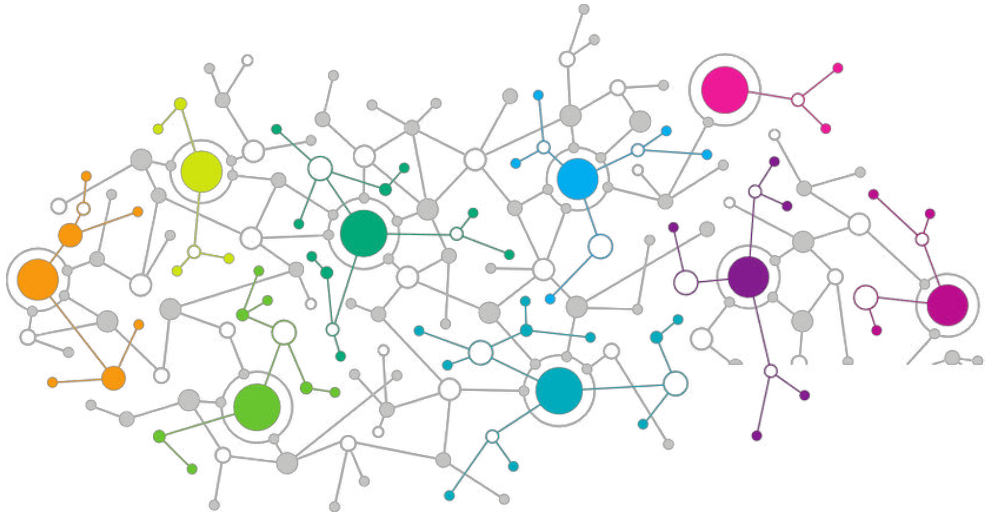
Data Science

Module-10

Recommendation Engine



Agenda

01 RECOMMENDATION ENGINE

02 TYPES OF RECOMMENDATION ENGINES

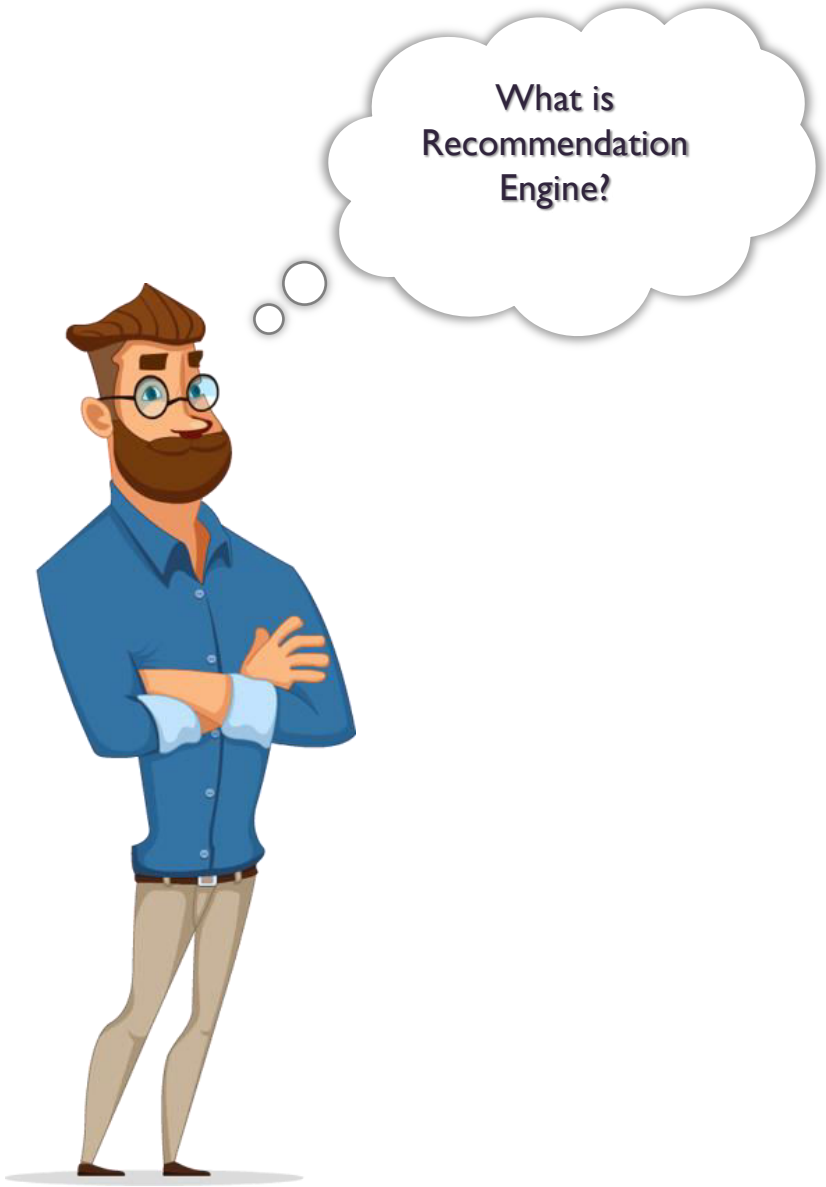
03 COLLABORATIVE FILTERING

04 USER-BASED COLLABORATIVE FILTERING

05 ITEM-BASED COLLABORATIVE FILTERING

Recommendation Engine

Recommendation Engine



A filtering system that seeks to predict and show the items of user interest.

