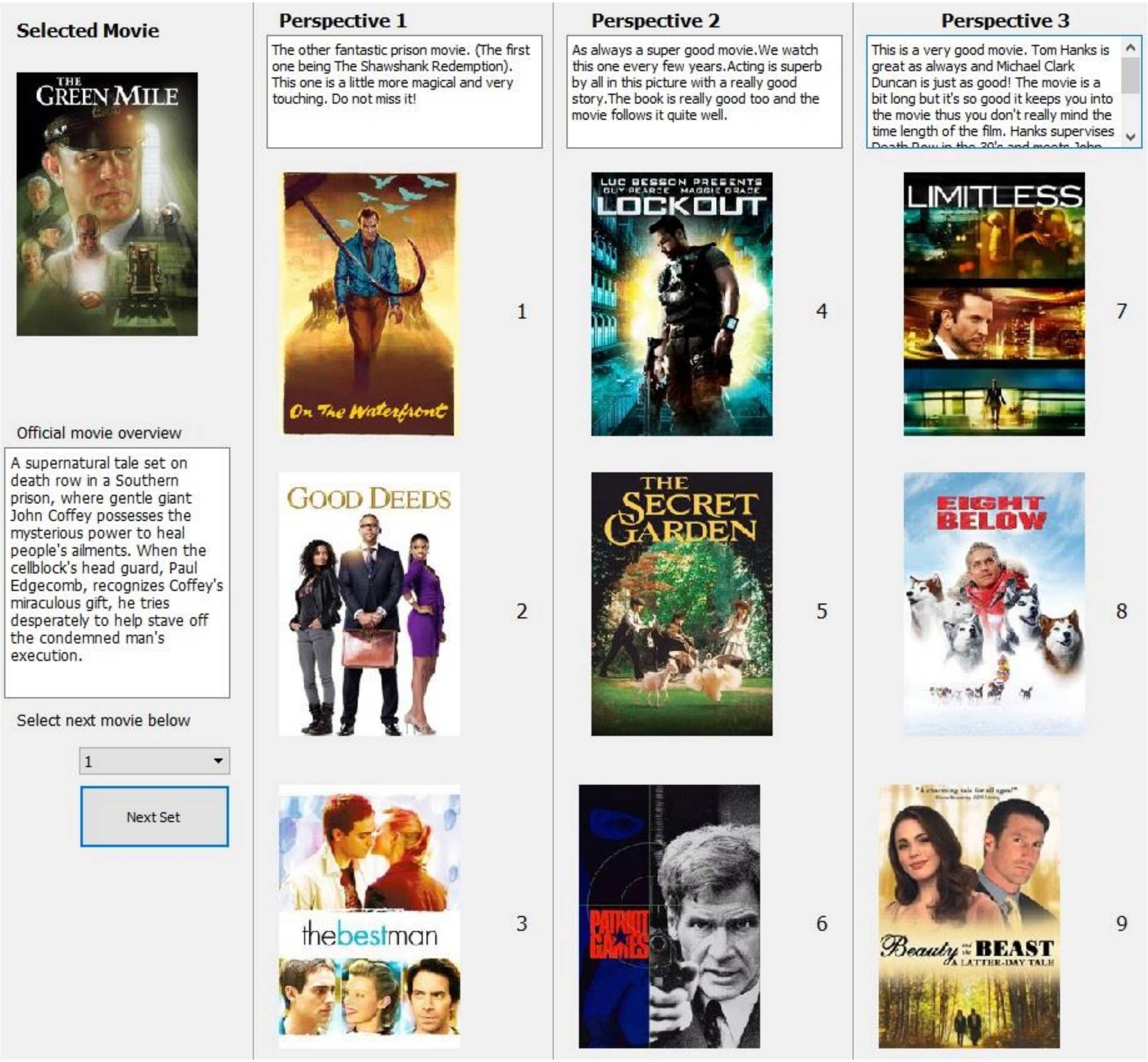
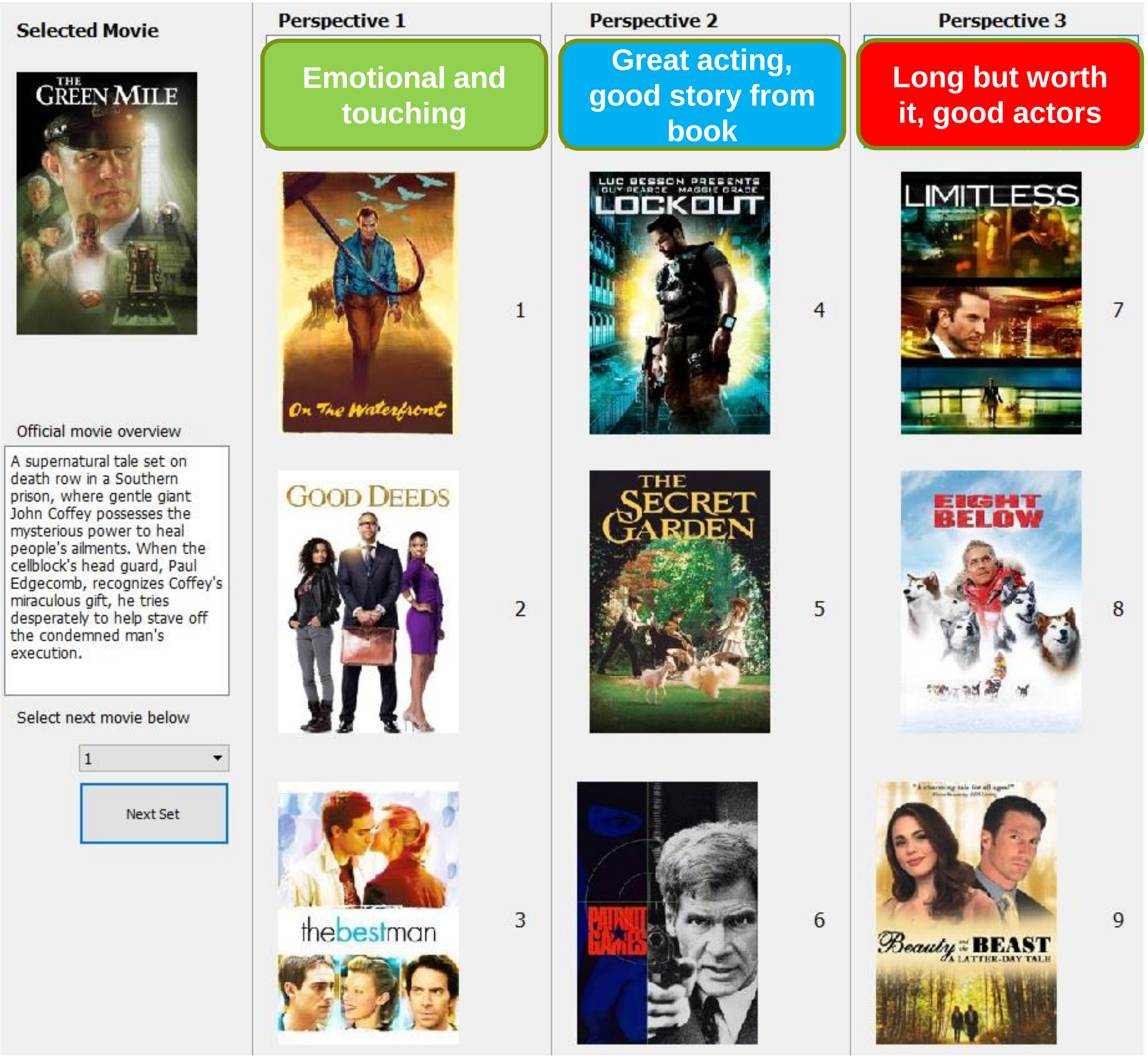

