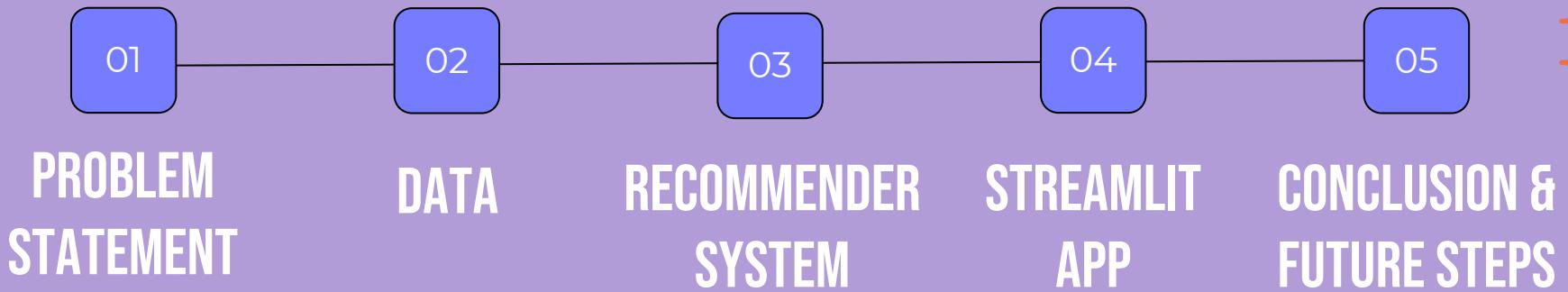


PERSONALIZED MOVIE RECOMMENDER

Ankita Patil

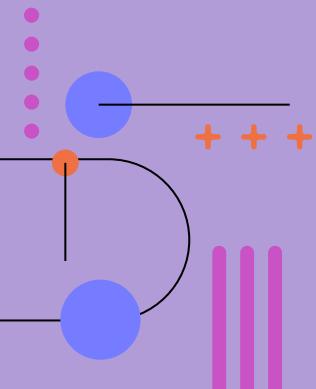


FLOW



PROBLEM STATEMENT

Given a database of users and their movie ratings, can we build a recommender that predicts a ranked list of movie recommendations that the users would like to watch?