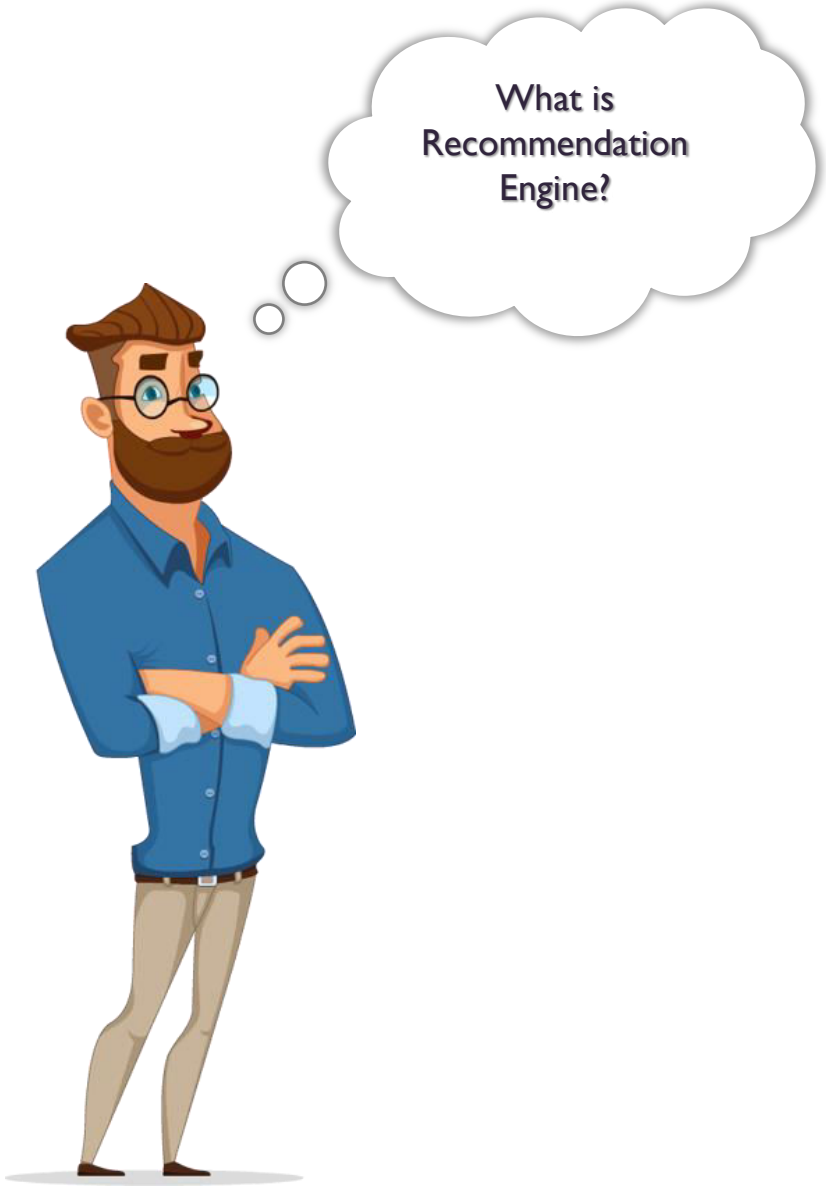
It may or may not be accurate

Utilized in a variety of areas

Mostly used in the digital domain

Can significantly boost revenues, CTRs, conversions, and other important metrics