Selected Movie
THE GREEN MILE
Official movie overview
A supernatural tale set on death row in a Southern prison, where gentle giant John Coffey possesses the mysterious power to heal people's ailments. When the cellblock's head guard, Paul Edgecomb, recognizes Coffey's miraculous gift, he tries desperately to help stave off the condemned man's execution.
Select next movie below
1
Next Set
Perspective 1
The other fantastic prison movie. (The first one being The Shawshank Redemption). This one is a little more magical and very touching. Do not miss it!
On The Waterfront
1
GOOD DEEDS
2
thebestman
3
Perspective 2
As always a super good movie.We watch this one every few years.Acting is superb by all in this picture with a really good story.The book is really good too and the movie follows it quite well.
LOCKOUT
4
THE SECRET GARDEN
5
PATRIOT GAMES
6
Perspective 3
This is a very good movie. Tom Hanks is great as always and Michael Clark Duncan is just as good! The movie is a bit long but it's so good it keeps you into the movie thus you don't really mind the time length of the film. Hanks supervises
LIMITLESS
7
EIGHT BELOW
8
Beauty & the BEAST A LATTER-DAY TALE
9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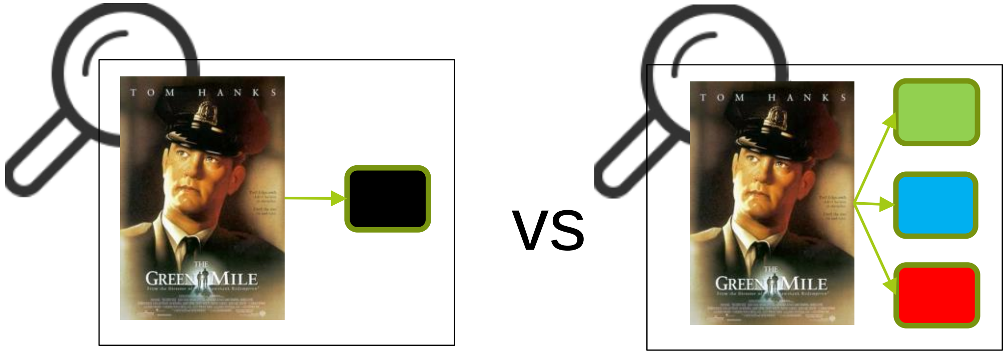
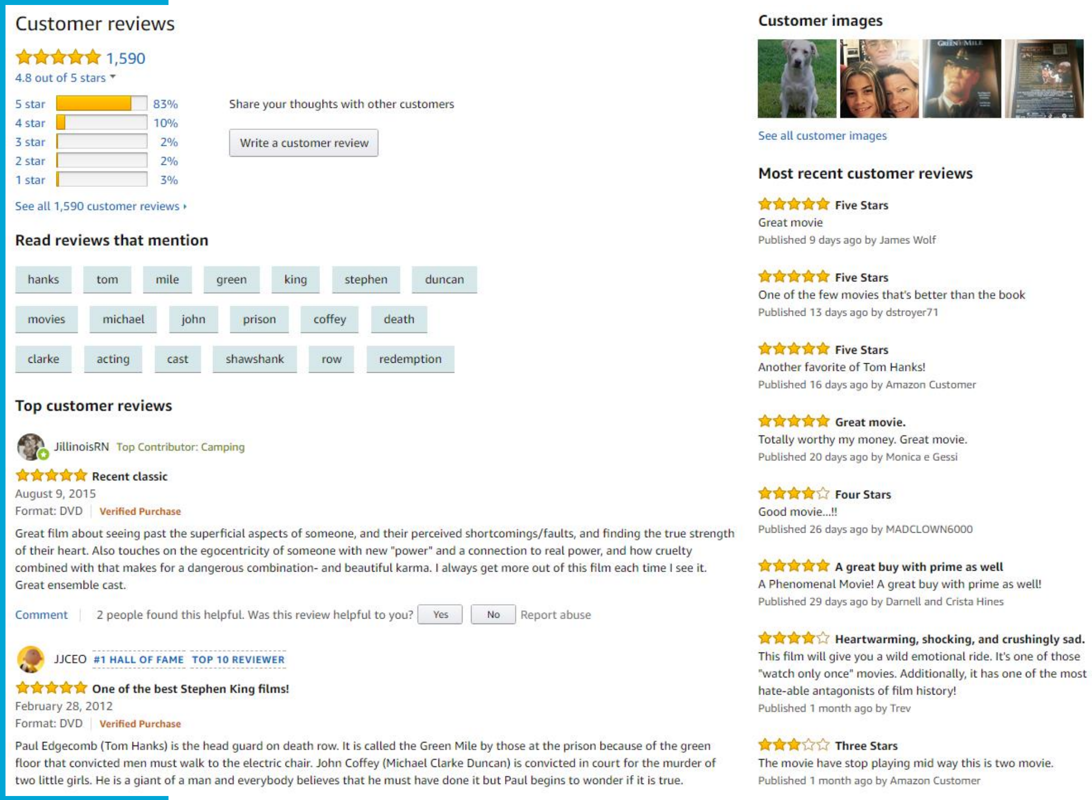
Select next movie below
1
Next Set
Perspective 1
Emotional and touching
Perspective 2
Great acting, good story from book
Perspective 3
Long but worth it, good actors
On The Waterfront
1
LOCKOUT
4
LIMITLESS
7
GOOD DEEDS
2
THE SECRET GARDEN
5
EIGHT BELOW
8
thebestman
3
PATRIOT GAMES
6
Beauty and the BEAST
A LATTER-DAY TALE
9

