



ĐẠI HỌC ĐÀ NẴNG

TRƯỜNG ĐẠI HỌC CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG VIỆT - HÀN  
VIETNAM - KOREA UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY

한-베정보통신기술대학교

Nhân bản – Phụng sự – Khai phóng

## Chapter 9

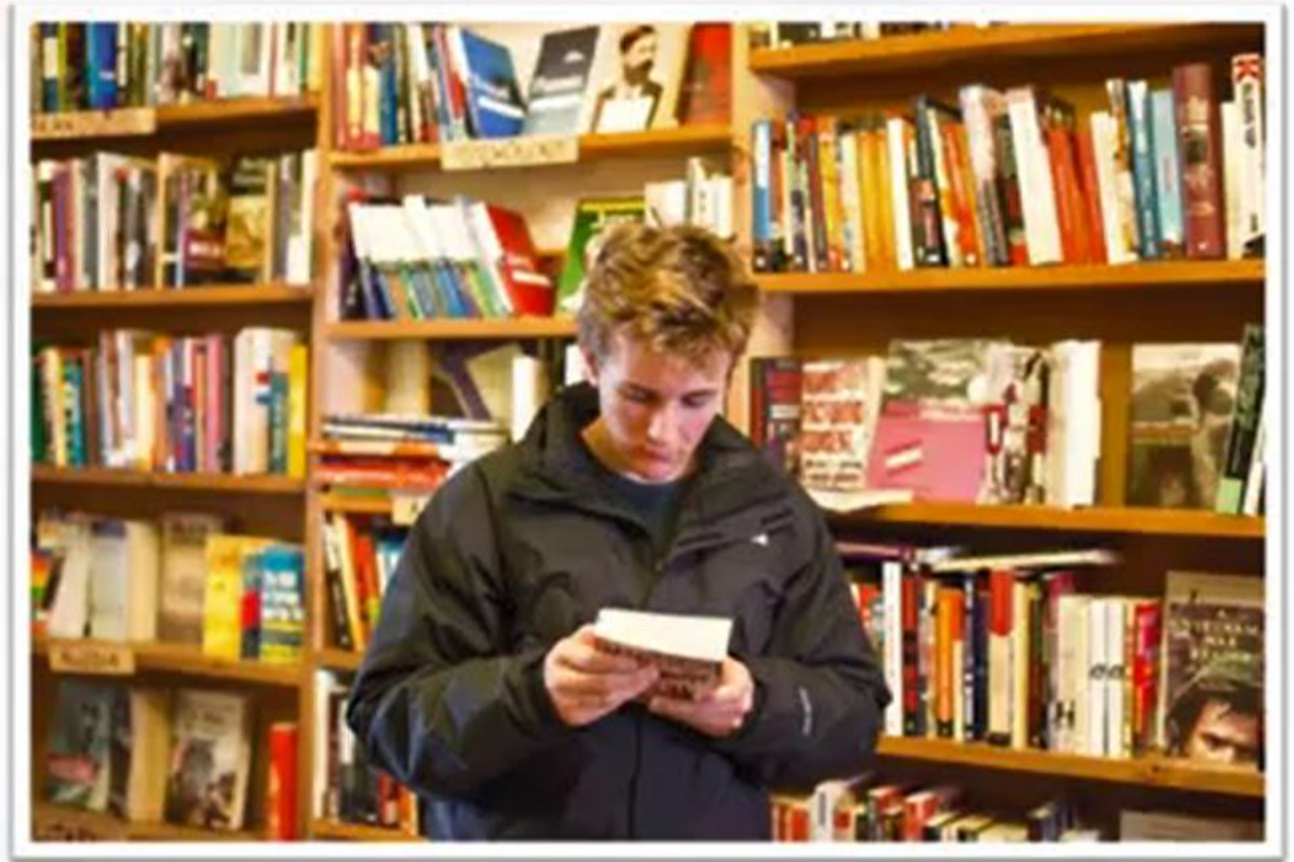
# Recommender Systems

Machine Learning

- Introduction to Recommender Systems
- Content-based Recommender Systems
- Collaborative Filtering

- Introduction to Recommender Systems

Recommender systems capture the pattern of peoples' behavior and use it to **predict what else they might want or like.**





- Applications

- What to buy?
  - E-commerce, books, movies, beer, shoes
- Where to eat?
- Which job to apply to?
- Who you should be friends with?
  - LinkedIn, Facebook, ...
- Personalize your experience on the web
  - News platforms, news personalization



- Advantages of Recommender Systems

- Broader exposure
- Possibility of continual usage or purchase of products
- Provides better experience

- Implementing Recommender Systems

- Memory-based

- Uses the entire user-item dataset to generate a recommendation
- Uses statistical techniques to approximate users or items  
e.g., Pearson Correlation, Cosine Similarity, Euclidean Distance, etc.

- Model-based

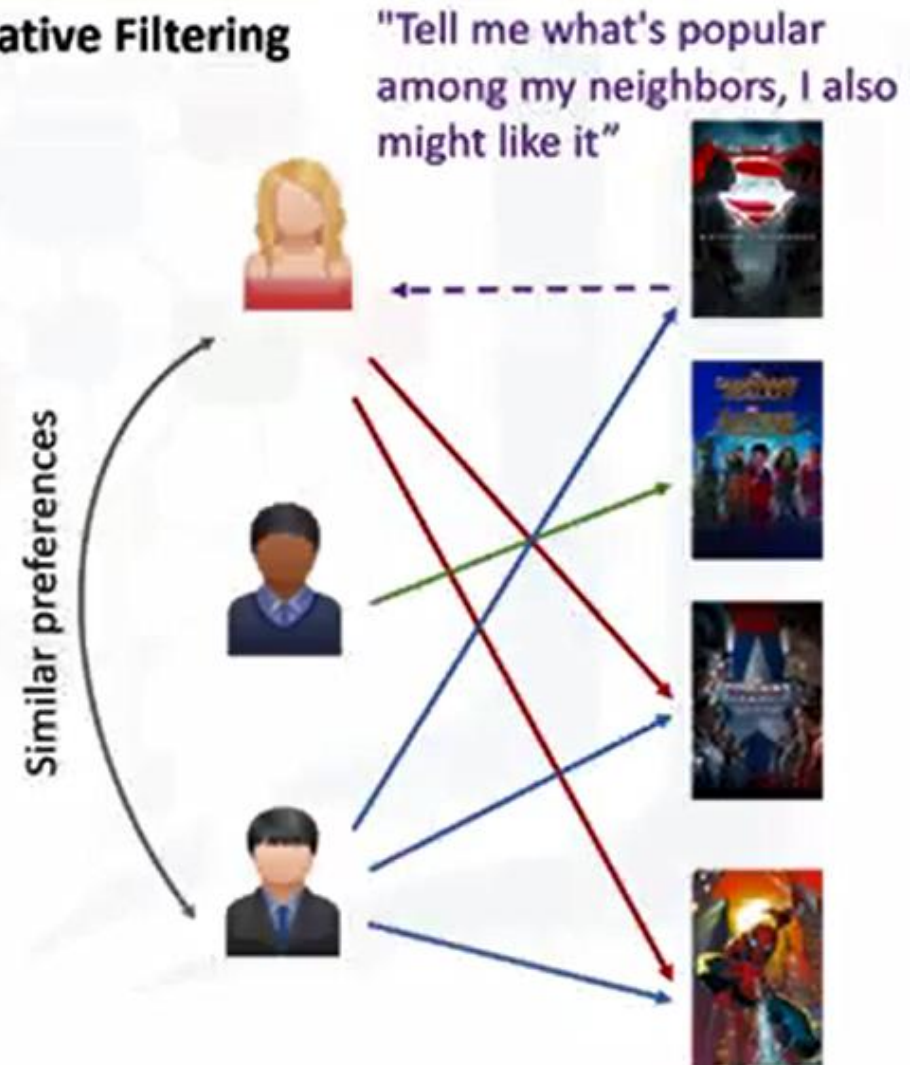
- Develops a model of users in an attempt to learn their preferences
- Models can be created using Machine Learning techniques like regression, clustering, classification, etc.

