Introducing the Recommender

Calculating Weighted Averages

Beyond Average Ratings

- Average ratings may be flawed

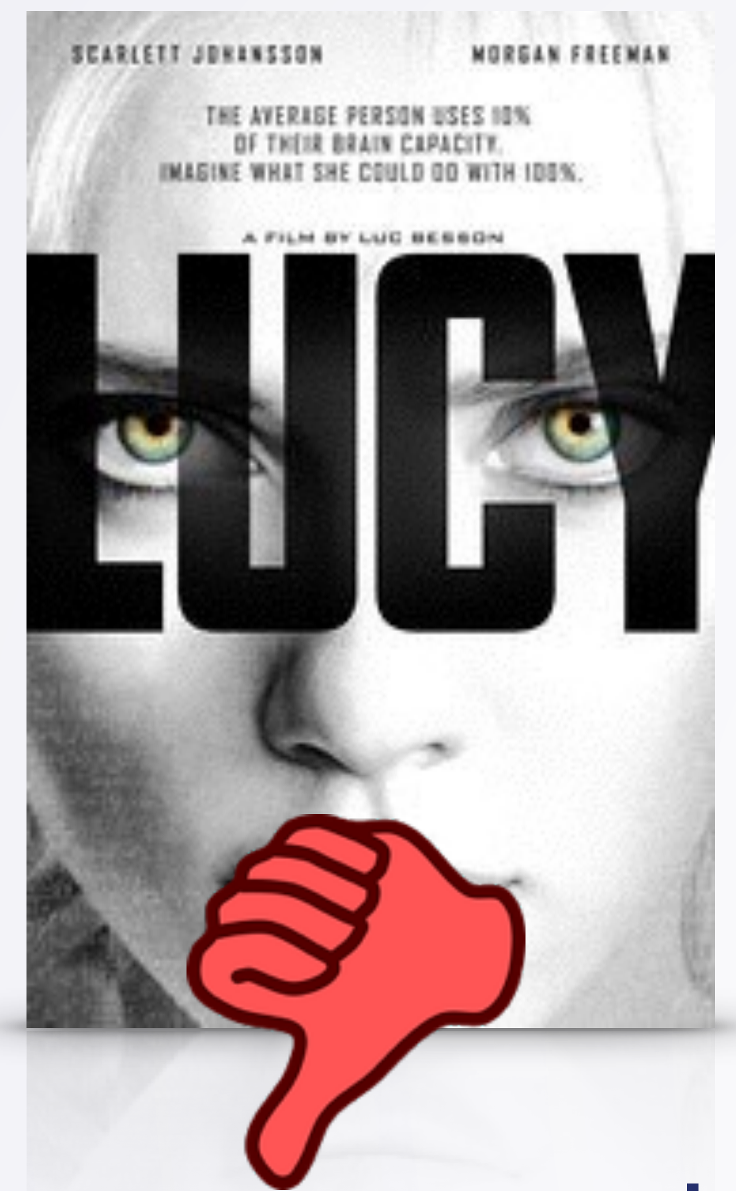
	Mission Impossible:	The Martian	Pitch Perfect 2	Star Wars: The Force Awakens
Chris	7	7	7	7
Sam	4	8	8	4
Morgan	9	8	7	7
Jessie	6	3	4	8
total	26	26	26	26

Beyond Average Ratings

- Average ratings may be flawed
  - Treat each rater equally, but I may be more like Morgan than Jessie in what I like to watch
- Collaborative Filtering Averages
  - Weight raters differently

	Mission Impossible:	*The Martian*	*Pitch Perfect 2*	*Star Wars: The Force Awakens*
Chris	*7*	*7*	*7*	*7*
Sam	*4*	*8*	*8*	*4*
Morgan	*9*	*8*	*7*	*7*
Jessie	*6*	*3*	*4*	*8*
total	*26*	*26*	*26*	*26*

Collaborative Recommendations


SCARLETT JOHANSSON
MORGAN FREEMAN
THE AVERAGE PERSON USES 10% OF THEIR BRAIN CAPACITY. IMAGINE WHAT SHE COULD DO WITH 100%.
A FILM BY LUC BESSON
LUCY

- Find raters more like me, use their ratings
    - Weight recommendations from Chris if Chris likes movies I like, dislikes those I don't.