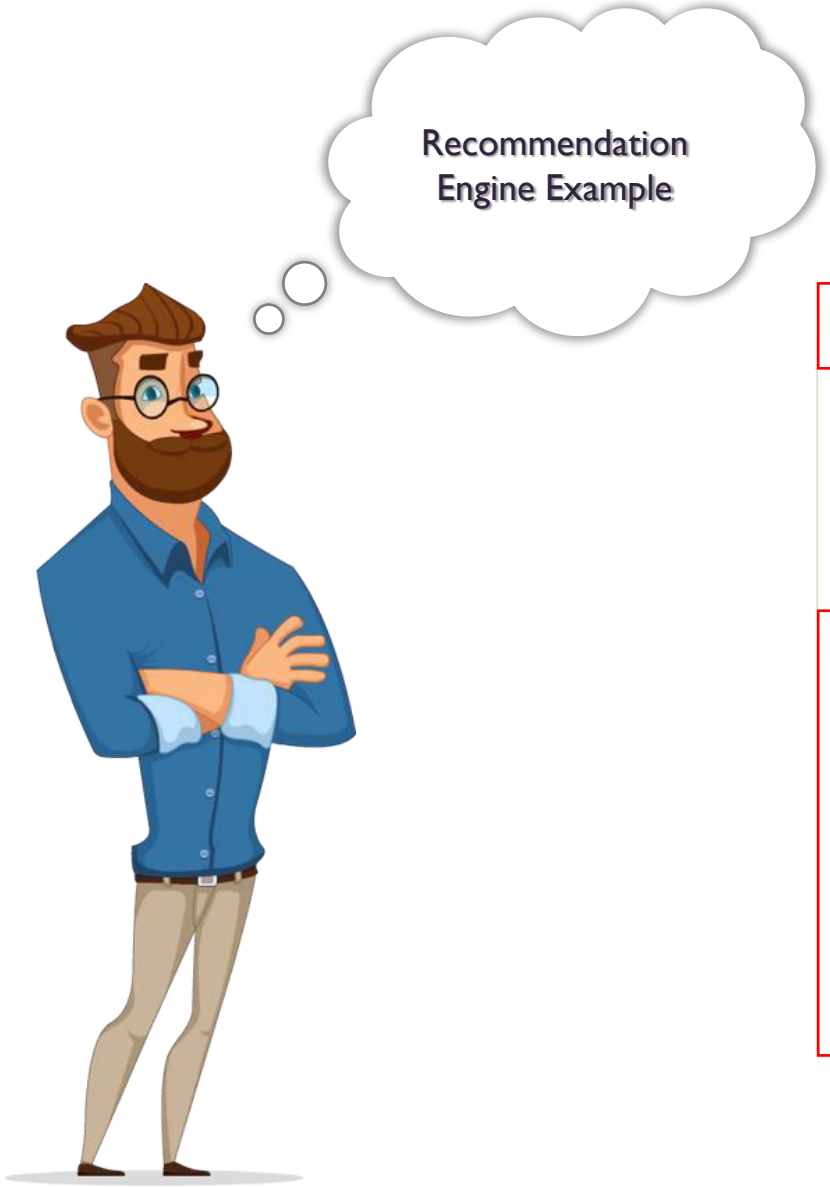
Recommendation Engine



Data filtering tools that make use of algorithms and data to recommend the most relevant items to a particular use

An automated form of "SHOP COUNTER GUY"