- Two types of Recommender Systems

### Content-Based



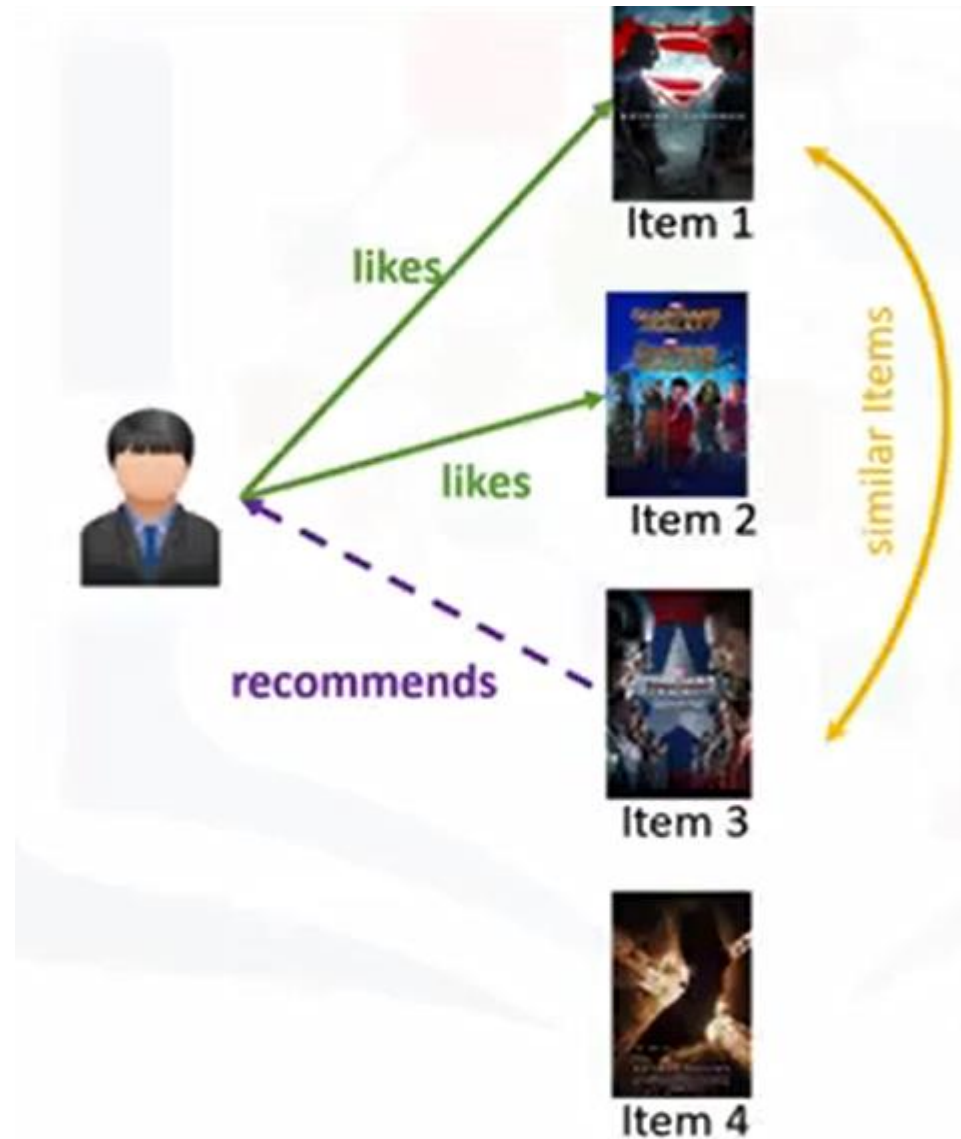
### Collaborative Filtering





- **Content-based Recommender Systems**
- Collaborative Filtering









## • Two types of Recommender Systems



## • Weighing the genres

	
	2
	10
	8

Input User Ratings

**X**

	Comedy	Adventure	Super Hero	Sci-Fi
	0	1	1	0
	1	1	1	1
	1	0	1	0


Movies Matrix

**=**



	Comedy	Adventure	Super Hero	Sci-Fi
	0	2	2	0
	10	10	10	10
	8	0	8	0

Weighted Genre Matrix

User Profile

	Comedy	Adventure	Super Hero	Sci-Fi
	18	12	20	10

## • Weighing the genres

	
	2
	10
	8

Input User Ratings

**X**

	Comedy	Adventure	Super Hero	Sci-Fi
	0	1	1	0
	1	1	1	1
	1	0	1	0


Movies Matrix

**=**

	Comedy	Adventure	Super Hero	Sci-Fi
	0	2	2	0
	10	10	10	10
	8	0	8	0

Weighted Genre Matrix

User Profile

	Comedy	Adventure	Super Hero	Sci-Fi
	0.3	0.2	0.33	0.16



- Candidate movies for recommendation



	Comedy	Adventure	Super Hero	Sci-Fi
	1	1	0	1
	0	0	1	0
	1	0	1	0

## • Finding the recommendation









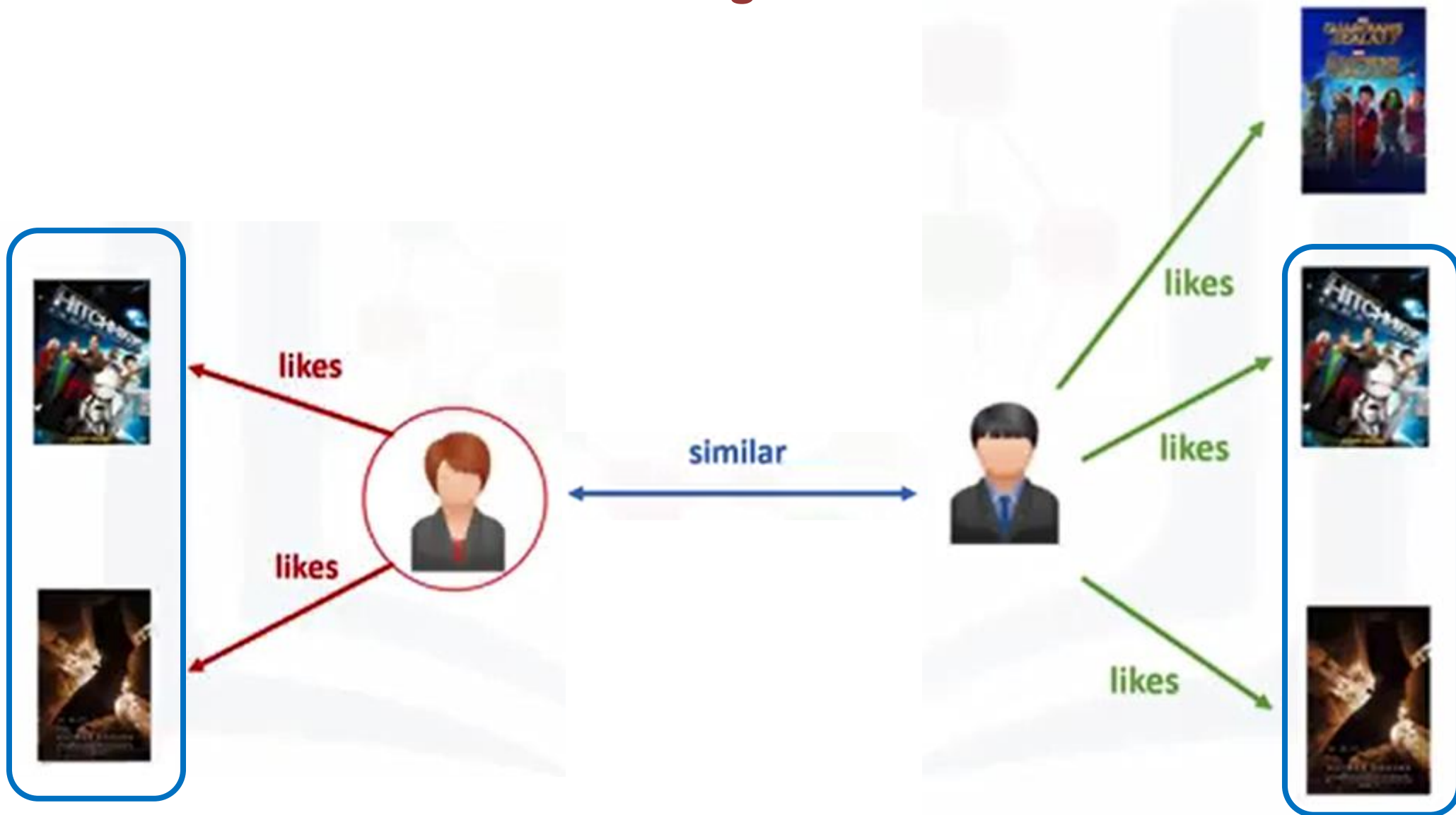


- Content-based Recommender Systems
- Collaborative Filtering

- **User-based collaborative filtering**
  - Based on users' neighborhood
- **Item-based collaborative filtering**
  - Based on items' similarity