DATA



USER DATA

MovieLens Data

610 Users

100,000 Ratings

9700 Movies



MOVIES DATA

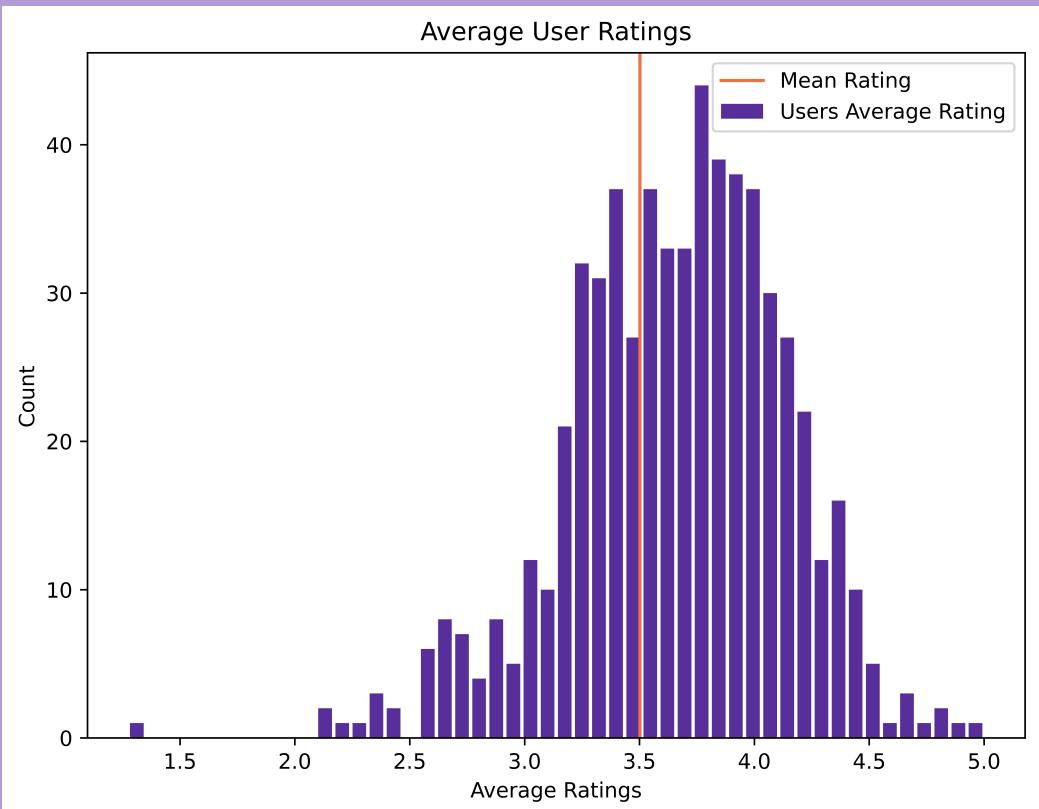
IMDb & TMDB

Rating, Plot synopsis,

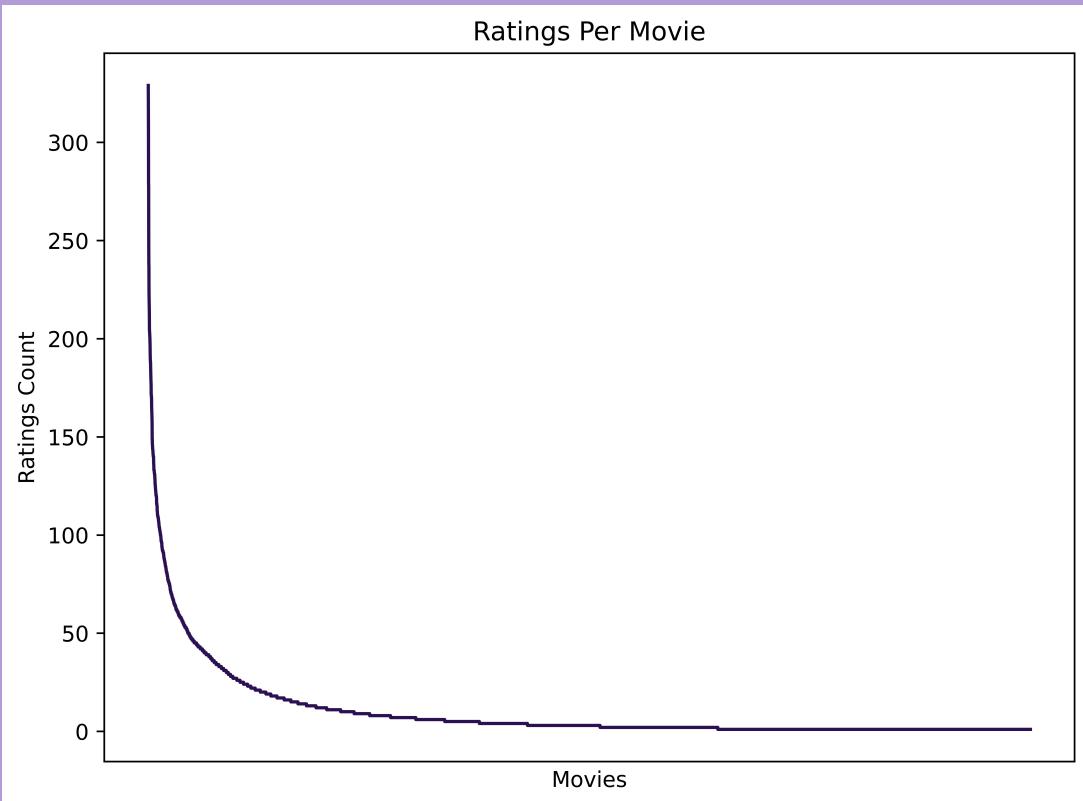
Tagline,

Keywords, Cast & Crew

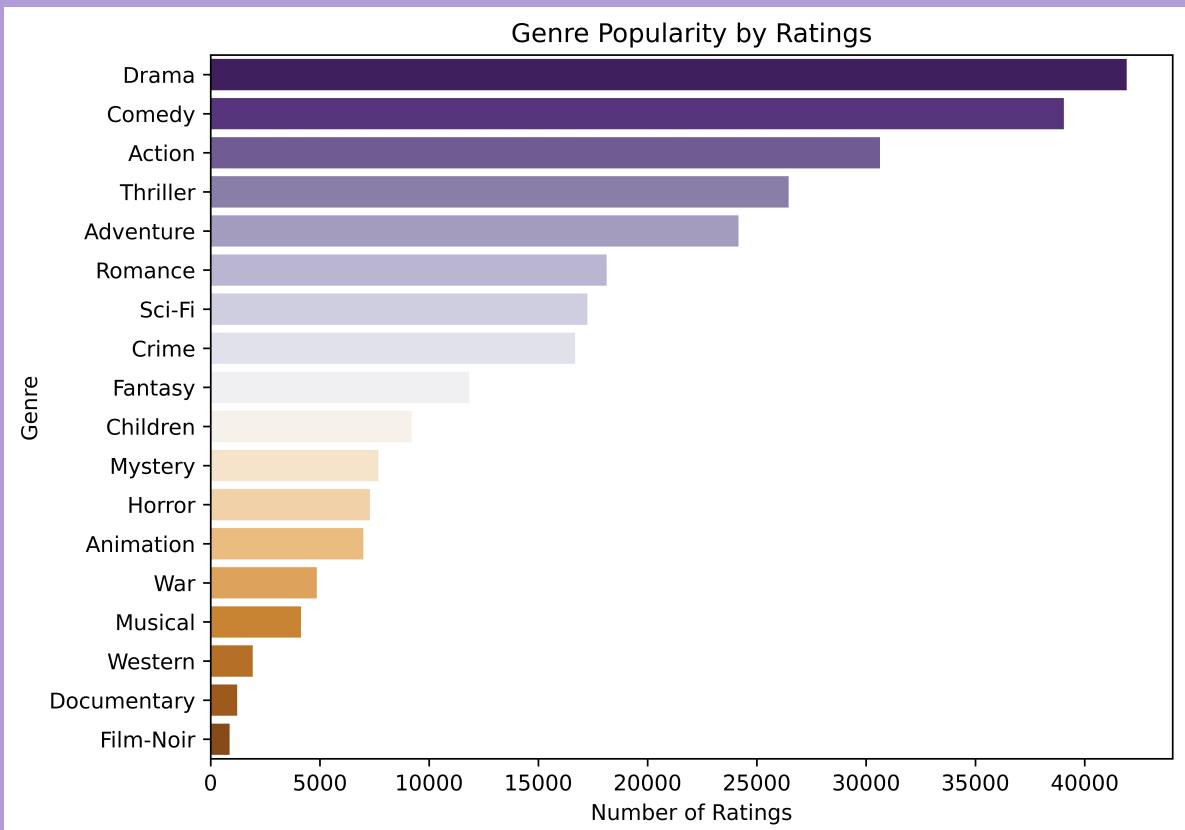
DATA



DATA



DATA



INFORMATION FILTERING

01

POPULARITY-BASED
FILTERING

02

CONTENT-BASED
FILTERING

03

COLLABORATIVE
FILTERING

POPULARITY-BASED FILTERING

- Recommend most popular movies
- No personalization

Rank & Title	IMDb Rating
1. The Shawshank Redemption (1994)	★ 9.2
2. The Godfather (1972)	★ 9.2
3. The Dark Knight (2008)	★ 9.0
4. The Godfather: Part II (1974)	★ 9.0
5. 12 Angry Men (1957)	★ 8.9
6. Schindler's List (1993)	★ 8.9
7. The Lord of the Rings: The Return of the King (2003)	★ 8.9
8. Pulp Fiction (1994)	★ 8.9
9. The Lord of the Rings: The Fellowship of the Ring (2001)	★ 8.8
10. The Good, the Bad and the Ugly (1966)	★ 8.8

CONTENT-BASED FILTERING

- Principle of similar content
- Feature Engineering movie features – genre, plot synopsis, keywords, cast and crew
- Natural Language Processing (TF-IDF)
- Sentiment Analysis
- Cosine Similarity

