Actively building private recommender networks for evolving reliable relationships

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Overview

- Introduction
- Active evolution model
- Analysis
- Conclusion
Introduction

Social networks

- Online community building
  - Make friends, keep friends, communicate
  - Wide user acceptance
  - Fast growing
  - Valuable profile and link information

Research

- Online community structure
- Social search
- Recommender networks
- Evolution of SN
Recommendation networks

- Using social networks for recommender systems
- Implemented in websites such as Amazon
- Area of active research

A study finds

“Results showed that the users friends consistently provided better recommendations than RS. However, users did find items recommended by online RS useful: recommended items were often ‘new’ and ‘unexpected’”

Transparency and Control

Combine strengths of recommender systems with friendships in networks
- Issue of trust and transparency has been addressed before
- Still limited control over who is in the recommendation network

Our goal
- Active building of customized recommender network
- Includes control, trust and transparency, and goes beyond that
Requirements

- Interaction $\Rightarrow$ user feedback for direct improvement of recommendations
- Growing networks $\Rightarrow$ maintain and grow social network based common interests
- Privacy $\Rightarrow$ users set and update privacy settings, for general public and contacts
- Bilateral vs. unilateral $\Rightarrow$ revealing any anonymous contact bilateral; anonymous contacts may be unilateral
- Transparency $\Rightarrow$ understand background for user judgment of recommendations
- Evolving trust $\Rightarrow$ As in most offline relationships, trust evolves over time with a common history
- Selective interests $\Rightarrow$ users do not need to agree on all topics of interest
Our model

- Start: RS on user profiles
- Create history of recommenders
- May be rated just for single item
- Additionally, user expands ratings
  - More recommendations from this user?
  - In any category?
- New unilateral anonymous contact
  - Entry on recommendations by this user
  - Whether they were picked
  - Possibly ratings and restrictions
- Recommender \(\Rightarrow\) create bilateral contacts
- Users may add or change ratings
- Add or relax constraints of the categories
- Possible (unilateral, bilateral) revelation
Updating recommendations

- **Recommendations**: sum of partially shared interests of user $u$ with recommender $r_j$:
  \[ s(i) = \sum_{r_1, \ldots, r_n} weight(i, u, r_j) \]

- **Weight** of $i$ by $r_j$ depends on similarity to $u$

- User chooses $i$: new $e(r_j) = \{ \langle i, weight(i, u, r_j) \rangle \}$

- If feedback, include **rating** value $v$: $e(r_j) = \{ \langle i, v \rangle \}$

- If rating restricted to category $c$: triplet of (item, category, recommender) $e(r_j) = \{ \langle i, c, v \rangle \}$

- **Updates** only change the values of the tuples or triples, and add to the overall confidence level: $|e(r_j)|$

- Additionally **age**, e.g. exp. decay of weights:
  \[ \exp(-\lambda \cdot (now - t)) \]

- $e(r_j)$ are displayed with weight $weight(i', u, r_j)$
# Active recommendation

## Reliable recommendations

<table>
<thead>
<tr>
<th>Pick a category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music</td>
</tr>
<tr>
<td>Movies</td>
</tr>
<tr>
<td>Games</td>
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<tr>
<td>Books</td>
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<tr>
<td>Hobbies</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Latest recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category: all restrict</td>
</tr>
</tbody>
</table>

**Music** *Good Girl Gone Bad*: Reloaded by Rihanna (artist)

**Music** *Fan24 ChrisLaken Anon2 ★★★★★

**Movies** *Quantum of Solace* with Daniel Craig, Olga Kurylenkoby, ... (cast)

**Movies** *Madagascar: Escape 2 Africa* with Ben Stiller, Chris Rock, ... (cast)

**Movies** *Sahra Anon1 ★★★

**Games** *World of Goo* for PC (platform)

**Books** *Wandering Star* by Le Clézio (author)
Analysis

- Interaction is easy: picking any recommendation, an anonymous relationship is created
  - Optionally refined by ratings and restrictions
- Growth: Anonymous relationships converted to regular contacts
- Privacy: Recommendation histories managed in separate entities; only if a user agrees to do so, will his or her identity on the network be revealed
- Users may keep recommendation histories unilateral, may become bilateral; anonymous or not
Analysis (cont.)

- Linking information makes recommendation transparent
  - Users gain personalized view on the reliability of recommenders
  - See if recommendations are by known friends or someone new
  - Any new person can be added (tracked)

- Anonymous relationships with repeated recommendations: trust evolves

- Partially shared interests captured in restrictions to categories
Ongoing work

- Plan to implement our model on existing systems
  - Several social networks provide easy access via APIs
  - Also Google recently suggested unified OpenSocial standard
  - Profile information via APIs
  - Maintain history of recommendations
  - For scalability reasons, pairwise history can be degraded with time and long tail cut off

- Study user acceptance and usage
  - Do recommendations improve?
  - Do users find time for building worthwhile?
  - Do users find new friends?
Conclusion

- Recommendations benefit from social network information
- Building recommendations increases trust and transparency, and allows active network evolution
- We characterize requirements for active recommendation networks
- Our model proposes a way of maintaining and incorporating information in anonymous contacts
- Revelation (unilateral, bilateral) grows network of friends
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Thank you for your attention.

Questions?