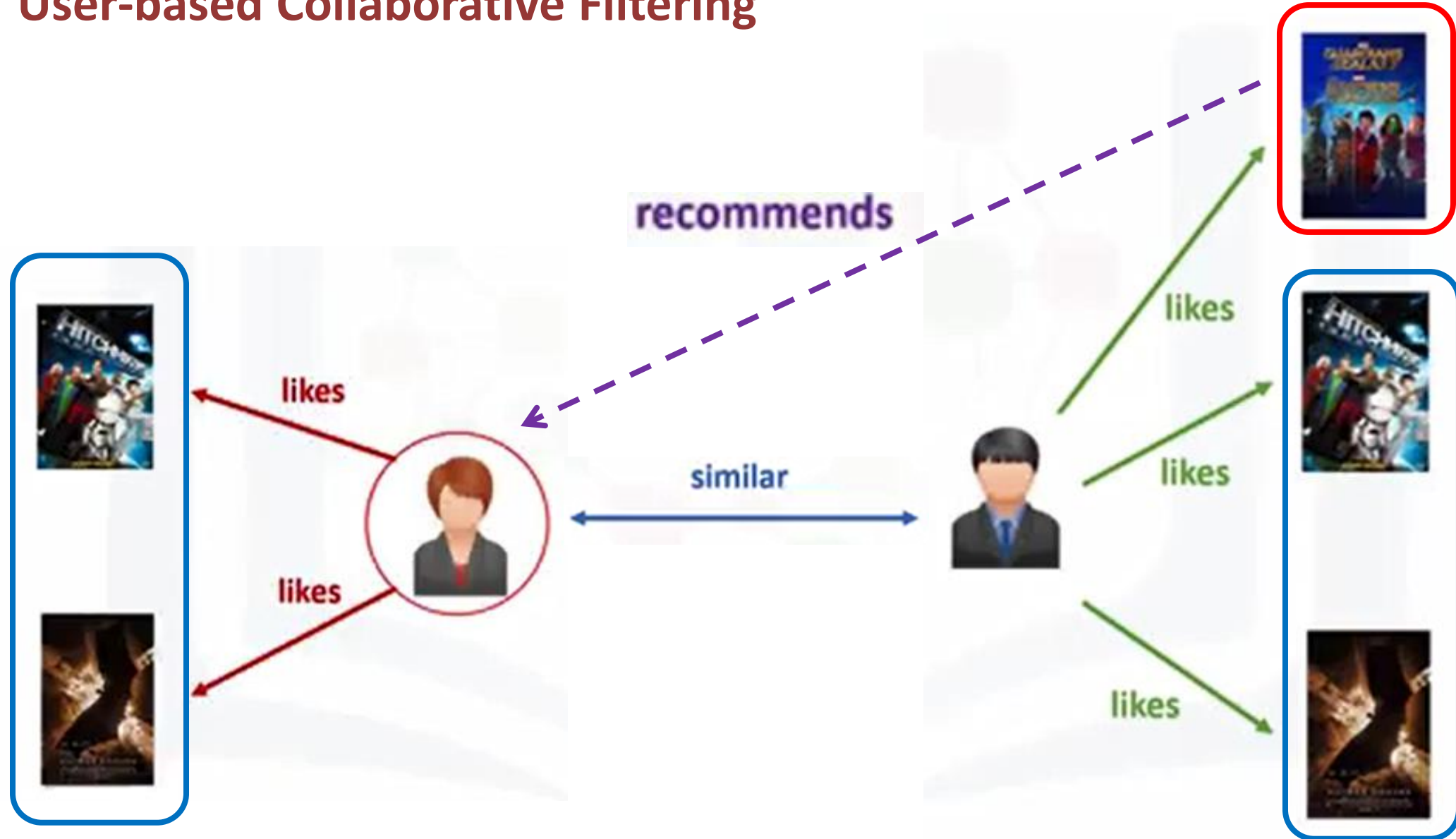


- User-based Collaborative Filtering






- User-based Collaborative Filtering



- User ratings matrix

					
	9	6	8	4	
	2	10	6		8
	5	9		10	7
Active user 	?	10	7	8	?

Ratings Matrix




- Learning the similarity weights



- Creating the weighted ratings matrix

		
	9	
	2	8
	5	7

Ratings Matrix Subset

	Similarity Index
	0.4
	0.9
	0.7






Similarity Matrix

=








		
	3.6	
	1.8	7.2
	3.5	4.9

Weighted Ratings Matrix



		
	3.6	
	1.8	7.2
	3.5	4.9

Weighted Ratings Matrix




		
 		12.1
  	8.9	

Rating and Weight Matrix






$\Sigma$

sum\_weightedRating



	Similarity Index
	0.4
	0.9
	0.7

Similarity Matrix

		
	3.6	
	1.8	7.2
	3.5	4.9

Weighted Ratings Matrix

sum\_similarityIndex  
 $\Sigma$

			Weight Sum
 		12.1	(0.9+0.7)
  	8.9		(0.4+0.9+0.7)