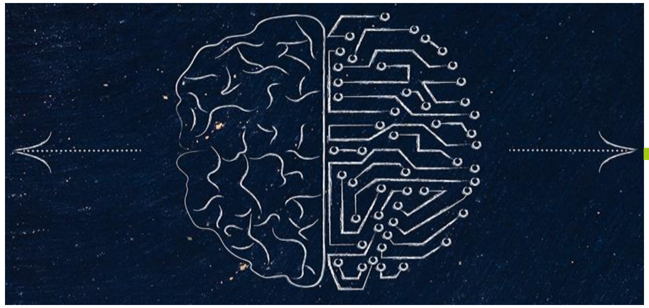
Evaluation: Performance

- Can Shared Perspectives **improve** the query process of items with Perceptual Attributes?
  - Simulate User Interaction with Current Similarity Search vs Shared Perspectives



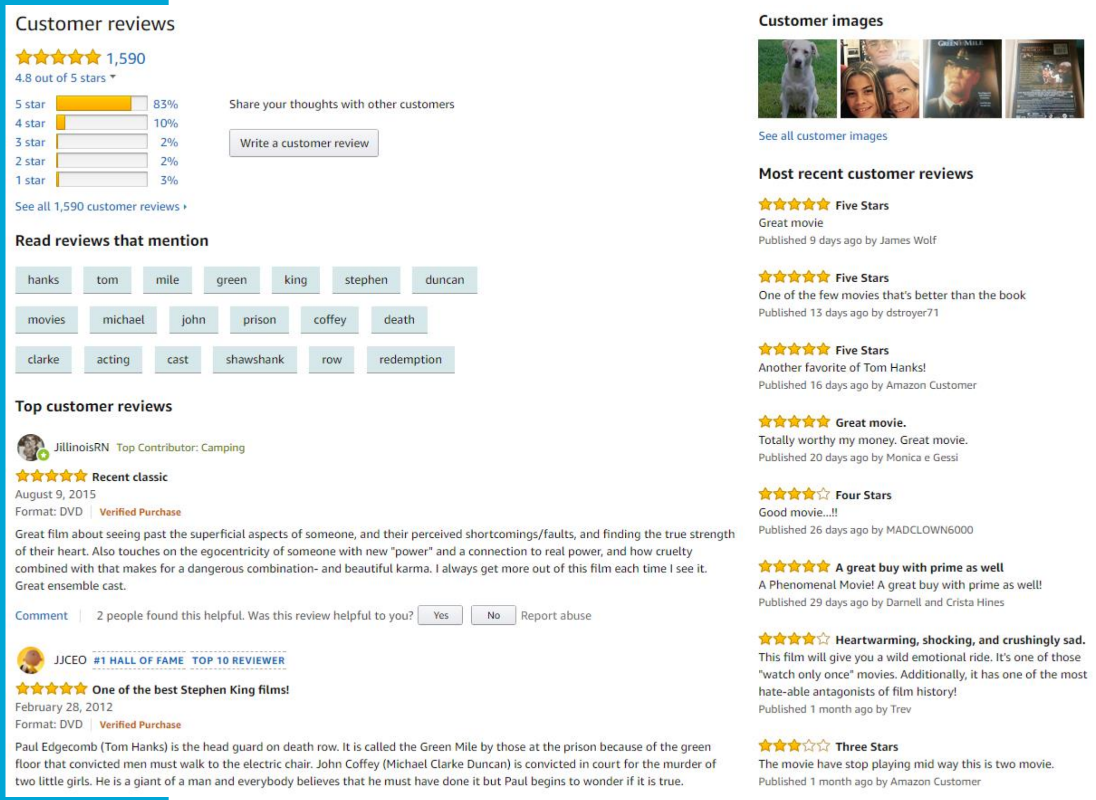
Current: Single Representation

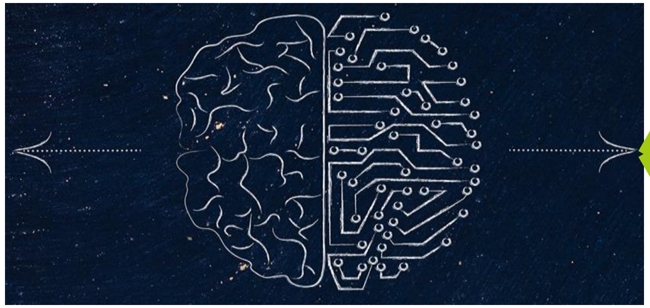




Acclaimed prison movie with Tom Hanks that everyone should watch

Proposed: Shared Perspectives





Emotional and touching movie

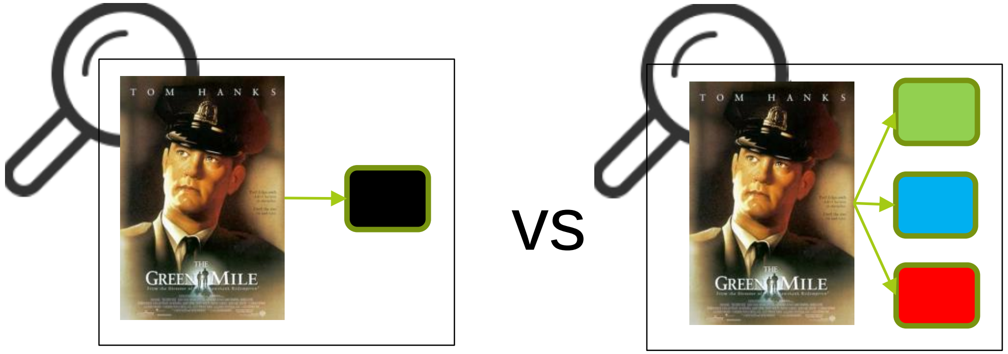
Great acting with good story from a book

Long but worth it, great movie w/ good actors

Evaluation: Performance

- Can Shared Perspectives **improve** the query process of items with Perceptual Attributes?
  - **Evaluate:** Simulate User with Current vs Proposed System (not SQL queries or Recommendation)
  - **Metric:** Query Iterations from Starting movie to Target movie (the only user input)
  - **Challenge:** Subjectivity, how to define movie pairs?