Recommendation Engine



Increase Average Order Value

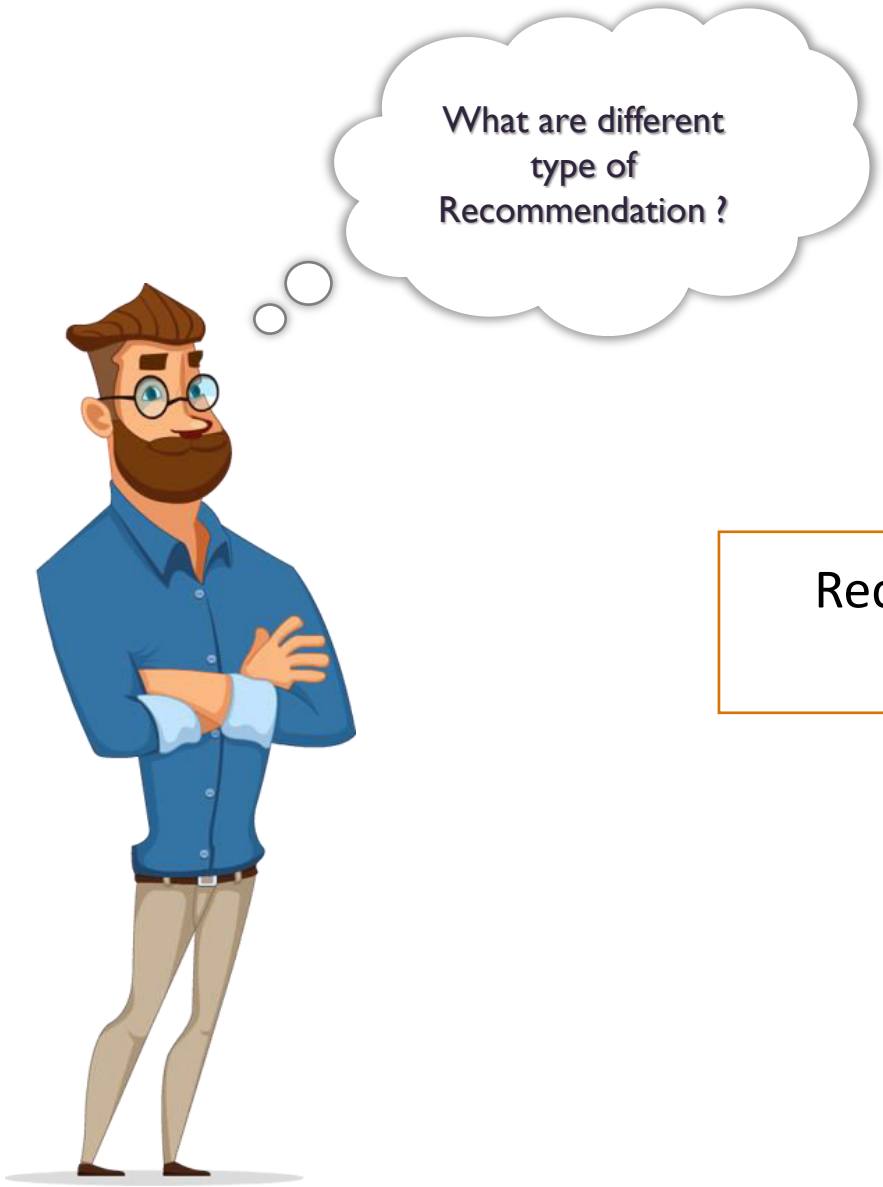
Reference: Amazon

Recommendation Engine

Reference: Amazon

Types of Recommendations

Types of Recommendation Engine

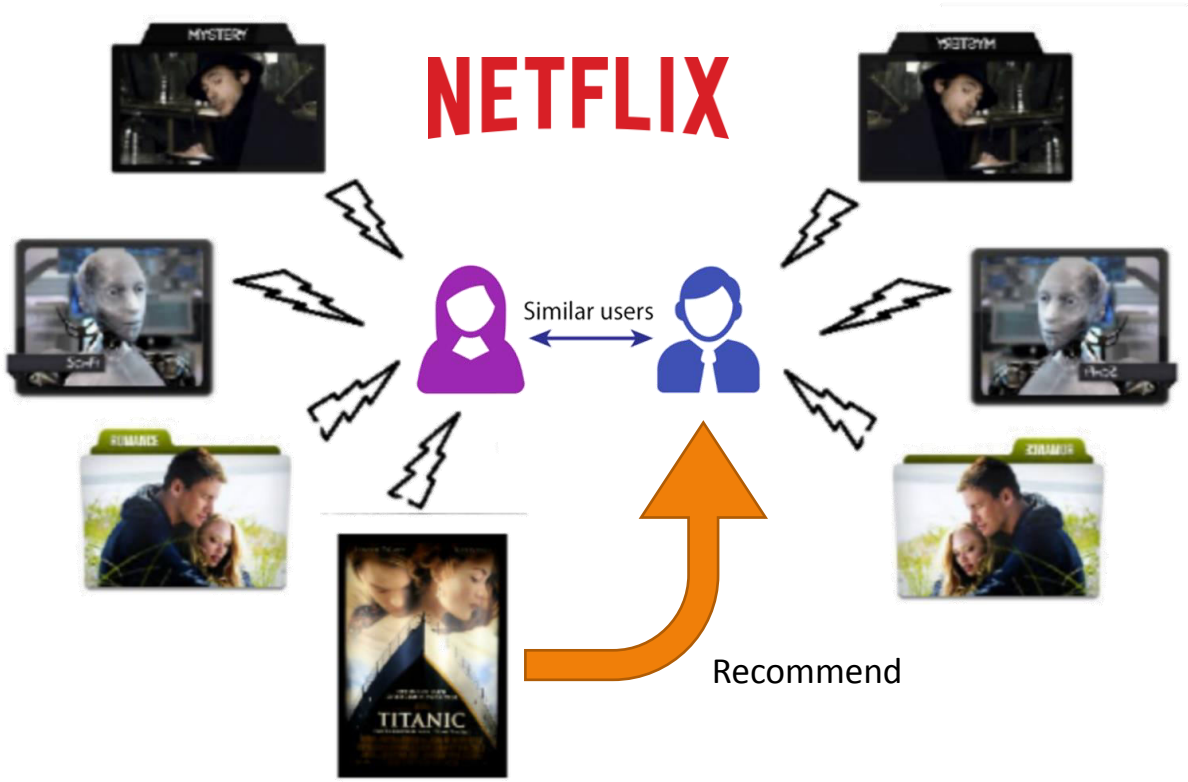


- Recommendation Engines
  - Collaborative Filtering