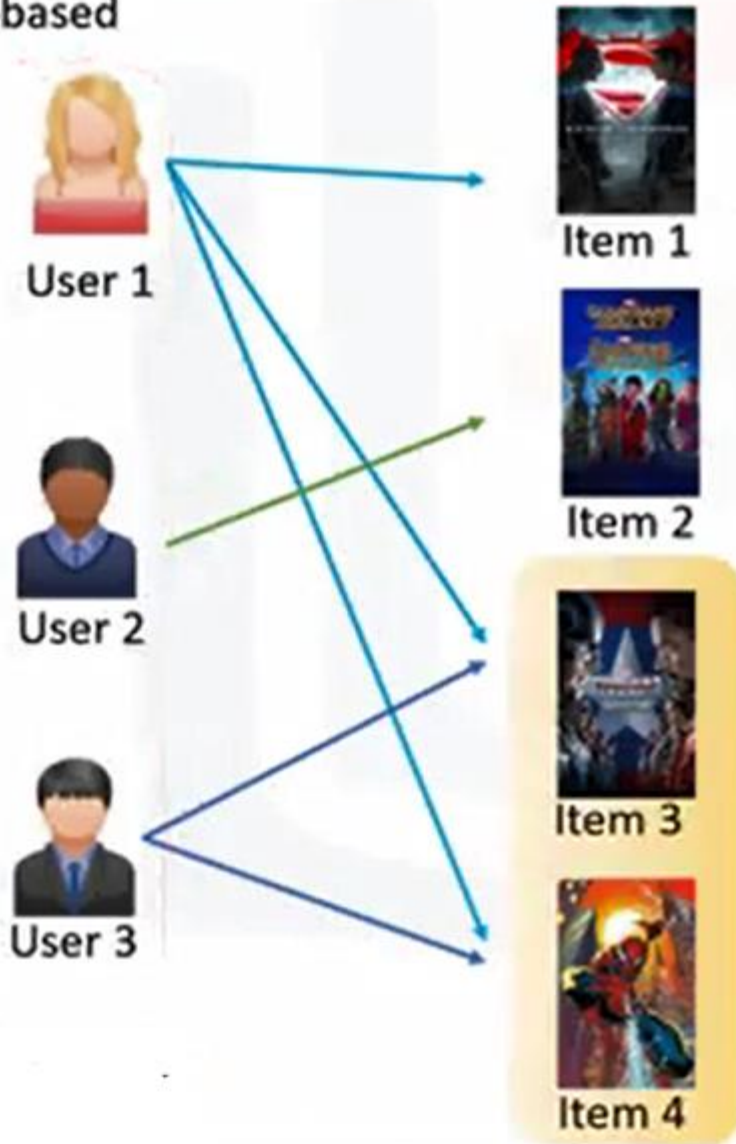
Rating and Weight Matrix

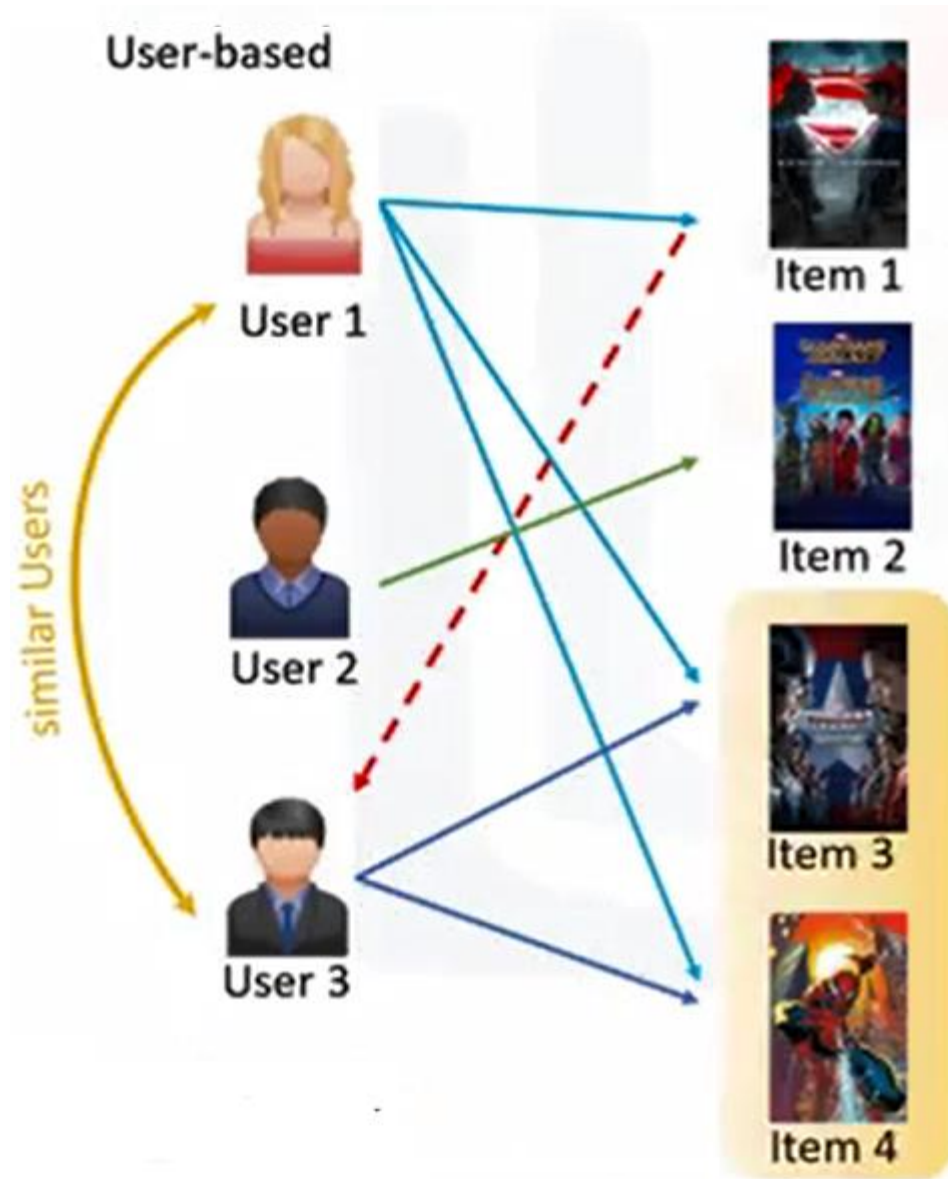
sum\_weightedRating  
