Unipartite vs Bipartite Recommender Systems

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Project objective

Explore the information gain associated with recommendations from a bipartite network compared with a unipartite network

Our hypothesis was a bipartite network has an exploratory element that allows users to see recommendations outside their immediate clusters

The initial network contained over 982,619 bipartite edges

KINDLE BOOK REVIEWS

Source: Kaggle

61,934 Books
68,223 Reviewers

Each book reviewed at least 5 times
Each person reviewed at least 5 books

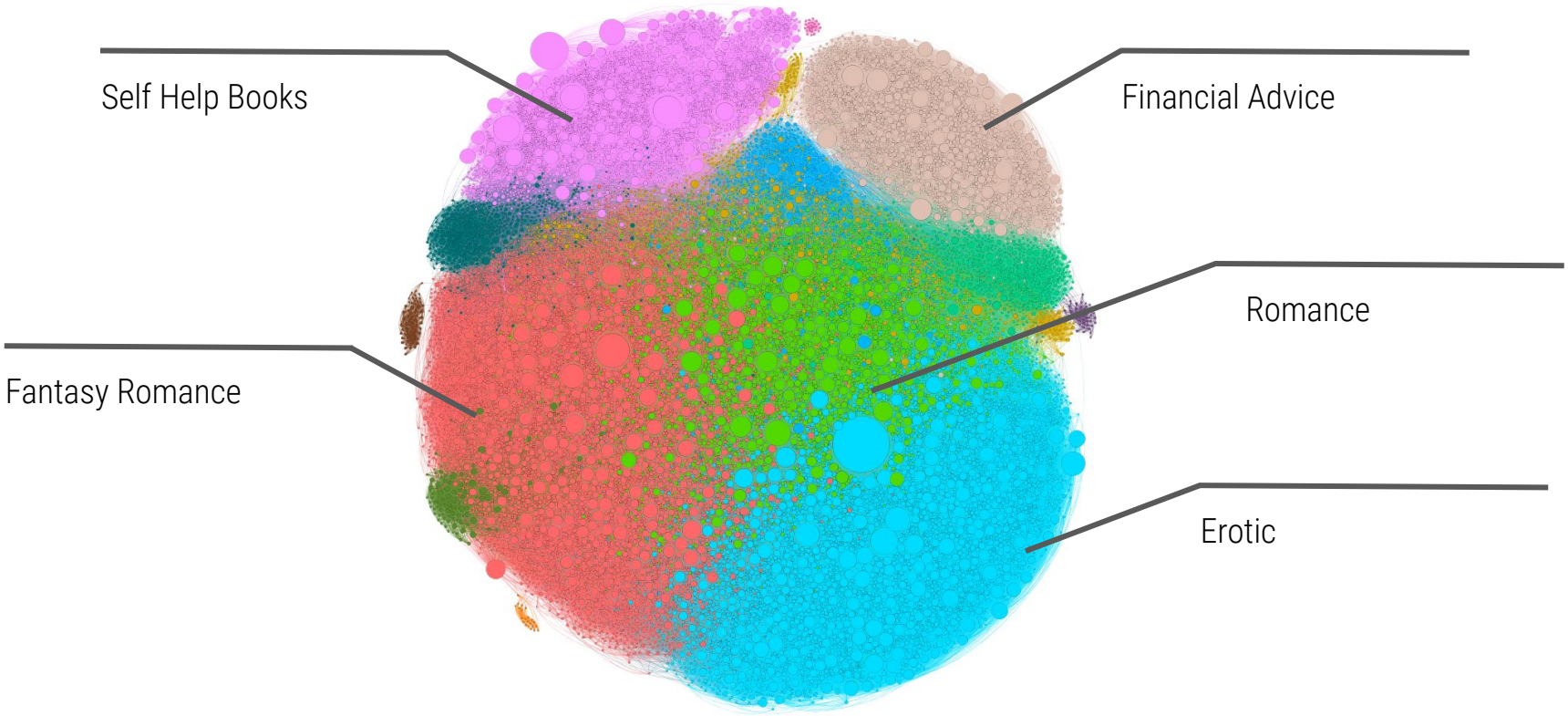
The data was filtered to get a more manageable network