  - Content-Based Filtering
  - Hybrid Recommendation Systems

Collaborative filtering recommender systems

Collaborative filtering recommender systems

Filtering items from a large set of alternatives is done collaboratively by users' preferences



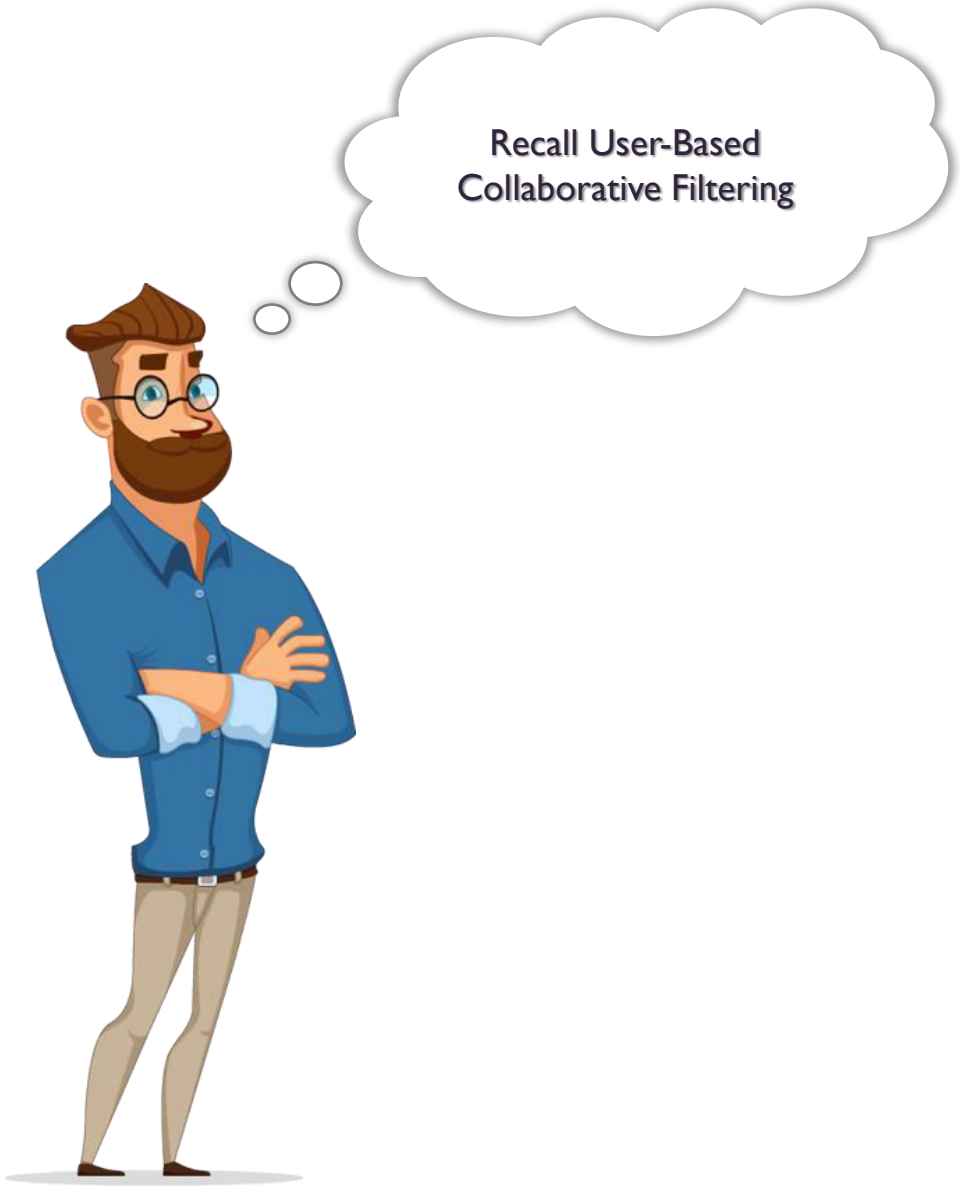
Collaborative filtering recommender systems