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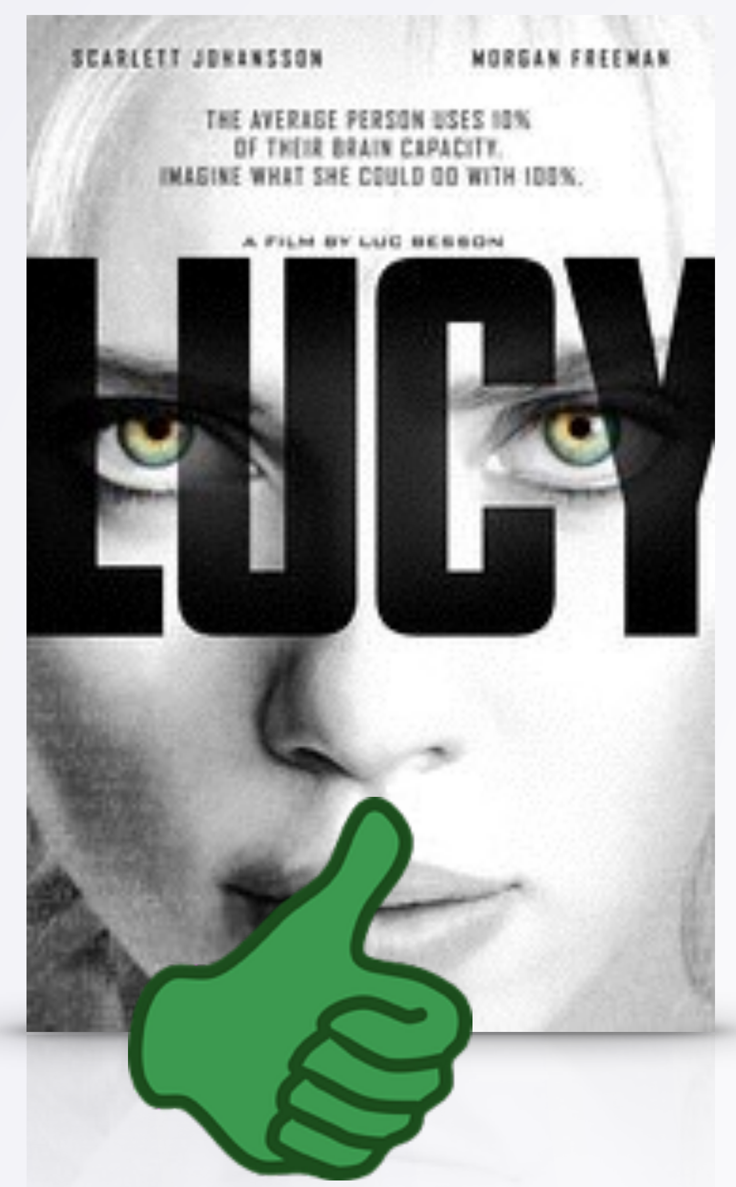
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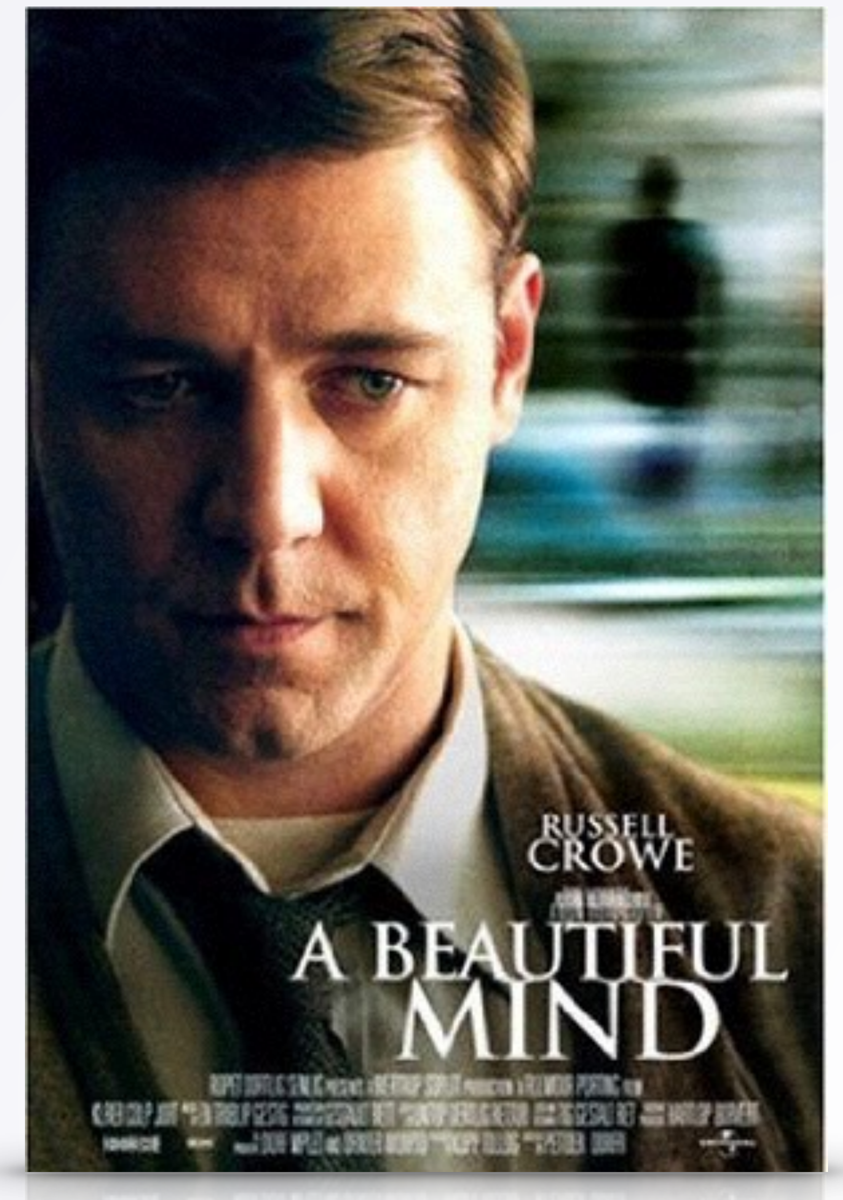
- Find raters more like me, use their ratings
  - Weight recommendations from Chris if Chris likes movies I like, dislikes those I don't.
  - Don't weight Sam's recommendations if we share little in common