KINDLE BOOK REVIEWS

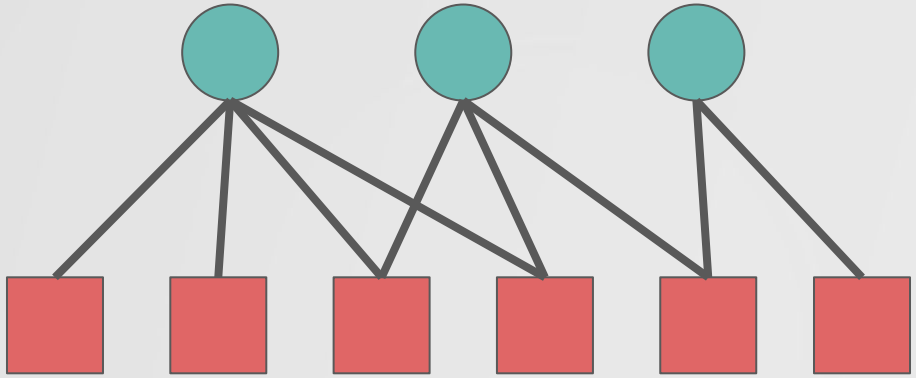
Reviews with over 4.0 in rating were kept
At least 10 reviews per book and 10 reviews per users

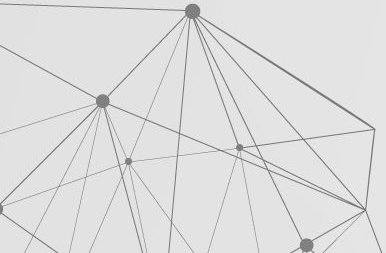
Final data:
9,724 users
11,182 books
242,968 edges

Bipartite Network Visualization



To recommend a book to a user on the bipartite network we look at the person with the most similar reading habits





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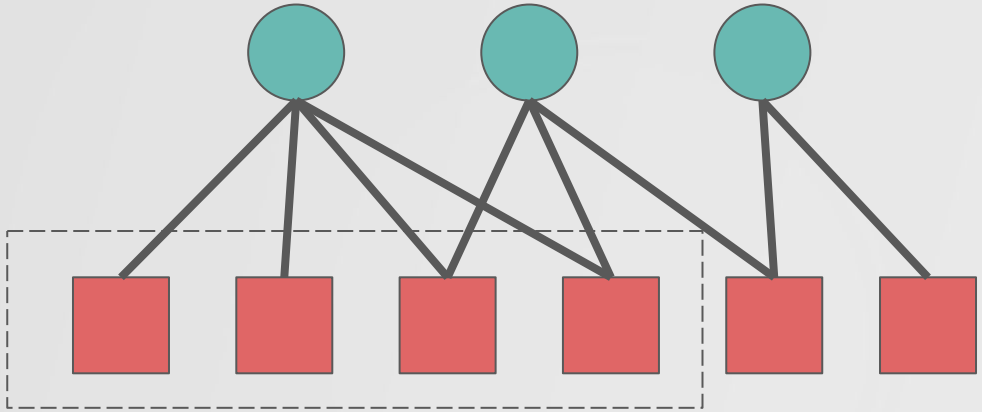
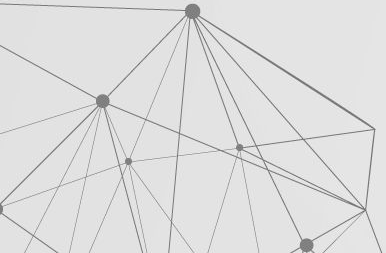


