Co-Staying: A Social Network for Increasing the Trustworthiness of Hotel Recommendations

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Recommender Systems

- Model and maintain network representations of users and data
  - Increase accuracy of recommendations
  - Able to scale to large data sets

[Linden et al., 2003]
Contributions

1. Concept of a **multimode network** for hotel RS
   - Represent users, hotels, and topics as nodes
   - Extract hotel properties from social media (e.g., reviews)
   - Generate more suitable suggestions

2. Proposed **interactive methods**
   - Facilitate presentation and exploration of the network
   - Increase transparency and control
**Common Network Types in RS**

- **1-mode networks**
  - All vertices are of the same type
    - e.g., users
Common Network Types in RS

- **1-mode networks**
  - All vertices are of the same type
    - e.g., users

- **2-mode networks**
  - Relationships between two types of vertices
    - e.g., users and items
Multimode Networks for Hotel Booking RS

- Hotels have amenities (i.e. topics)
- Guests reference amenities they (dis)liked in reviews

```
Although next to the elevator, the room was quiet.
Good breakfast.

The breakfast buffet was very modest and the offer
did not change during our entire stay.
Noisy room.
Shower was leaking.

Our room was above the restaurant and very noisy...
Excellent staff. Good breakfast.
```

Diagram:
```
Relationships between users and hotels can be modeled based on the topics mentioned in reviews.

Several paths between a user and a hotel: one for each topic referenced in the user’s review.

Topics extracted from user reviews give a broader range of (subjective) preferences.
Extracting Topics from User Reviews

1. Identify topics
2. Merge and de-duplicate
3. Analyze sentiment
4. Classify topics

[Feuerbach et al., 2017]
Clustering Users Based on Topics (and Sentiment)

“Being positioned in between two of the busiest roads in London, it was very noisy due to sheer weight of traffic.”

“The rooms were quite noisy in the mornings with people moving around outside.”

“Clean, bright and quiet room. would certainly stay here again.”

(noisy, room) ➔ (noisy, room) ➔ (quiet, room)
Clustering Based on Topics

- **Users**
  - Travel profile, e.g., visited hotels, purpose, duration of stay
  - Topics mentioned in reviews (and their polarity)

- **Hotels**
  - Topic similarity

- **Topics**
  - Mentioned together often in reviews

(heavy, traffic) → (noisy, room)
Exploiting Hotel Chains to Alleviate Data Sparsity

Most hotels have few reviews

Brands aim for consistent user experience

Data Sparsity

“Soft links” can be generated from a topic to other hotels that are part of the same chain.

NB: Not all topics are suitable for soft linking.
Interactive Mechanisms for Visualization (1/4)

- Explore underlying graph

Recommended hotel

Relevant topics

Representative user
Interactive Mechanisms for Visualization (2/4)

- Change focus

Seamless transition to other nodes in the graph
Interactive Mechanisms for Visualization (3/4)

- Manage complexity

Zoom in / out to adjust the amount of information
Interactive Mechanisms for Visualization (4/4)

- Explore the public profiles of reviewers

- Embed **trust cues** to identify trustworthy users
  - Breadth of experience (i.e. expertise)
  - Review history
  - Endorsements from other users
Social Network Analysis

- Challenge: Most network analysis methods are defined only for 1-mode networks

- Projections typically result in loss of detail

- (Borgatti & Everett, 1997) and (Latapy et al., 2008) have adapted or introduced measures for 2-mode networks

- Measures for multimode networks are still very scarce
Conclusions & Future Work

- Hotel topics as an additional type of vertex could
  - ...introduce novel interaction techniques
  - ...facilitate the discovery of similar users
  - ...increase transparency and user control

- Data sparsity could be alleviated through “soft linking”

- Novel network analysis methods need to be developed

- Evaluate change in perceived trustworthiness

Thank you!

Questions?

