Group Recommendation System

Nafiseh Shabib,
Norwegian University
of science and Technology
(NTNU)

2013

Outline

- Introduction
  - Collaborative Filtering
  - Group Recommendation
    - News recommendation
    - Data-plan marketing
  - Evaluating Recommenders
- Conclusion

Introduction

- Need For Recommenders
  - Rapid Growth of Information
  - Lots of Options for Users

- Input Data
  - A set of users $U=\{u_1, \ldots, u_N\}$
  - A set of items $I=\{i_1, \ldots, i_M\}$
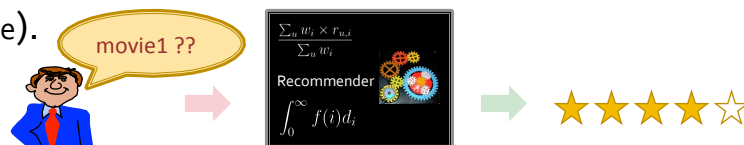 - The rating matrix $R=[r_{u,i}]_{NxM}$

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Problem Definitions in RSs

- Predicting the rating on a target item for a given user (i.e. Predicting John's rating on Star Wars Movie).

  movie1 ??

  $$\frac{\sum_u w_i \times r_{u,i}}{\sum_u w_i}$$

  Recommender

  $$\int_0^\infty f(i)d_i$$

  ★★★★☆

- Recommending a List of items to a given user (i.e. Recommending a list of movies to John for watching).

  List of Top Movies ??

  $$\frac{\sum_u w_i \times r_{u,i}}{\sum_u w_i}$$

  Recommender

  $$\int_0^\infty f(i)d_i$$

  Movie 1

  Movie 2
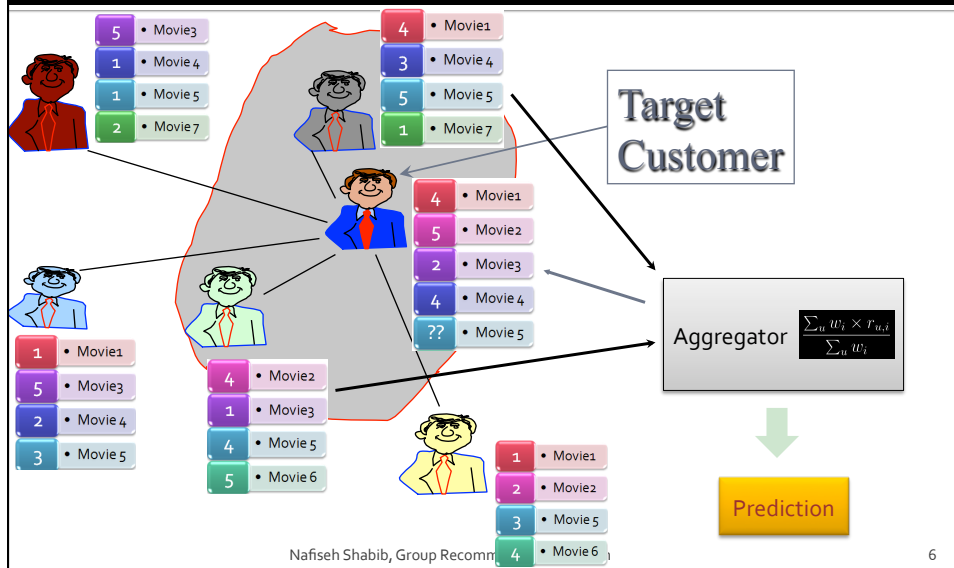
  Movie 3

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Collaborative Filtering

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Group Recommendation

Restaurants – for a work group lunch!

Movies – for a family!

Places to visit – using a travel agency!

Solution : **Group Recommendation**
Helps *socially acquainted individuals* find content of interest to all of them together.