Collaborative Recommendations



- Value Chris' ratings more than Sam's!
    - Chris likes A Beautiful Mind, I haven't seen it!!
    - Time to think about seeing the movie

Weighted Averages

	The Fly	*Spider-Man*	*Butterfly Effect*	*Beetlejuice*
20, Chris	*8*	*5*	*7*	
10, Sam		*7*	*8*	*9*
5, Morgan	*6*	*6*	*6*	*6*
Average	*14/2 = 7*	*18/3 = 6*	*21/3 = 7*	*15/2 = 7.5*

- Conceptually two changes to averages
  - Only count N raters "close" to me
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- Which movie has the highest average?

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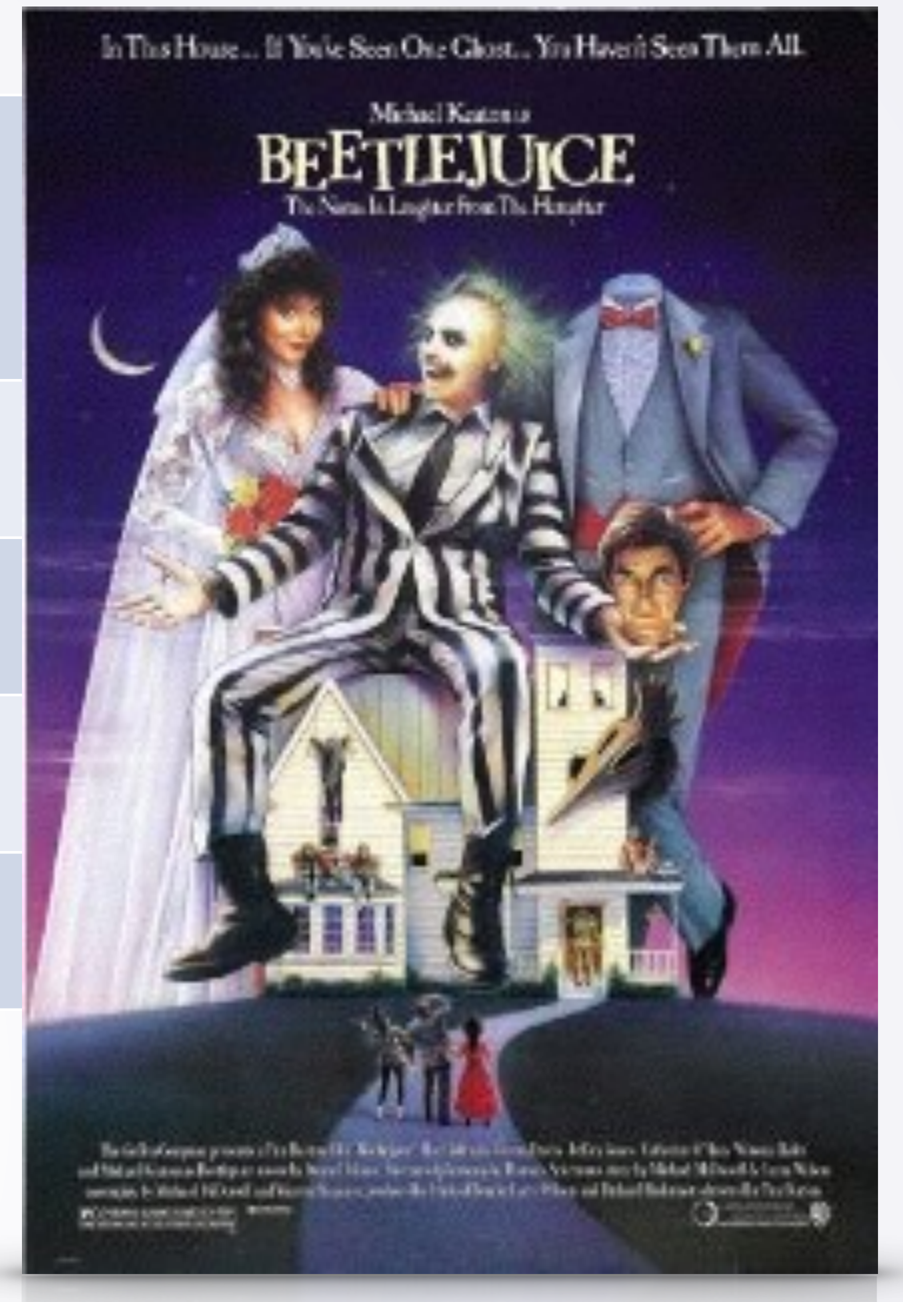
In This House... If You've Seen One Ghost... You Haven't Seen Them All.
Michael Keaton is
BEETLEJUICE
The Name In Laughter From The Hereafter

- Conceptually two changes to averages
  - Only count N raters "close" to me
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- Which movie has the highest average?
- Chris is more like me than Morgan, value more!

Weighted Averages in Detail

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Weighted	*160+30* *95.0*	*100+70+30* *66.67*	*140+80+30* *83.3*	*90+30* *60.0*

- Use "closeness" weight for each rater
  - Multiply ratings by the corresponding weight
  - Movies not rated by everyone, what to watch?