1. Identify a person's set



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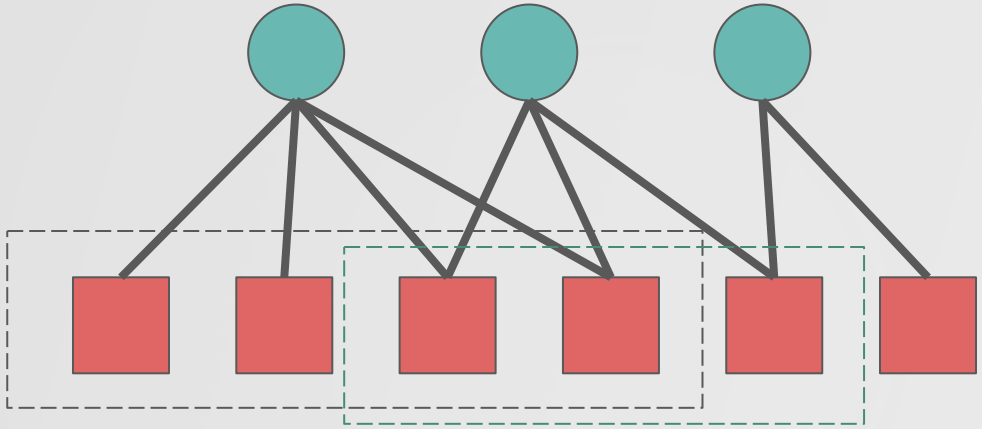
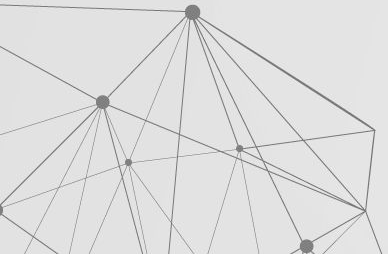


1. Identify a person's set
2. Find the person with the closest reading pattern



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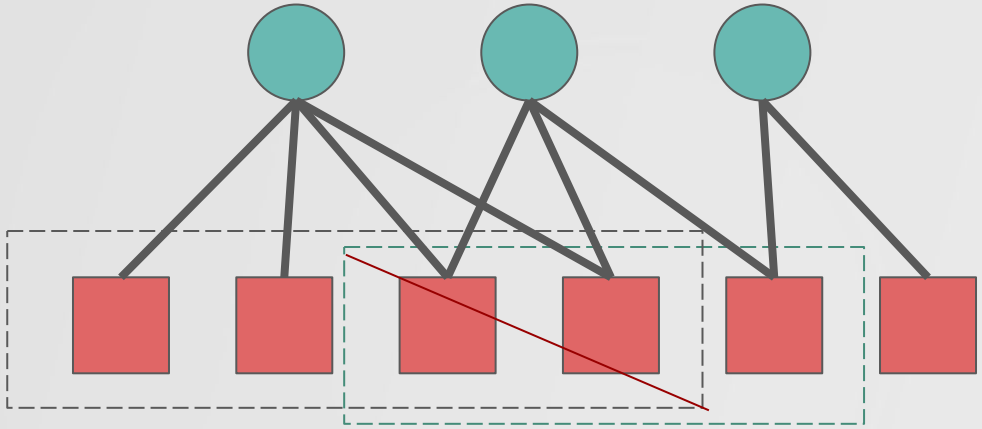

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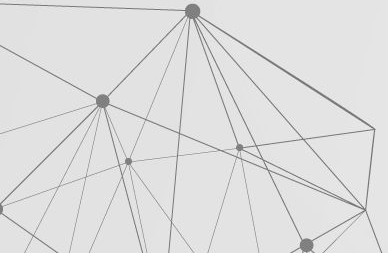
2. Find the person with the closest reading pattern
3. Find the difference in their sets