 $\Sigma$

		
	4.4	7.5

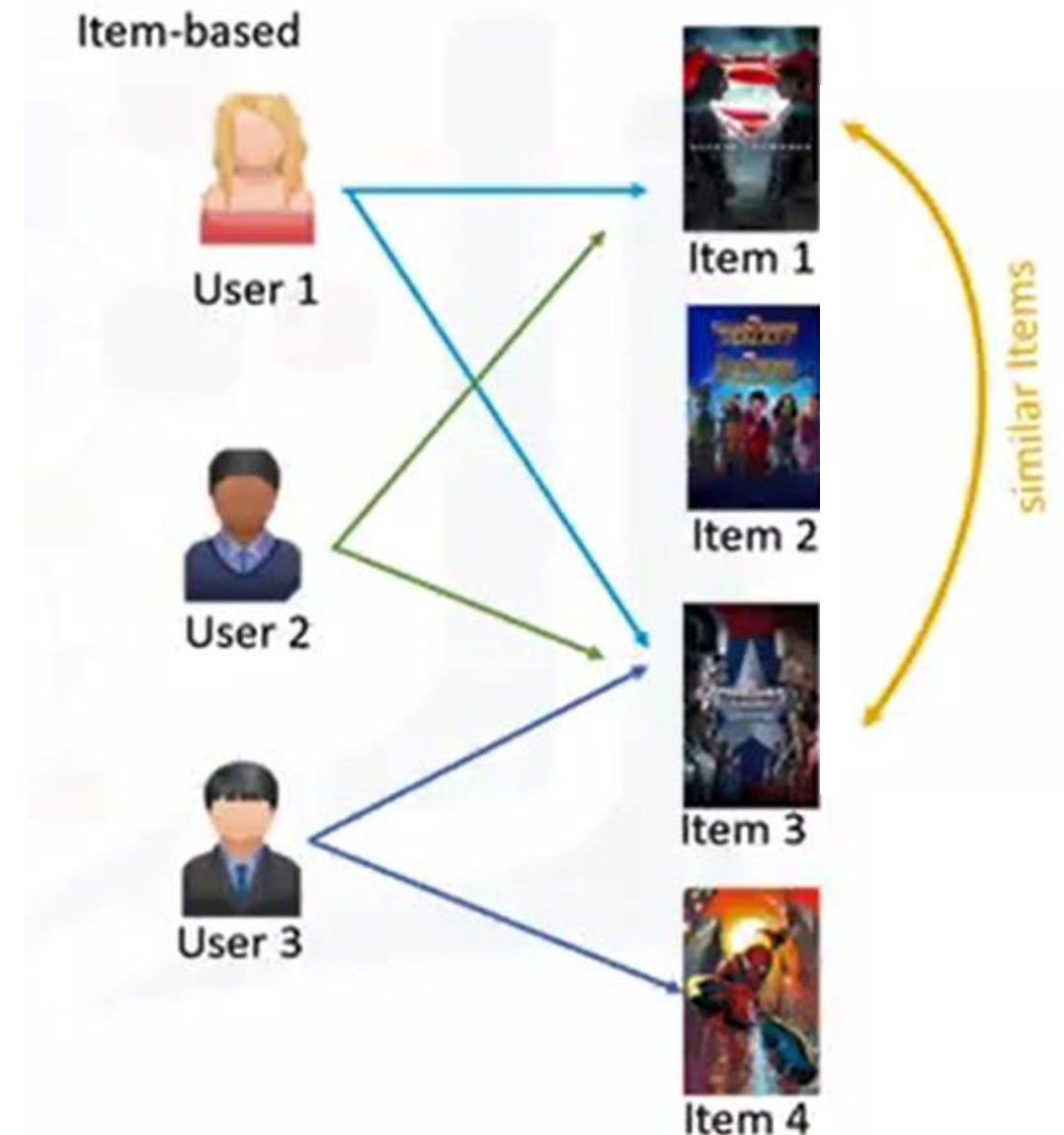
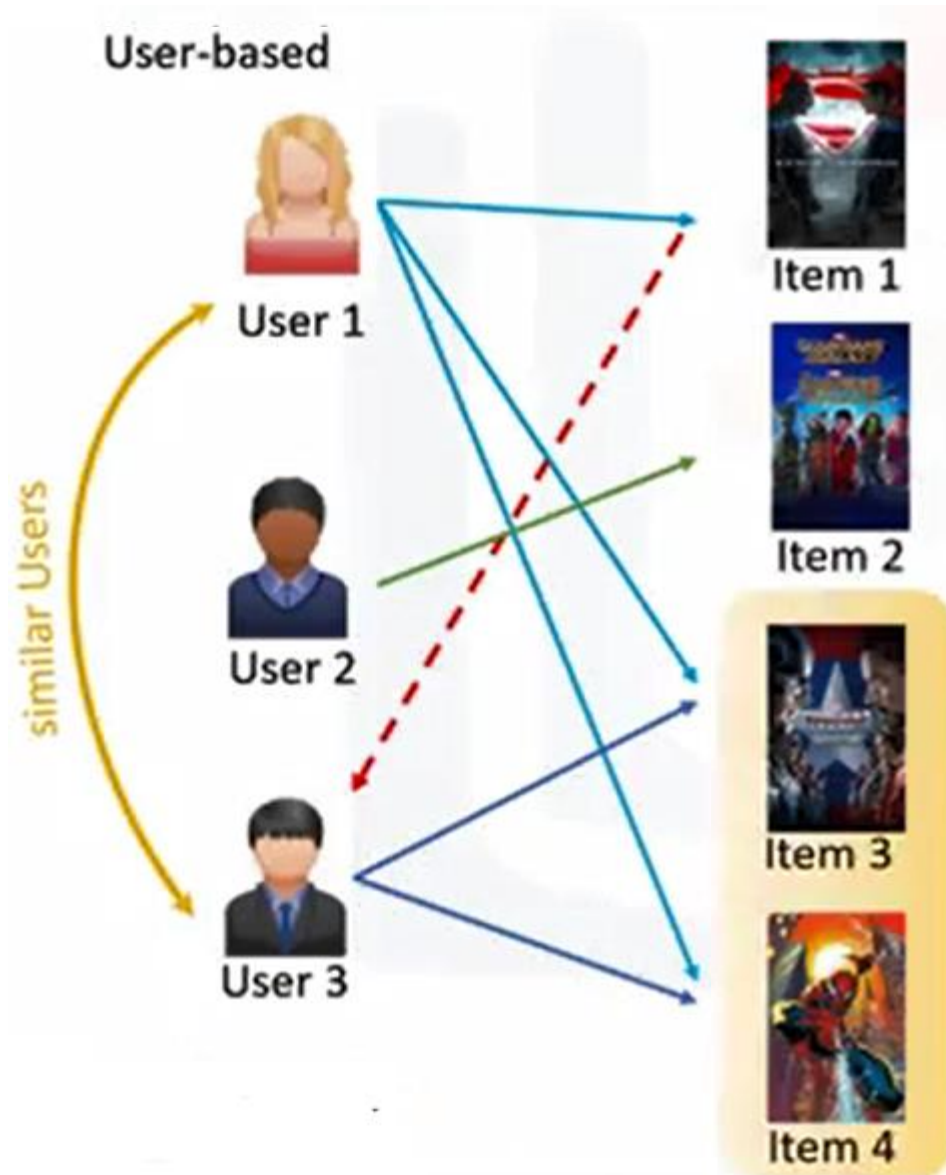
Recommendation Matrix