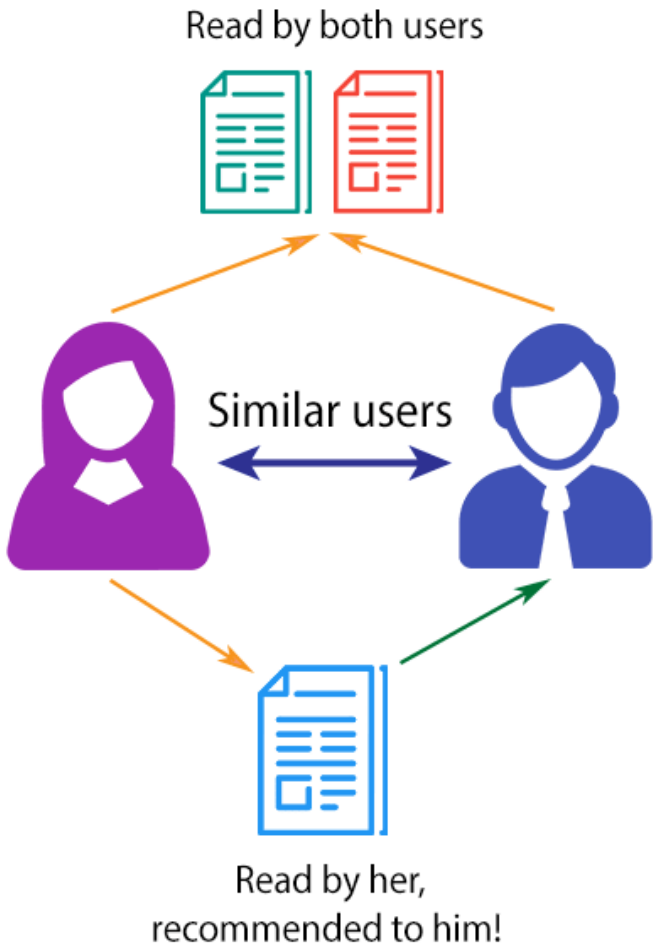
Collaborative Filtering

- **User-based Collaborative Filtering**
  - Identify similar users based on similar user preferences
  - Recommend new items to an active user based on the rating given by similar users on the items not rated by the active user.
- **Item-based Collaborative Filtering**
  - Calculate the item similarity based on the item preferences
  - Find the top similar items to the non-rated items by active user and recommend them