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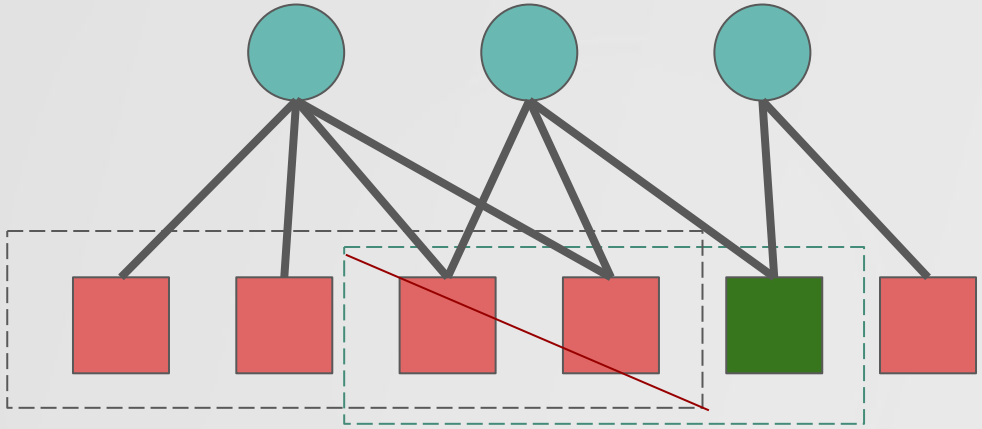
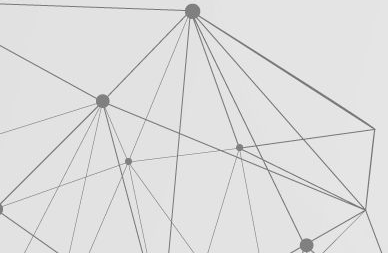
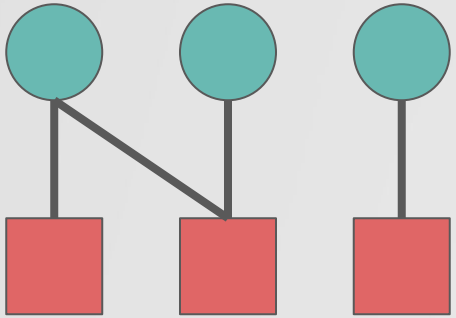


1. Identify a person's set
2. Find the person with the closest reading pattern
3. Find the difference in their sets
4. Recommend something from there

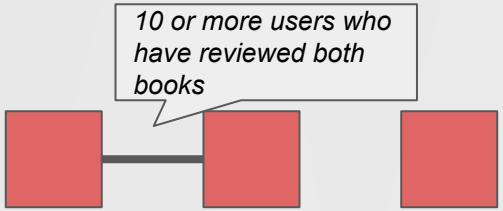


To create a unipartite network we connected books that had 10+ users who had reviewed both books