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Group Recommendation

<u>An item must be acceptable by all the members of the group</u>

- Use consensus functions to characterize how much the item satisfies the group as a whole

- Existing solutions aggregate ratings (referred to as relevance) among group members

  - **Preference Aggregation**: aggregates group members' prior ratings into a single virtual user then computes recommendations for that user

  - **Rating Aggregation**: aggregate individual ratings on the fly using
    - Average
    - Least Misery: computes min rating

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Group Recommendation

- **Least misery**: Strong member preferences act as veto
  - e.g., do not recommend steakhouses if a vegetarian is in the group

$$value(\mathcal{G}, i) = \min_{u \in \mathcal{G}}(value_{\mathcal{F}_u}(u, i))$$

- **Average**: Democracy wins
  - e.g., recommend a holiday destination if on average the group is satisfied

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Group Recommendation

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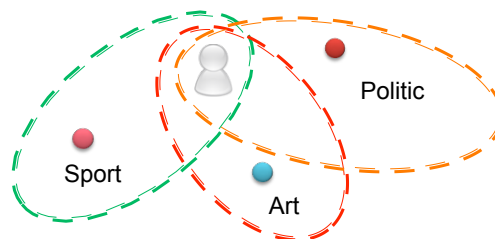$$value(\mathcal{G}, i) = \left(\sum_{u \in \mathcal{G}} value_{\mathcal{F}_u}(u, i)\right) / |\mathcal{G}|$$

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  - Group Recommendation (case research)
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News Group Recommendation

- There is two approaches that we can use Group Recommendation in news domain
  - Using group recommendation methods for a single user in news domain
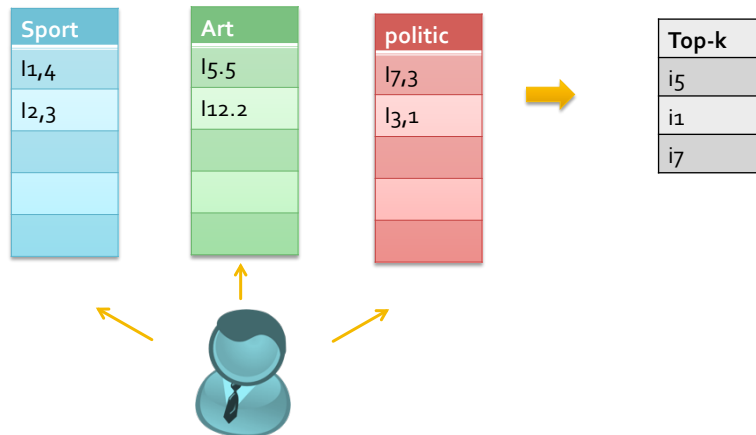 - Recommending news based on targeted Group

News Group Recommendation

Using Group recommendation methods for a single user in news recommender

Politic

Sport

Art

News Group Recommendation

Sport	Art	politic		Top-k
$I_{1,4}$	$I_{5.5}$	$I_{7,3}$		i_5
$I_{2,3}$	$I_{12.2}$	$I_{3,1}$		i_1
				i_7

News Group Recommendation

- Recommending news based on targeted Group
  - Medical researchers
  - Engineers
  - Students
  - …

Group Recommendation for Marketing at Telenor

Framework Group Recommendation for Marketing at Telenor

Layer1	• Community Detection
Layer2	• Data-plan assigning
Layer3	• Evaluation

Group Recommendation for Marketing at Telenor

Layer1	• **Community Detection**

- How?
  - Detecting community(Groups) based on their characteristics
  - How to manage borderline customers in the right group

Group Recommendation for Marketing at Telenor

Layer2	• **Data-plan assigning**

- How?
  - Tailored data-plan to the (Groups)

Group Recommendation for Marketing at Telenor

Layer3	• **Evaluation**

- How?
  - Evaluating the customer feedback based on offered data-plan
    - For example, most of the border line customers "moves" to a higher plan (success)

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Evaluating Recommenders

- Cross Validation
  - K-Fold
  - Leave-one-out
- Root Mean Squared Error (RMSE)

$$RMSE = \sqrt{\frac{\sum_{(u,i)|R_{u,i}} (r_{u,i} - \widehat{r}_{u,i})^2}{|\{(u,i)|R_{u,i}\}|}}$$

- Mean Absolute Error (MAE)

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Conclusion

- Group recommendation need a bigger picture of group behavioral modeling, and there is still a lot that can be done in this regard.

Our Work

- Challenge of Group RecSys [recsys 2013]
- Group Recommendations in Information Systems [NOKOBIT 2013]
- Contextual Recommendations for Groups [NoCoDa 2012]

Thank you!