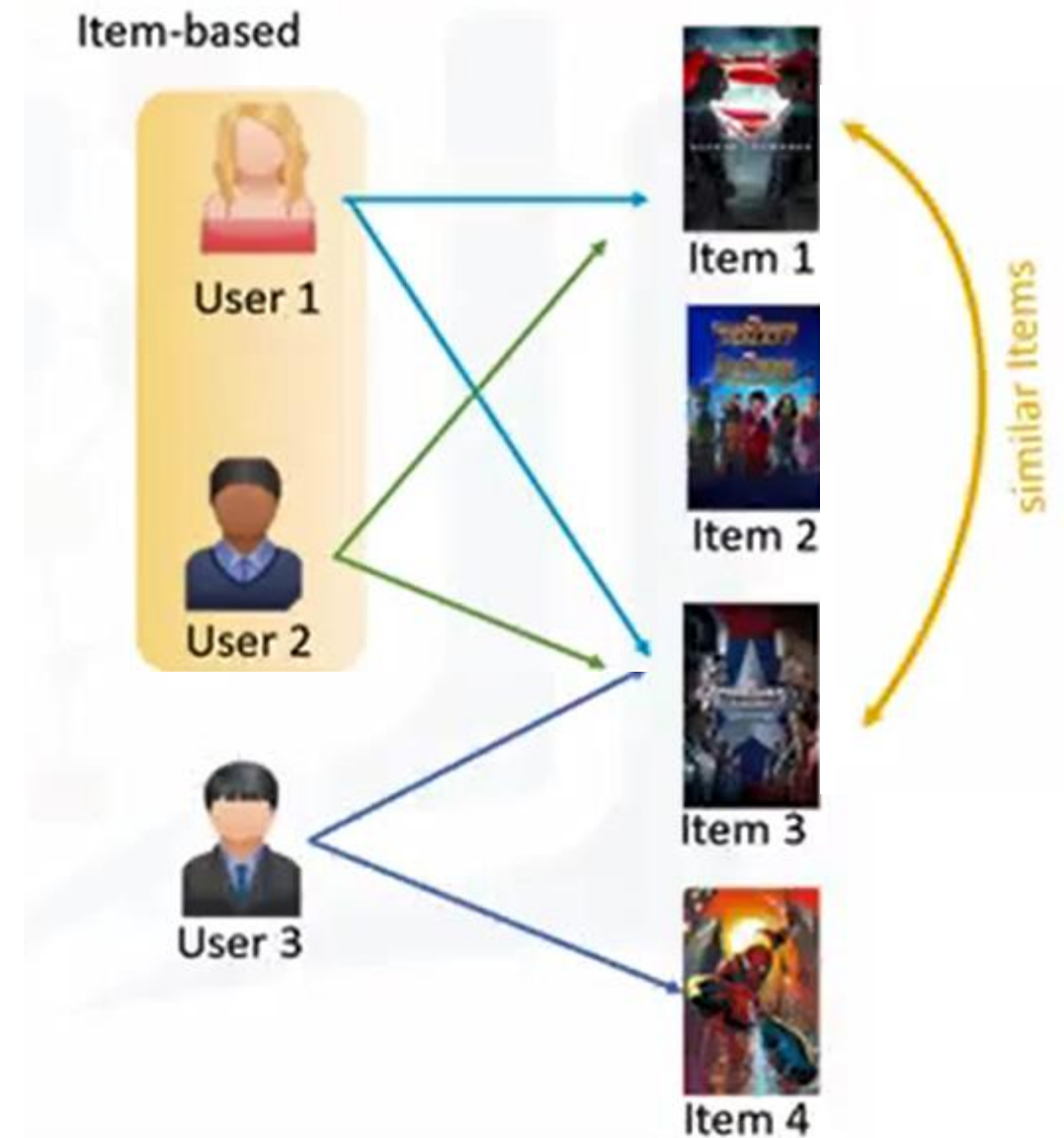
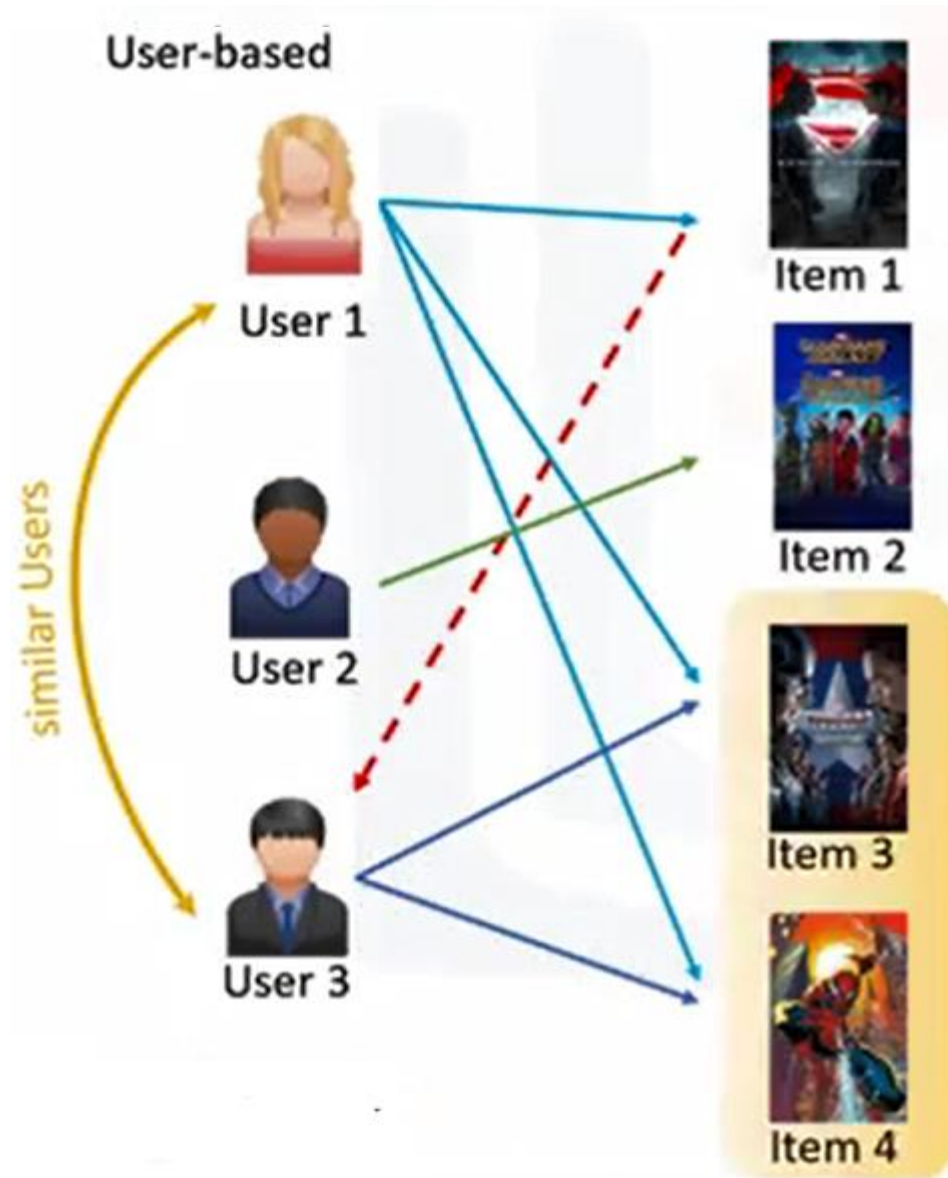
User-based