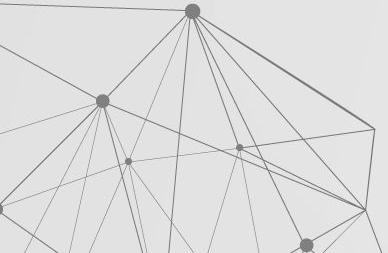
Bipartite Network



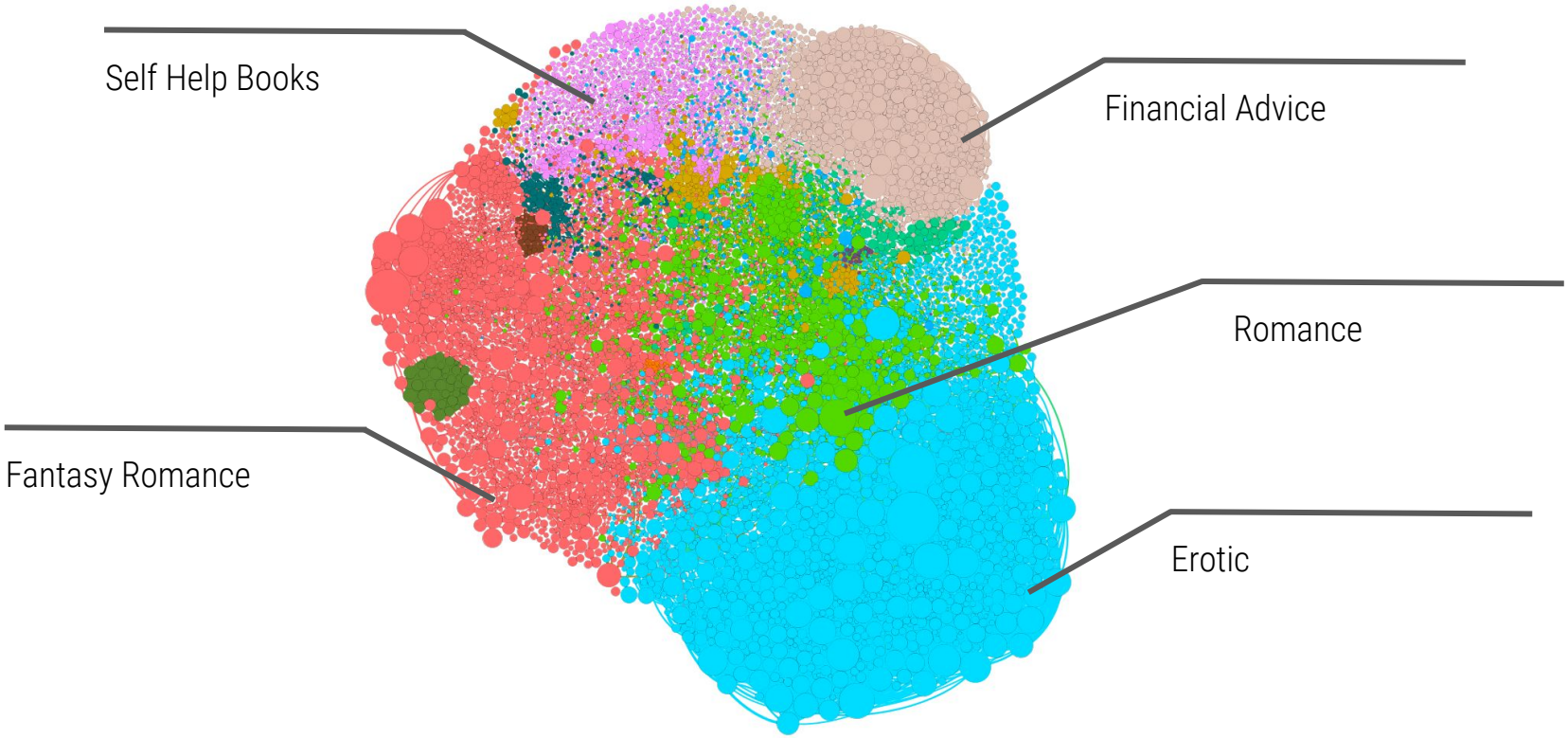
One-mode projection (Unipartite Network)



- Dropped books with fewer than 10 connections
- 11,182 books remained in the network

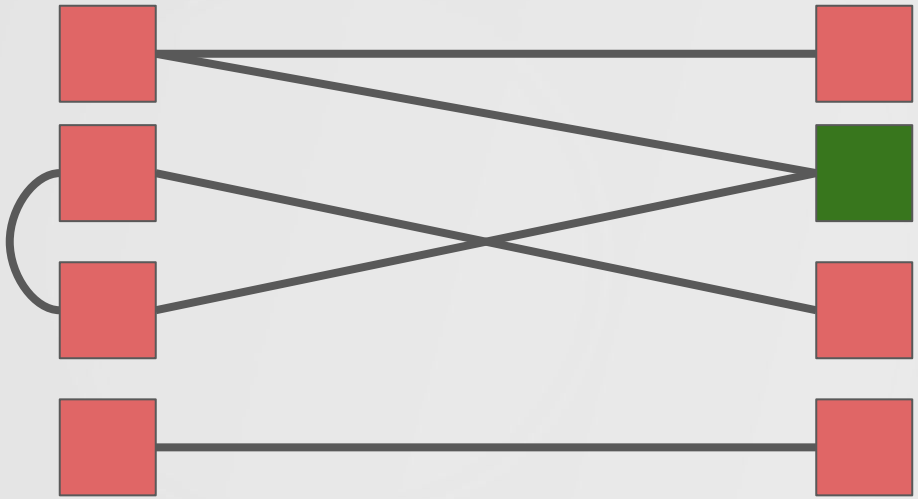


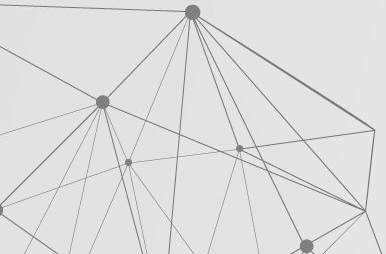
One-mode projection - Unipartite Network (Books)