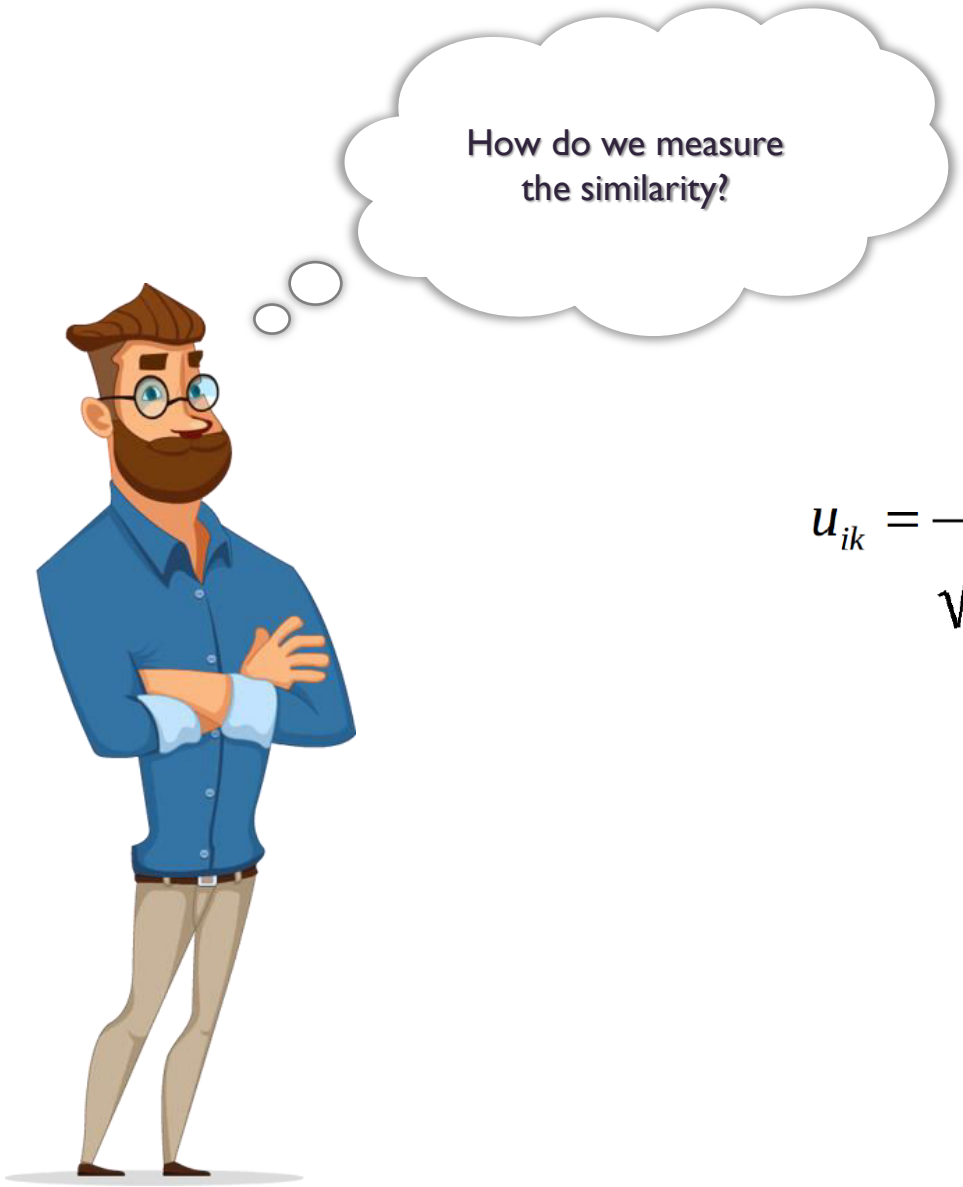
User-based Collaborative Filtering

User-based Collaborative Filtering





User-based Collaborative Filtering



Pearson Correlation

$$u_{ik} = \frac{\sum_j (v_{ij} - v_i)(v_{kj} - v_k)}{\sqrt{\sum_j (v_{ij} - v_i)^2 \sum_j (v_{kj} - v_k)^2}}$$

Cosine Similarity

$$\cos(u_i, u_j) = \frac{\sum_{k=1}^{m} v_{ik} v_{jk}}{\sqrt{\sum_{k=1}^{m} v_{ik}^2 \sum_{k=1}^{m} v_{jk}^2}}$$

$$v_{ij}^* = K \sum_{v_{kj} \neq ?} u_{jk} v_{kj}$$

User-based Collaborative Filtering

	The Avengers	Sherlock	Transformers	Matrix	Titanic	Me Before You	Similarity(i, E)
A	2		2	4	5		NA
B	5		4			1	0.87
C			5		2		1
D		1		5		4	-1
E	3.51*	3.81*	4	2.42*	2.48*	2	1
F	4	5		1			NA