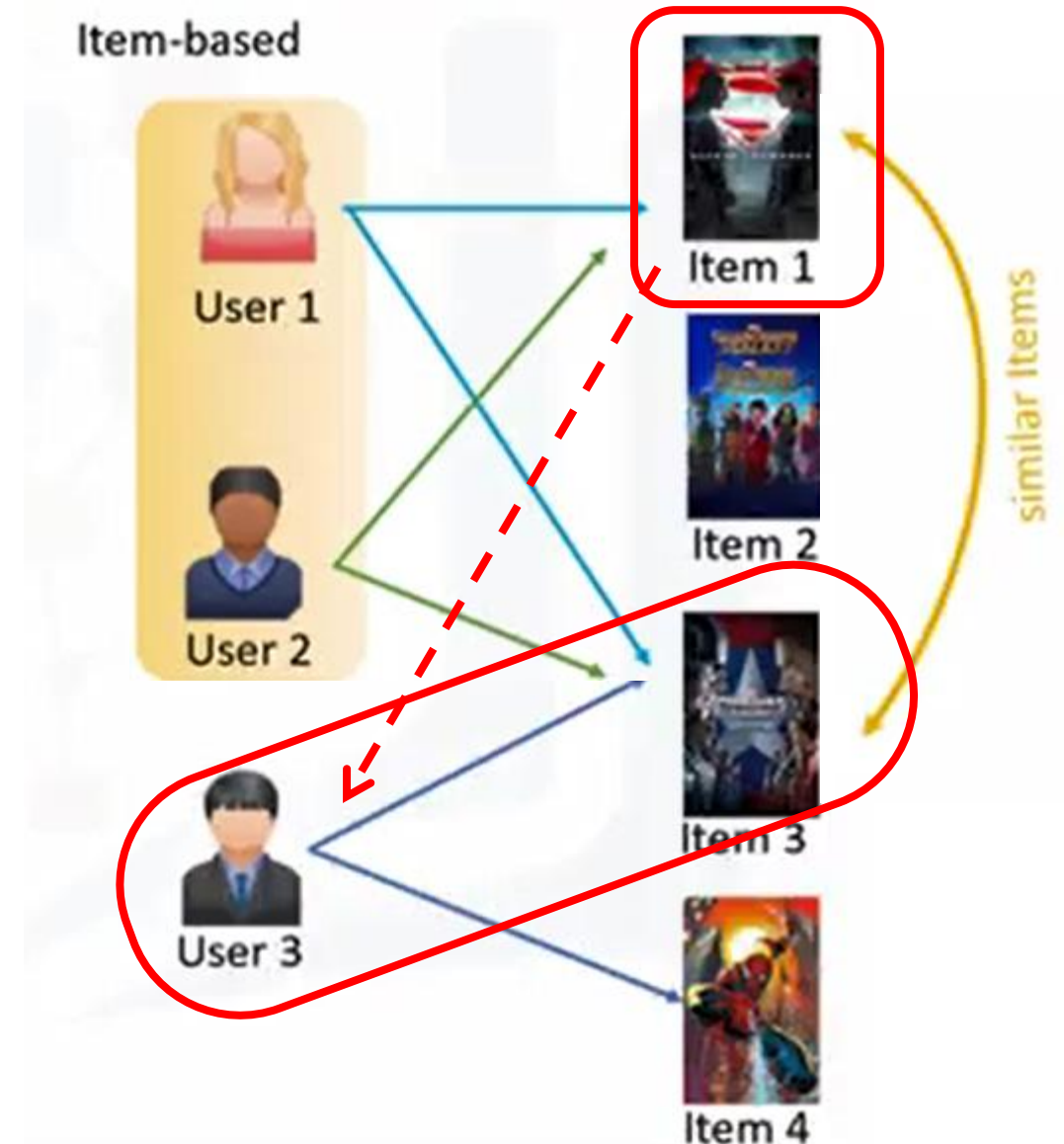
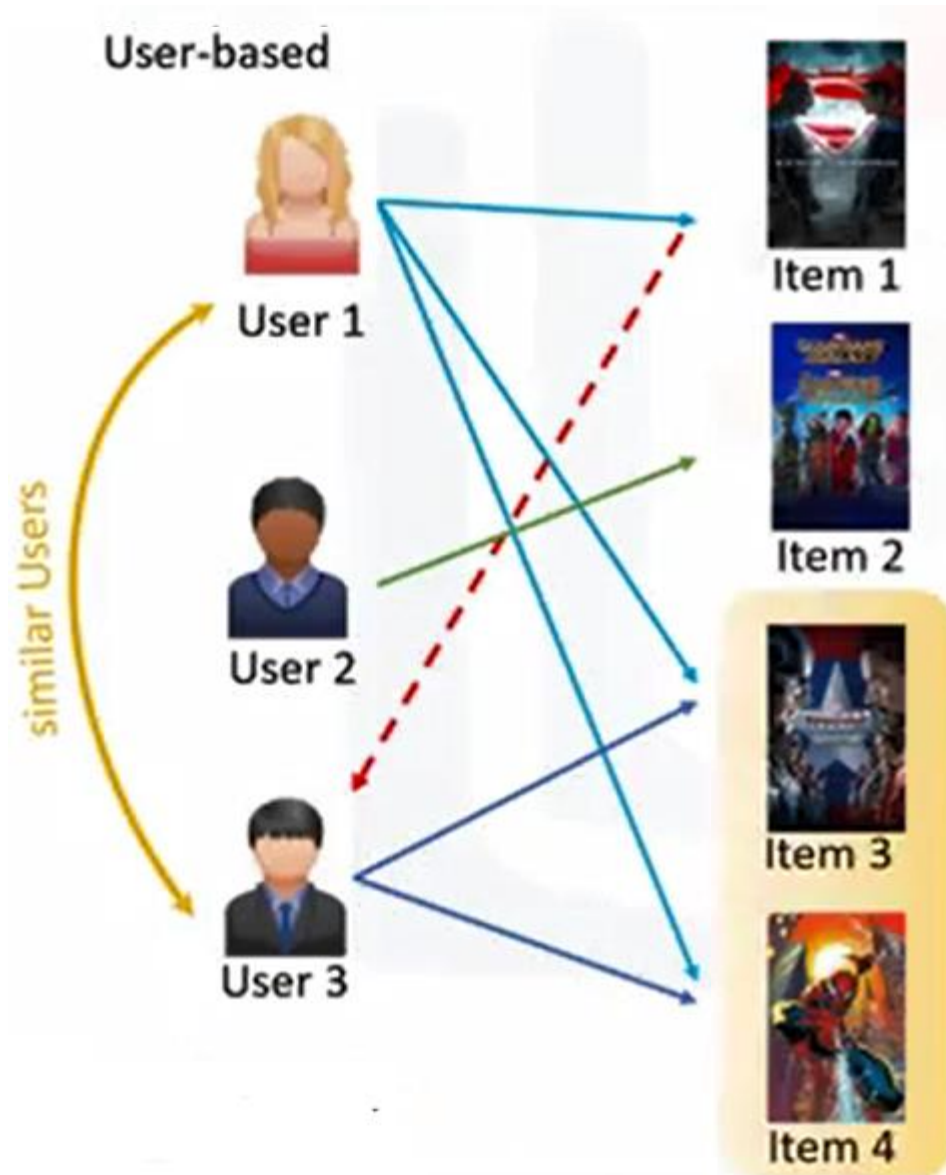