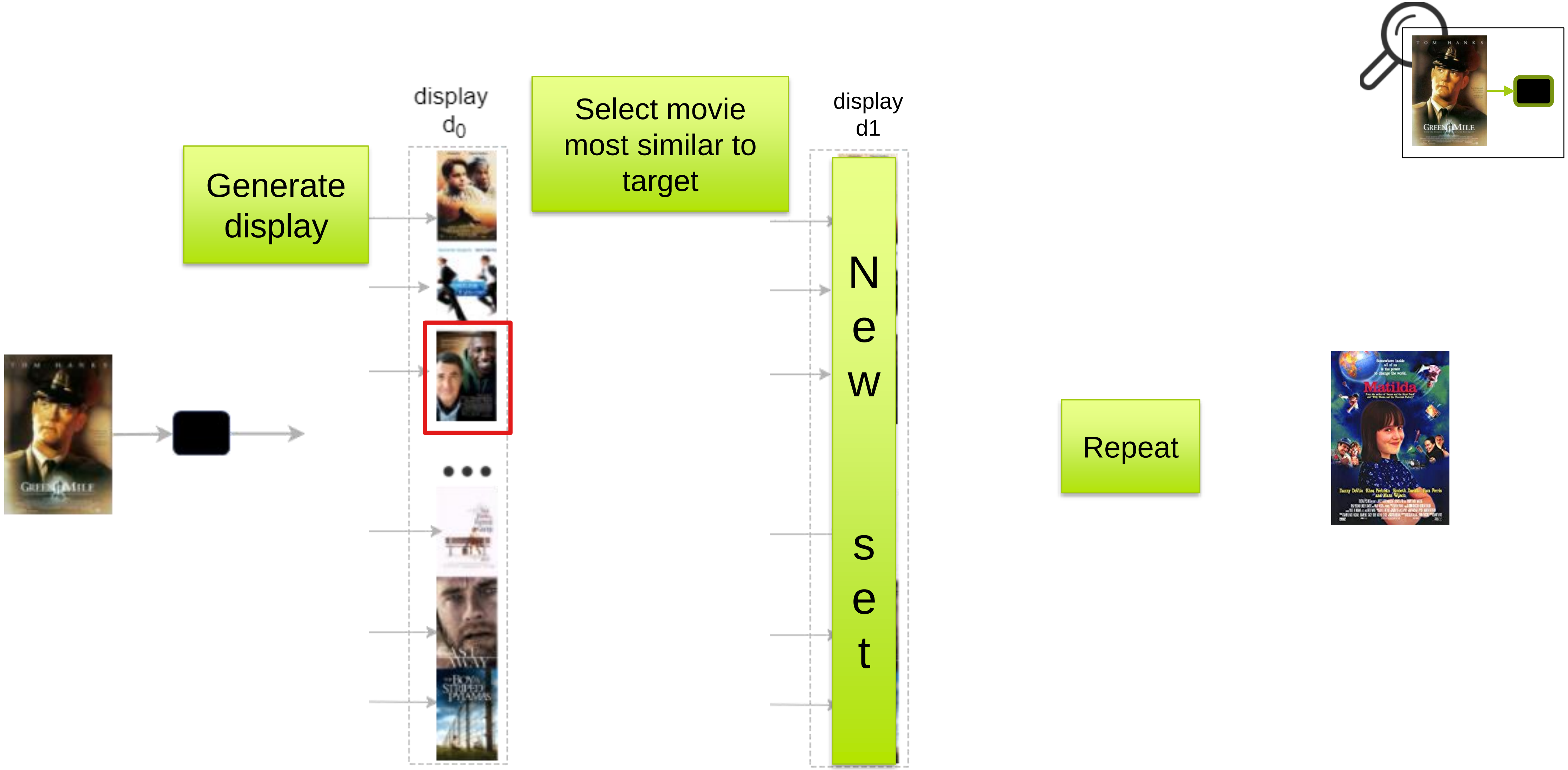
Evaluation: Performance



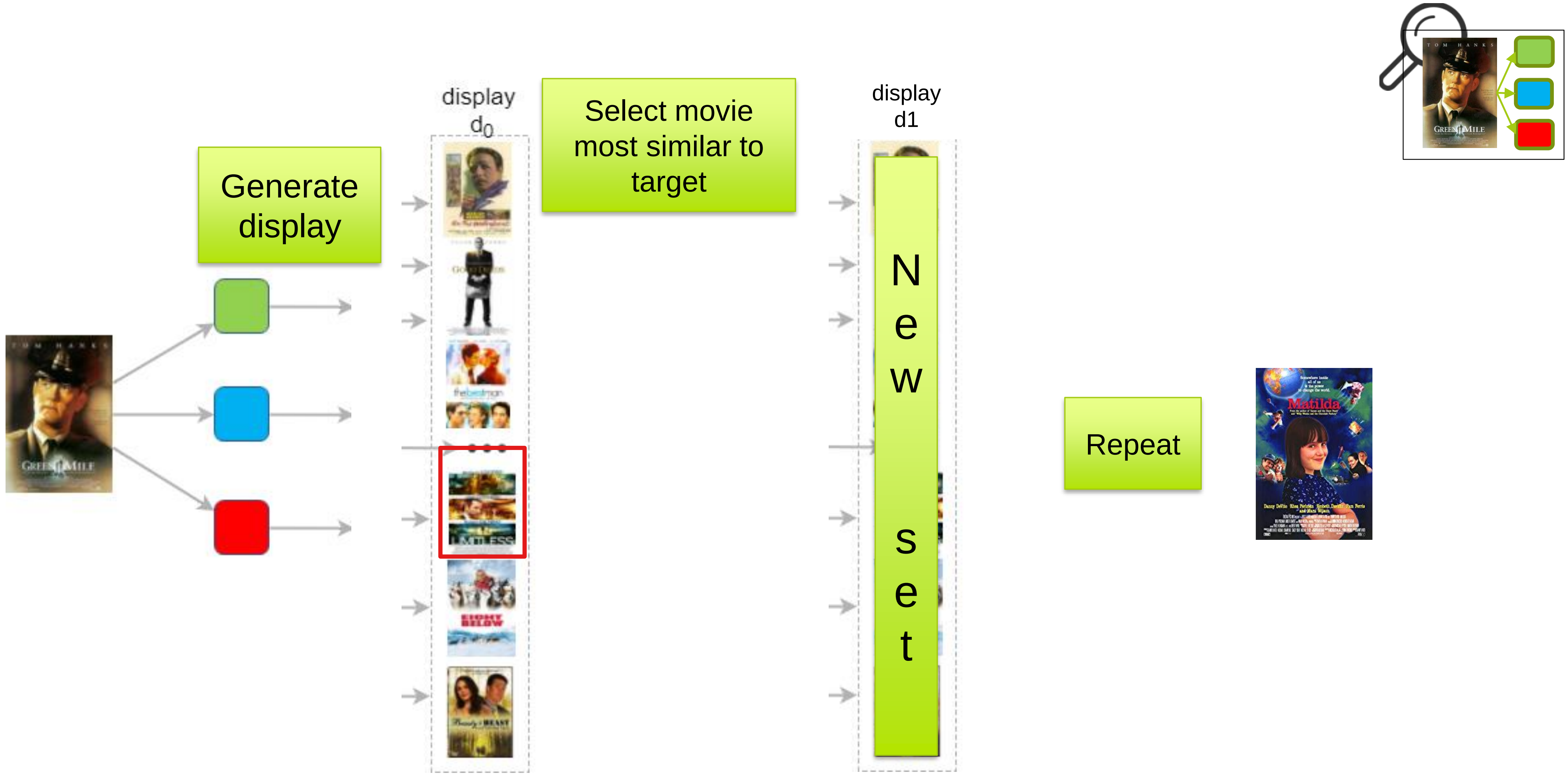
- Simulated QBE User Behavior
  - Predefined, random pairs of start and target movie
  - Count the query iterations
  - In average, SPs should outperform SR