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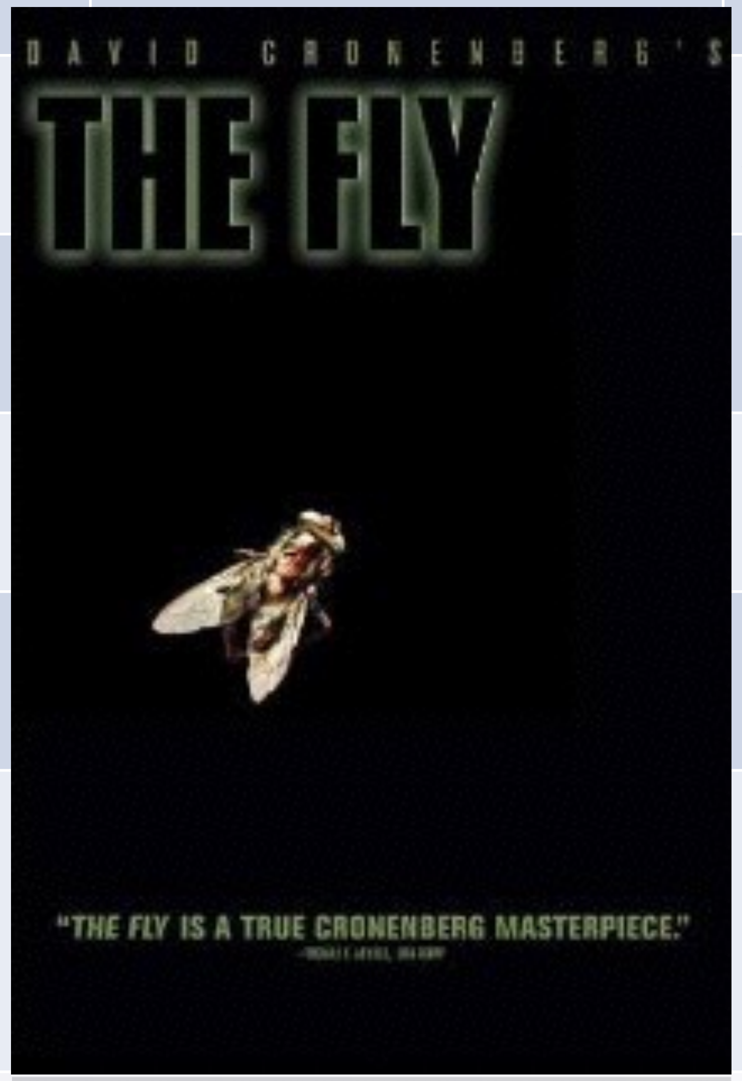

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Calculating Closeness

- Each rater represented by vector of ratings
  - Sam **`[0,5,2,7,0,8,1]`**
  - Chris **`[6,7,5,0,0,0,9]`**
  - Me **`[2,6,0,4,5,4,6]`**
- Sam and me: **`5*6+7*4+8*4+1*6 = 96`**

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- Sam and me: **`5*6+7*4+8*4+1*6 = 96`**
- Chris and me: **`6*2+7*6+9*6 = 108`**
- This is dot product, measure of closeness in mathematical vector space
  - Sum of rating products for each movie rated

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What Does "Close" Mean?

- To represent 1-10 scale, we adjust ratings
  - Ratings of 1 and 2 compared to 8 and 9
    - (1-5)*(2-5) = 12, and (8-5)*(9-5) = 12
  - Sam `[ *,0,-3, 2,*, 3,-4]` `[0,5,2,7,0,8,1]`
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- Chris and me: `1*-3 + 2*1 + 4*1 = 3`
- Standard: center by subtracting middle rating

Closeness with getSimilarities

- Find raters near me, call **`getSimilarities`**

```
private ArrayList<Rating> getSimilarities(String id) {
     ArrayList<Rating> list = new ArrayList<Rating>();
     Rater me = RaterDatabase.getRater(id);
     for(Rater r : RaterDatabase.getRaters()) {
       // add dot_product(r,me) to list if r != me
     }
     Collections.sort(list, Collections.reverseOrder());
     return list;
    }
```

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  - List of raters sorted in reverse order

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- Similar to **`getAverages`**, specific to a Rater

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Presenting Recommendations

- Display movies already seen?

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0  332.43   Rush
1  327.67   Interstellar
2  324.14   Whiplash
3  323.29   Gone Girl
4  321.17   The Fault in Our Stars
5  320.00   The Judge
6  318.29   Gravity
7  312.83   Dallas Buyers Club
8  306.17   The Secret Life of Walter Mitty
9  305.50   The Grand Budapest Hotel
10 304.14  *** Mission: Impossible - Rogue Nation
11 301.83   The Imitation Game
12 299.86   Birdman or (The Unexpected Virtue of Ignorance)
13 291.22  *** American Hustle
14 290.25  *** Kingsman: The Secret Service
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- Print top 15? Print weighted average?

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    - Movie information? HTML?

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7  312.83   Dallas Buyers Club
8  306.17   The Secret Life of Walter Mitty
9  305.50   The Grand Budapest Hotel
10 304.14  *** Mission: Impossible - Rogue Nation
11 301.83   The Imitation Game
12 299.86   Birdman or (The Unexpected Virtue of Ignorance)
13 291.22  *** American Hustle
14 290.25  *** Kingsman: The Secret Service
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