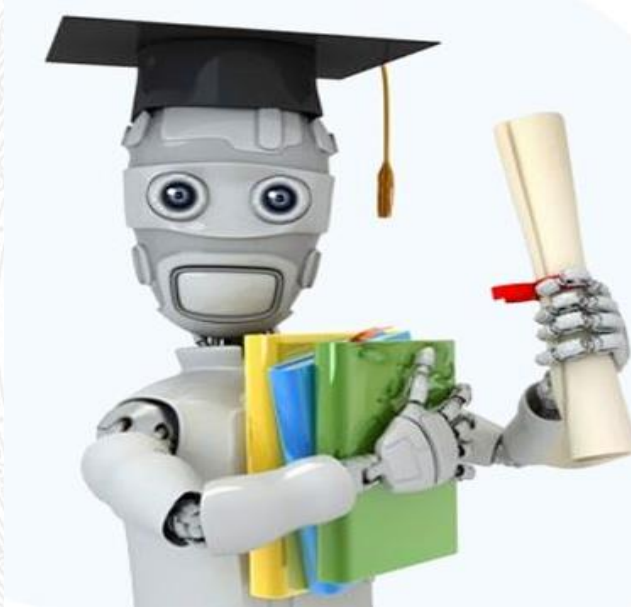


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**Nhân bản – Phụng sự – Khai phóng**



**Enjoy the Course...!**