Simulated User

Simulated User: Single Representation



Simulated User: Shared Perspectives



Results – 100 Pairs

Pairs	Single Representation	Shared Perspectives
100	40.58	32.54

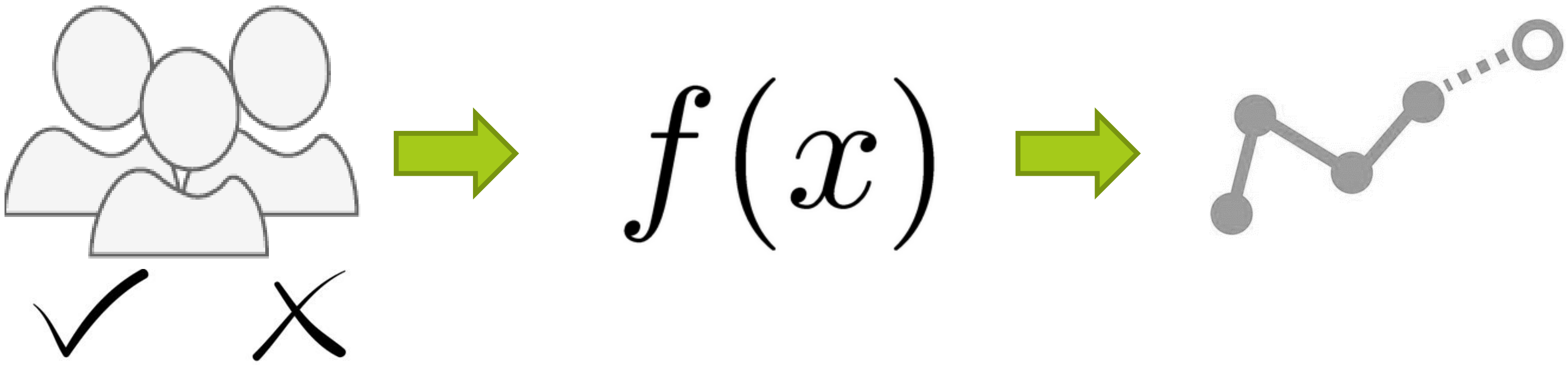
- In average, 30% fewer steps from start to target item using Shared Perspectives
- Main issue, pairs with many iterations (up to 200)

Qualitative Analysis

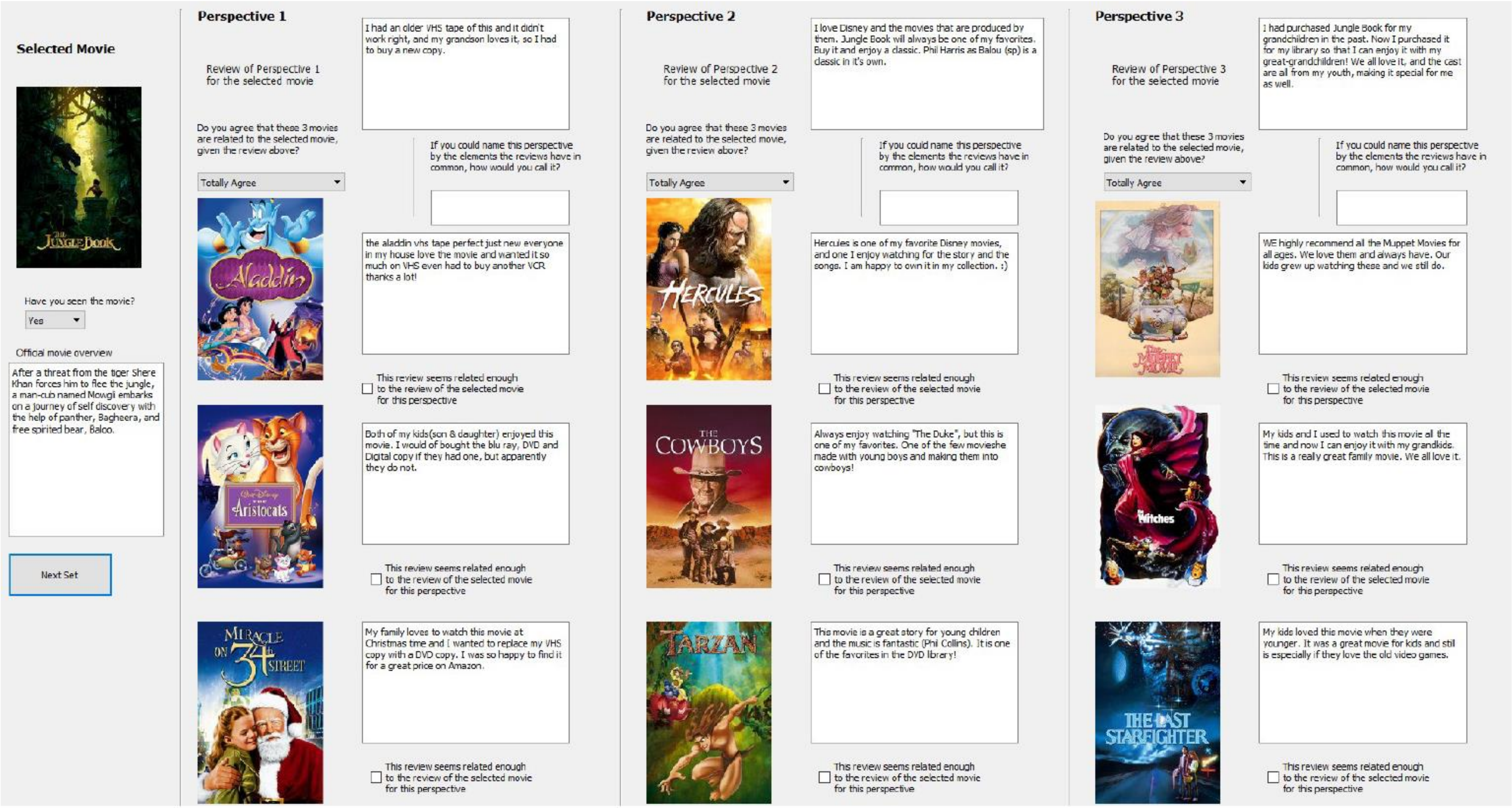
- 2 steps from romantic comedy to sci-fi because of "unexpected good acting, refreshing to the genre" ✓
- 96 steps from horror to musical because "it looks better on Blu-ray than VHS" ✗
- 200 steps from drama/comedy to romantic comedy because all SP of target "looked good but it's just alright" ✗