CONTENT-BASED RECOMMENDATIONS

rating	title	genres
3.0	Copycat (1995)	Crime Drama Horror Mystery Thriller
3.5	First Knight (1995)	Action Drama Romance
0.5	Muriel's Wedding (1994)	Comedy
0.5	So I Married an Axe Murderer (1993)	Comedy Romance Thriller
3.5	Bridge on the River Kwai, The (1957)	Adventure Drama War
3.5	Grease (1978)	Comedy Musical Romance
4.5	Last of the Mohicans, The (1992)	Action Romance War Western
3.5	Sneakers (1992)	Action Comedy Crime Drama Sci-Fi
0.5	Chasing Amy (1997)	Comedy Drama Romance
3.5	Untouchables, The (1987)	Action Crime Drama
3.5	Romancing the Stone (1984)	Action Adventure Comedy Romance
4.5	South Park: Bigger, Longer and Uncut (1999)	Animation Comedy Musical
1.5	Talented Mr. Ripley, The (1999)	Drama Mystery Thriller
5.0	Shrek (2001)	Adventure Animation Children Comedy Fantasy Ro...
5.0	Lord of the Rings: The Fellowship of the Ring,...	Adventure Fantasy

	title	genres	content_similarity
	Pocahontas (1995)	Animation Children Drama Musical Romance	0.556938
	Hobbit: An Unexpected Journey, The (2012)	Adventure Fantasy	0.536777
	Monty Python and the Holy Grail (1975)	Adventure Comedy Fantasy	0.516482
	Shrek 2 (2004)	Adventure Animation Children Comedy Musical Ro...	0.498551
	Jewel of the Nile, The (1985)	Action Adventure Comedy Romance	0.496085
	Merlin (1998)	Action Adventure Drama Fantasy Romance	0.476997
	Hobbit: The Desolation of Smaug, The (2013)	Adventure Fantasy	0.470085
	The Hobbit: The Desolation of Smaug, The (2014)	Adventure Fantasy	0.465219
	Shrek Forever After (a.k.a. Shrek: The Final C...	Adventure Animation Children Comedy Fantasy	0.455850
	Lord of the Rings: The Two Towers, The (2002)	Adventure Fantasy	0.445944

CONTENT-BASED FILTERING

ADVANTAGES

- No data required on other users
- Can handle new item introduction
- Good at handling cold start problem