The unipartite recommender system suggested a book based on connections to a reader's review history

A Reader's History **Connected Books**





18.9%

More Out-of-Cluster Recommendations

From bipartite recommendation system when the unipartite recommendation system suggests a book in the same cluster as the user

Example results of recommender systems

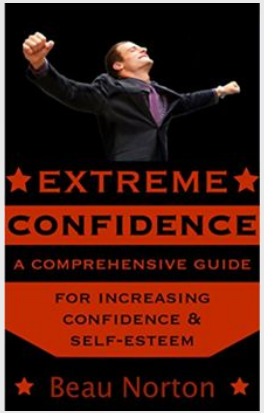
MARY RUIZ

Book history:
Nonfiction > Health, Fitness & Dieting > Diets & Weight Loss

Bipartite recommendation:
Nonfiction > Self-Help > Personal Transformation

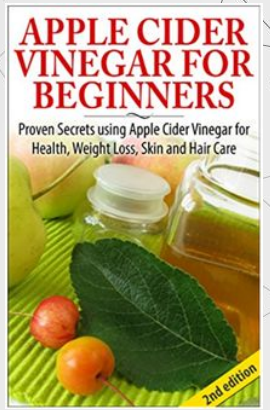
Unipartite recommendation:
Nonfiction > Health, Fitness & Dieting > Diets & Weight Loss

Bipartite Rec.

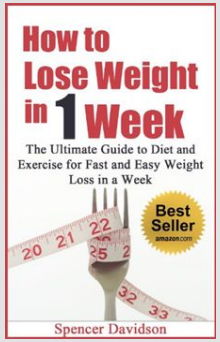


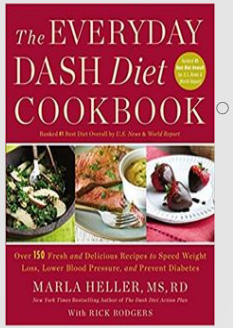
Nonfiction > Self-Help > Personal Transformation

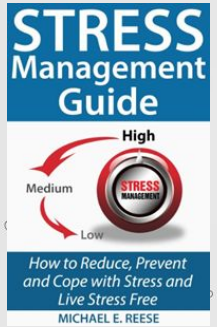
Unipartite Rec.



Nonfiction > Health, Fitness & Dieting > Diets & Weight Loss







Example results of recommender systems

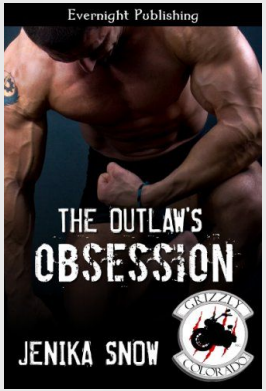
JONATHAN DOE

Book history:
Fiction > Romance

Bipartite recommendation:
Fiction > Erotic

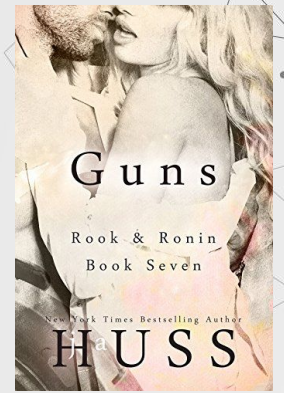
Unipartite recommendation:
Fiction > Romance

Bipartite Rec.

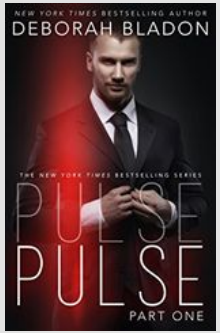


Fiction > Erotic

Unipartite Rec.



Fiction > Romance



Bipartite recommendation systems encourage exploration outside current cluster

Bipartite network recommendation systems are computationally expensive.

They're worth the extra cost when exploration of new material is desired.

- Spotify "I'm feeling lucky" button
- Try a new type of cuisine
- New feature for online shopping (like Amazon)
  - "You might also like to try…"

Unipartite vs Bipartite Recommender Systems

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