Evaluation: Semantic Quality

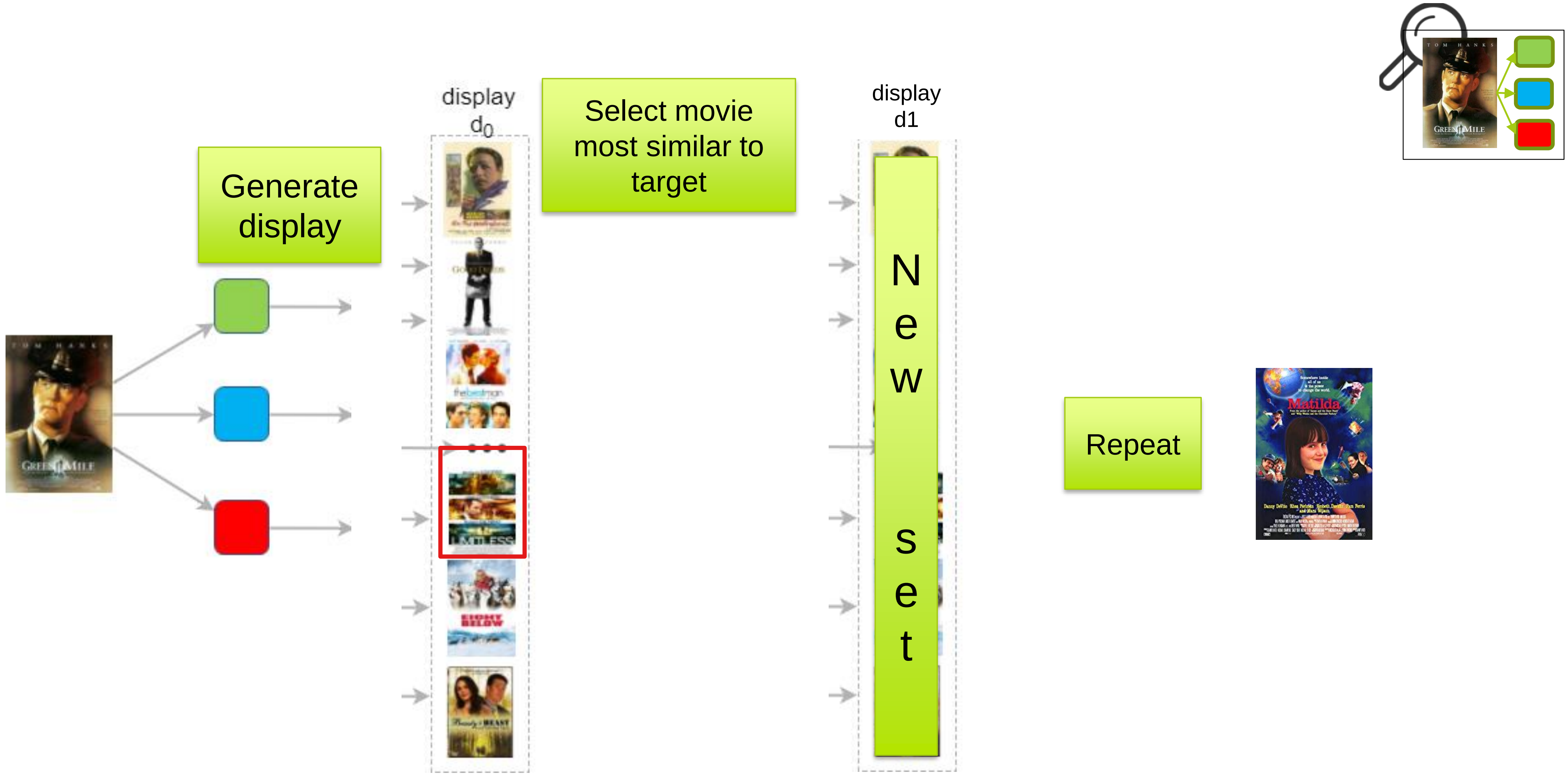
1. Ask users to rate some SPs to obtain their Usefulness Scores
2. Model this Score as a function of available data
3. Predict the Score of all SPs and Evaluate in Simulation