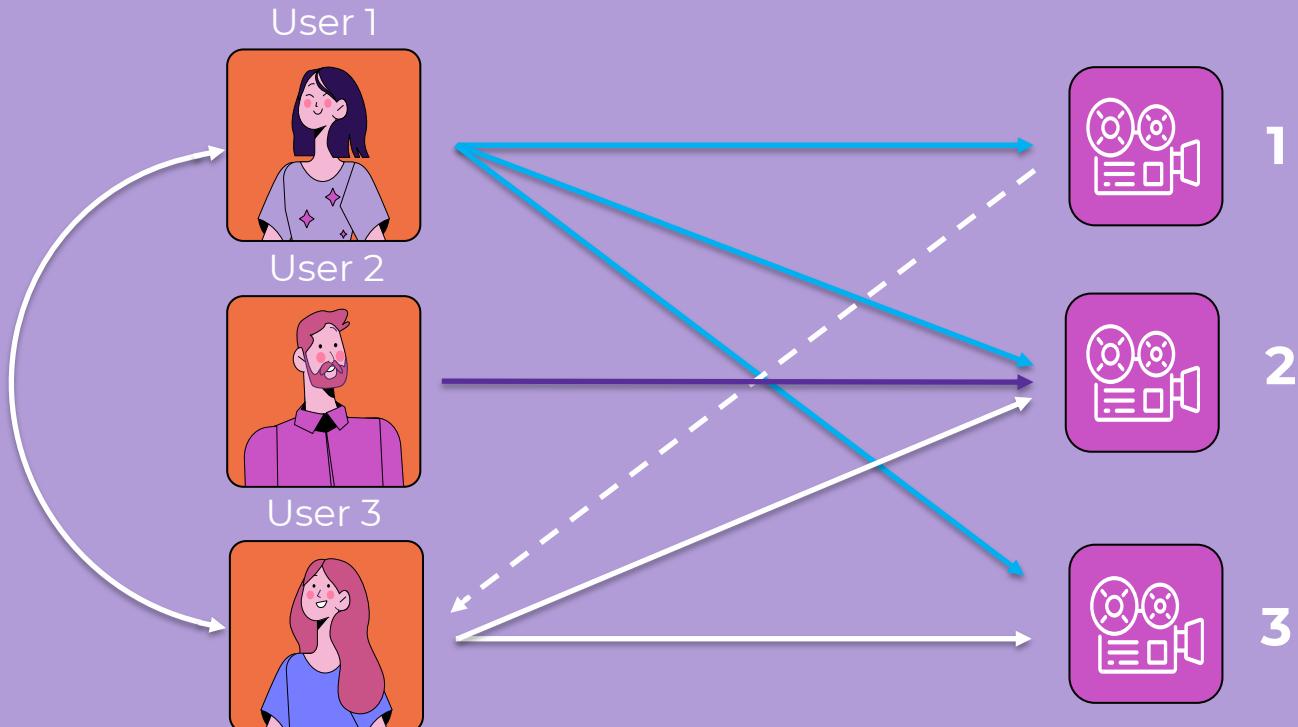
DISADVANTAGES

- Performance dependent on subject matter expertise
- Lacks diversity in recommendations
- Lacks ability to assess item quality

COLLABORATIVE FILTERING

- Principle of similar users
- User-based & item-based collaboration
- Building block - user-item interaction data

USER-BASED COLLABORATIVE FILTERING



USER-BASED COLLABORATIVE RECOMMENDATIONS

rating	title	genres
3.0	Copycat (1995)	Crime Drama Horror Mystery Thriller
3.5	First Knight (1995)	Action Drama Romance
0.5	Muriel's Wedding (1994)	Comedy
0.5	So I Married an Axe Murderer (1993)	Comedy Romance Thriller
3.5	Bridge on the River Kwai, The (1957)	Adventure Drama War
3.5	Grease (1978)	Comedy Musical Romance
4.5	Last of the Mohicans, The (1992)	Action Romance War Western
3.5	Sneakers (1992)	Action Comedy Crime Drama Sci-Fi
0.5	Chasing Amy (1997)	Comedy Drama Romance
3.5	Untouchables, The (1987)	Action Crime Drama
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5.0	Shrek (2001)	Adventure Animation Children Comedy Fantasy Ro...
5.0	Lord of the Rings: The Fellowship of the Ring,...	Adventure Fantasy

	title	genres	user_similarity
	Jungle Book, The (1967)	Animation Children Comedy Musical	1.768116
	Star Wars: Episode IV - A New Hope (1977)	Action Adventure Sci-Fi	1.574452
	Close Encounters of the Third Kind (1977)	Adventure Drama Sci-Fi	1.307692
	Rocky (1976)	Drama	1.307692
	Moby Dick (1956)	Drama	1.307692
	V for Vendetta (2006)	Action Sci-Fi Thriller	1.268116
	Terminator 2: Judgment Day (1991)	Action Sci-Fi	1.268116
	Indiana Jones and the Last Crusade (1989)	Action Adventure	1.268116
	Driving Miss Daisy (1989)	Drama	1.268116
	Star Wars: Episode V - The Empire Strikes Back...	Action Adventure Sci-Fi	1.268116

COLLABORATIVE FILTERING

ADVANTAGES

- Independent of subject matter expertise
- Diverse recommendations
- Captures change in user interests over time

DISADVANTAGES

- Cold start problem
- Sparsity of data
- Popularity bias
- Recommendation quality dependent on historical data

HYBRID RECOMMENDER

- Combination of content-based & collaborative filtering
- Relevance vs Diversity tradeoff
- Computes content-based and user-based recommendations separately and combines them
- Builds on strengths and addresses flaws of individual filtering techniques

