



Holistic AI



The  
Alan Turing  
Institute

# Bias in Recommender Systems Part I

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# Contents

- **Part I – Introduction to Recommender Systems**
- Part II – Fairness in Recommender Systems
- Part III – Measuring Bias in Recommender Systems
- Part IV – Mitigating Bias in Recommender Systems



# I - Introduction

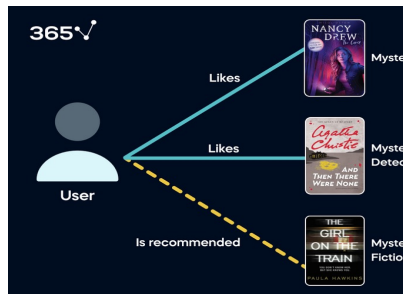
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- 1) Introduce Recommender Systems as a form of AI.
- 2) Provide real world examples to contextualize the ideas.
- 3) Motivate the importance of fairness in Recommendation.



# What is a recommender system?

- A recommender system is a subclass of information filtering system that seeks to predict the rating a user would give to an item.
- The predicted ratings are then used to recommend new items to each user, that they are likely to enjoy/buy/interact with.
- These systems are trained using the past interactions of the users.



# Interaction matrix

- The training data of a Recommender system is often displayed as a matrix, where each row corresponds to a user and each column corresponds to an item.
- For each rating that was given from a user to an item, we have a non-Nan entry of the interaction matrix (for simplicity assume the rating is from 1 to 5).

				
John 	5	1	3	5
Tom 	?	?	?	2
Alice 	4	?	3	?



# Example 1: E-Commerce

- A multinational E-Commerce firm provides recommendations on its website which are tailored to each individual consumer.
- Such recommendations are based upon each consumer's purchase history, search history and current basket.
- The E-Commerce firm serves up recommendations that are both sold directly by the firm itself and sold directly by third party sellers.
- Question: what kind of biases might be associated to this?
- E.g., Amazon



## Example 2: Job Recommendation

- A website specialized in job browsing and job recommendation attempts to connect employers with employees.
- Based on information stored about the users (interests, cv, personal information, etc.), the platform recommends a dozen jobs to each user weekly.
- Question: what kind of biases might be associated to this?



# Example 3: Hotel Booking

- A phone app can be downloaded to more easily find and book hotels.
- Given a search (location, budget, time, etc.), the app will output a list of hotels fitting the criterions.
- Question: what kind of biases might be associated to this?
- E.g., Booking.com





# Example 4: Movie Streaming

- A website is specialized in movie streaming
- Each user will be provided new movie recommendations based on their recently watched movies
- Question: what kind of biases might be associated to this?
- E.g., Netflix



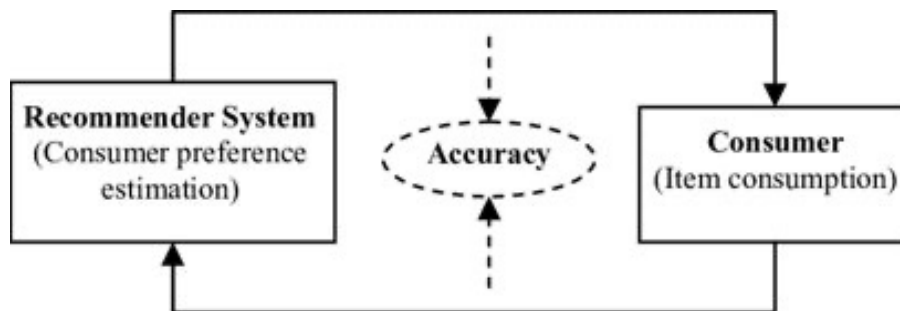
# Motivation 1 (they are everywhere)

- Recommender systems are a very widespread form of AI used to help users discover new products, books, news, music, movies, courses, restaurants, etc.
- Basically, they are everywhere!



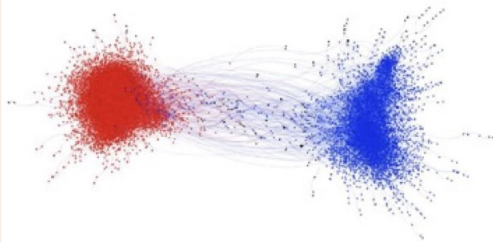
# Motivation 2 (the feedback loops)

- There are feedback loops between humans and the recommender systems.
- Recommender systems have the potential of skewing (exacerbating) patterns that already exist in society.



# Motivation 3 (echo chambers)

- One example and consequence of feedback loops is the creation of echo chambers
- These are common on social media website, where two groups with opposite views are constantly fed information that reinforces their beliefs. This leads to increasingly polarized views.



# Motivation 4 (information asymmetry)

- In some cases, there is a big asymmetry between the stakes at play of the owner of the recommender system and the users
- For instance, in job recommendation, a user being recommended a job can change the course of their lives.
- On the other hand, the job recommendation provider only cares that their recommendation engine is performing in a statistical sense.



# Conclusion

- We have introduced recommender systems as a form of AI
- We have provided some examples which will be useful to contextualize our ideas in the next section
- We have given some motivation for the critical importance of fairness in recommendation



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# Next

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# References

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