Usefulness Score: Asking Users



Simulated User: Shared Perspectives



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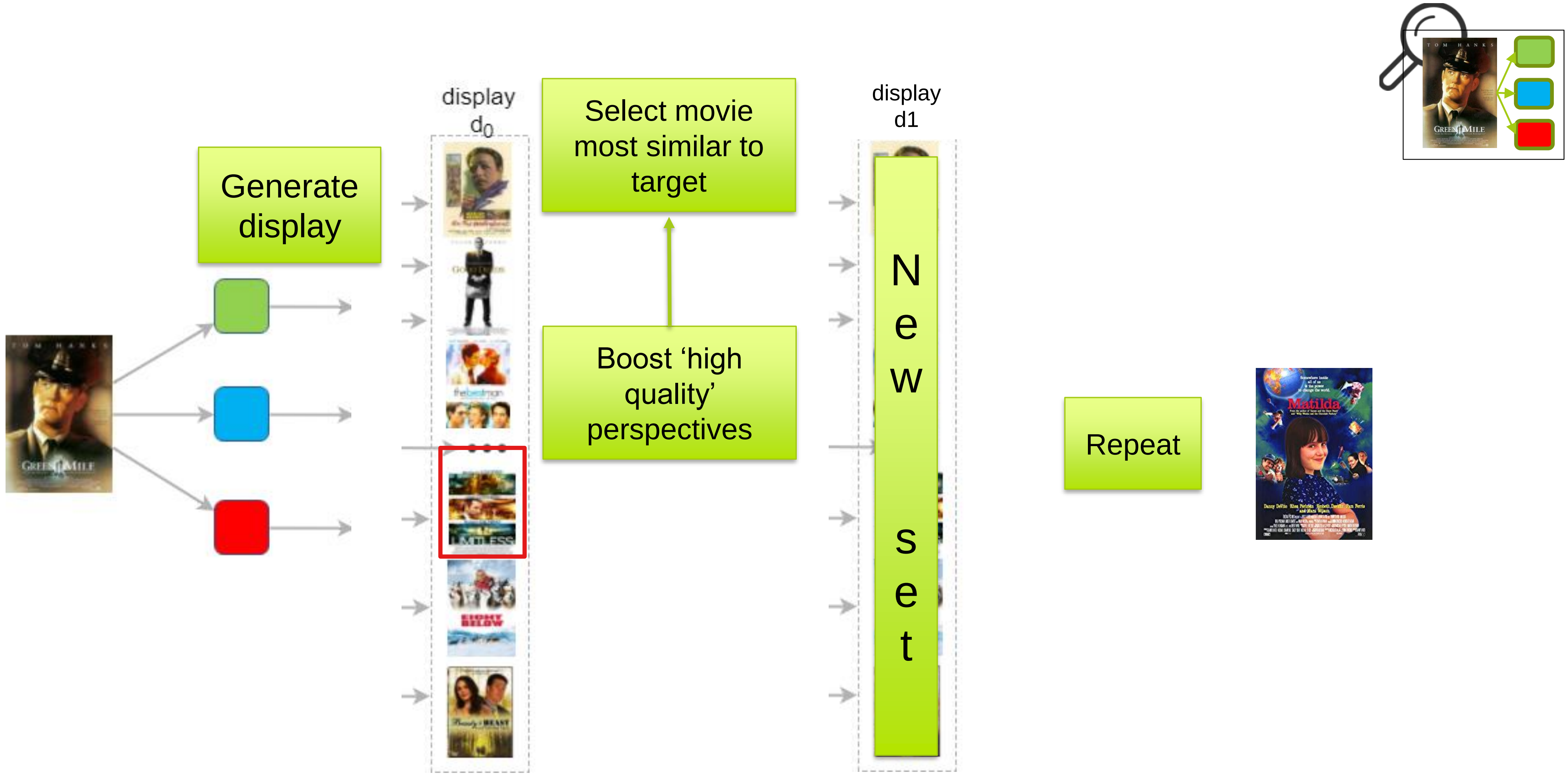

Results – 100 Pairs

- Optimize “selection” step:

Pairs	Single Representation	Three Shared Perspectives	Three SP + Usefulness
100	40.58	32.54	**31.56**

- Improvement for pairs with **unusually high** results
- More importantly: Implementation

In summary

- Some entity types require **perceptual features** to be effectively queryable
- Perceptual features can be **extracted** from user feedback
- User feedback is often conflicting
  - Current single-representations lose information!
  - Grouping perceptual features into **Shared Perspectives** covers this well
- Shared perspectives can be effectively used for **Query-by-Example similarity queries**

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Table of students' features

Aspect	Sum Importance	Avg Importance	mentions
storyline	346	4.67	74
acting	341	4.73	72
scenery	197	4.10	48
character	186	4.53	41
directing	177	4.43	40
sound	162	2.74	59
humor	160	3.01	53
originality	67	2.48	27
pace	49	3.06	16
cinematography	46	2.70	17
child friendliness	3	3	1
babes	2	2	1
morality	2	2	1
animal friendliness	1	1	1
Disney'ishness	1	1	1

K-MEDOIDS

- Spherical k-medoids for Document Embeddings: Partitions the available tuples into *k* clusters.
  - Cosine distance: angle between tuples
  - The medoid is the central datapoint
  - Determine *k* by applying the "elbow method": 3 clusters in average
  - Same number of clusters for all movies, for consistency