HYBRID RECOMMENDER

title	genres	content_similarity	user_similarity	similarity_score
Jungle Book, The (1967)	Animation Children Comedy Musical	0.228229	1.768116	0.998172
Star Wars: Episode IV - A New Hope (1977)	Action Adventure Sci-Fi	0.182753	1.574452	0.878602
Monty Python and the Holy Grail (1975)	Adventure Comedy Fantasy	0.516482	1.117117	0.816800
Indiana Jones and the Last Crusade (1989)	Action Adventure	0.234489	1.268116	0.751302
Shrek 2 (2004)	Adventure Animation Children Comedy Musical Ro...	0.498551	0.984649	0.741600
Rocky (1976)	Drama	0.142002	1.307692	0.724847
Rebecca (1940)	Drama Mystery Romance Thriller	0.170906	1.268116	0.719511
Lord of the Rings: The Two Towers, The (2002)	Adventure Fantasy	0.445944	0.984649	0.715297
Driving Miss Daisy (1989)	Drama	0.147052	1.268116	0.707584
Schindler's List (1993)	Drama War	0.269673	1.117117	0.693395

Personalized Movie Recommendations

How many movies would you like to rate?

5 - +

Movie title

2001: A Space Odyssey (1968) ▼

Rate the movie

0.5 5

Movie title

Star Wars: Episode III - Revenge of the Sith (2005) ▼

Rate the movie

0.5 5

Movie title

Duellists, The (1977) ▼

Rate the movie

0.5 5

Movie title

Philadelphia Story, The (1940) ▼

Rate the movie

0.5 5

Movie title

Batman Returns (1992) ▼

Rate the movie

0.5 5

STREAMLIT APP

	Movie Title	genres	IMDb Rating	TMDB rating	Similarity Score
0	Hot Shots! Part Deux (1993)	Action Comedy War	6.6000	6.2000	0.9213
3	Seven Samurai (Shichinin no samurai) (1954)	Action Adventure Drama	8.7000	8.2000	0.9177
6	Naked Gun 2 1/2: The Smell of Fear, The (1991)	Comedy	6.9000	6.6000	0.9077
1	Psycho (1960)	Crime Horror	8.5000	8.3000	0.8709
5	For a Few Dollars More (Per qualche dollaro in più) (1965)	Action Drama Thriller Western	8.3000	7.8000	0.7724
9	Deadpool (2016)	Action Adventure Comedy Sci-Fi	8.0000	7.4000	0.7711
4	Bull Durham (1988)	Comedy Drama Romance	7.1000	6.6000	0.7690
7	Stranger than Fiction (2006)	Comedy Drama Fantasy Romance	7.6000	7.1000	0.7584
8	Moon (2009)	Drama Mystery Sci-Fi Thriller	7.8000	7.6000	0.7003
2	Driving Miss Daisy (1989)	Drama	7.4000	7.0000	0.6795

Get Recommendations

EVALUATION

- Evaluation of recommendation systems difficult
- Success metric depends on user reaction on recommendation
- Constant experimentation through A/B Testing

CONCLUSIONS

- Hybrid recommender gives more accurate recommendations than individual filtering techniques
- Partially overcomes weaknesses of individual filtering techniques like cold start, inadequate diversity and subject-matter expertise dependency
- Limitations on speed and scalability still persist

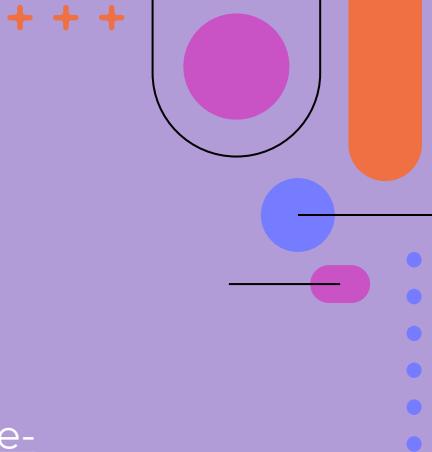
FUTURE STEPS

- Collect more user data
- Use model-based collaborative filtering to increase computational speed and improve scalability
- Improve recommendation engine by using A/B testing in the app

THANK YOU!

Do you have any questions?

patilankita2491@gmail.com



RESOURCES

Date:

- <https://grouplens.org/datasets/movielens/latest/>
- <https://www.kaggle.com/datasets/rounakbanik/the-movies-dataset>
- <https://www.imdb.com>

App:

- Fdghkjdhf

Slides:

- This presentation template was created by Slidesgo, including icons by Flaticon, infographics and images by Freepik