Users' preference can change over time

Item-based Collaborative Filtering

Item-based Collaborative Filtering

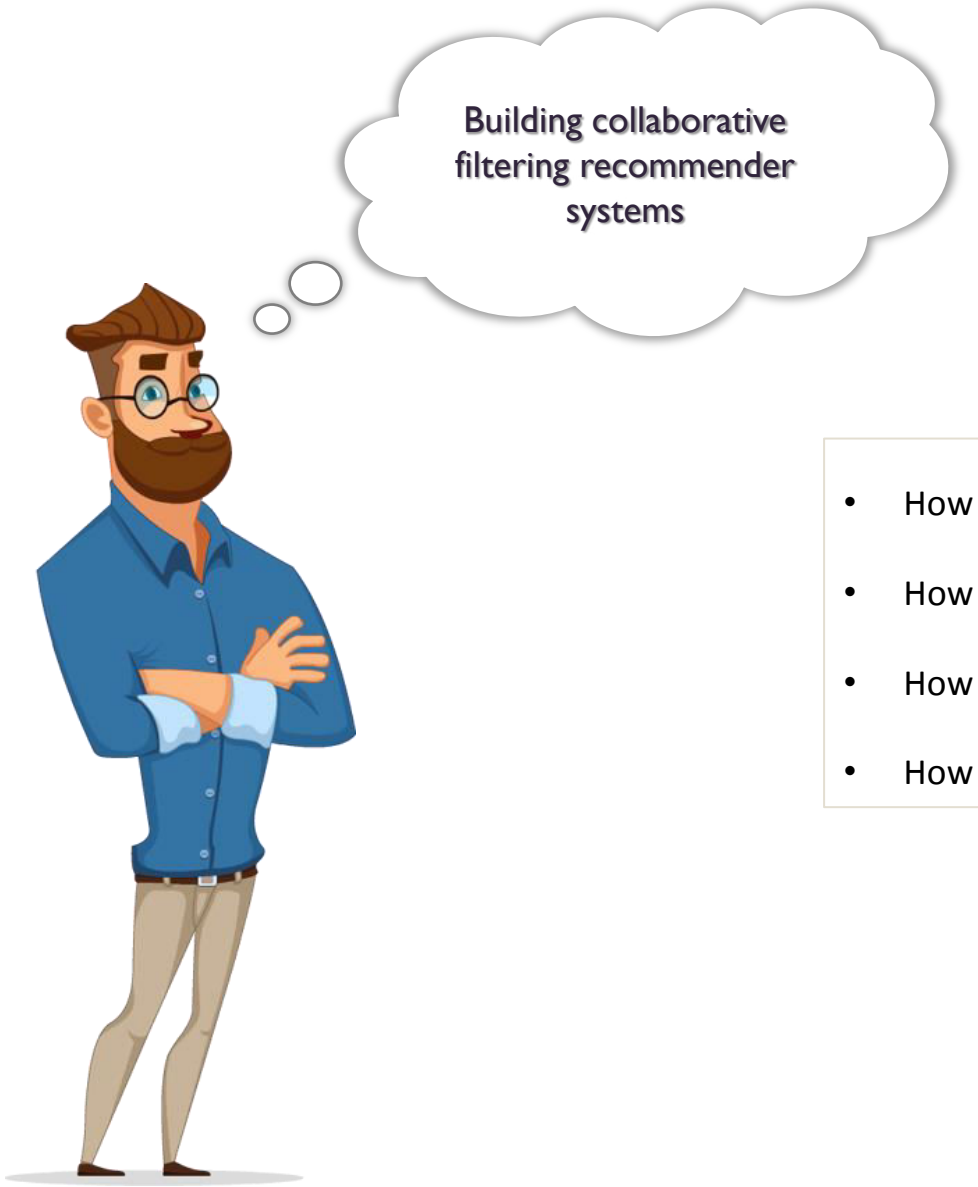
	The Avengers	Sherlock	Transformers	Matrix	Titanic	Me Before You
A	2		2	4	5	2.94*
B	5		4			1
C			5		2	2.48*
D		1		5		4
E			4			2
F	4	5		1		1.12*
Similarity	-1	-1	0.86	1	1	

Scalability

The worst-case complexity is O (mn)

Sparsity

Collaborative Filtering



- How to calculate the similarity between users?
- How to calculate the similarity between items?
- How recommendations are generated?
- How to deal with new items and new users whose data is not known?

Cold Start problem

Thank You