

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

Catalin-Mihai Barbu and Jürgen Ziegler

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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

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[Linden et al., 2003]

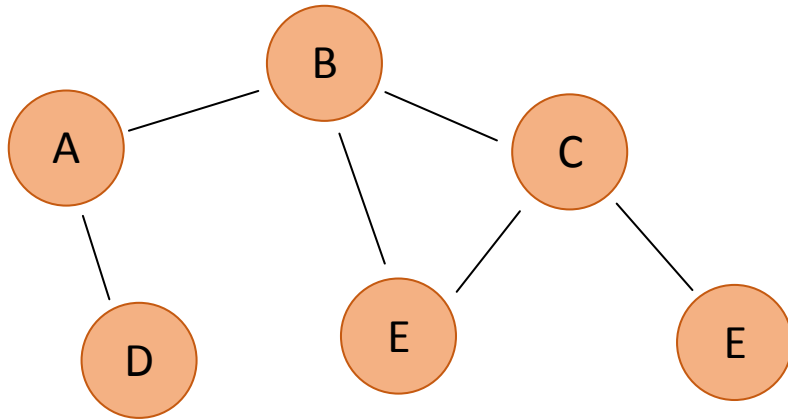
Contributions

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

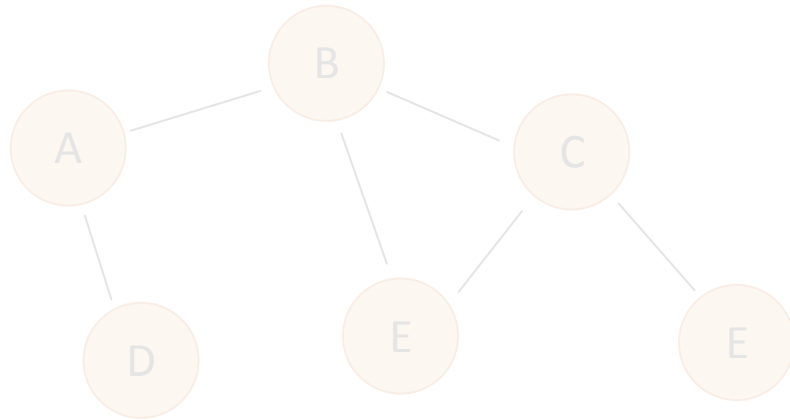
- 1-mode networks
 - All vertices are of the same type
 - e.g., users



Common Network Types in RS

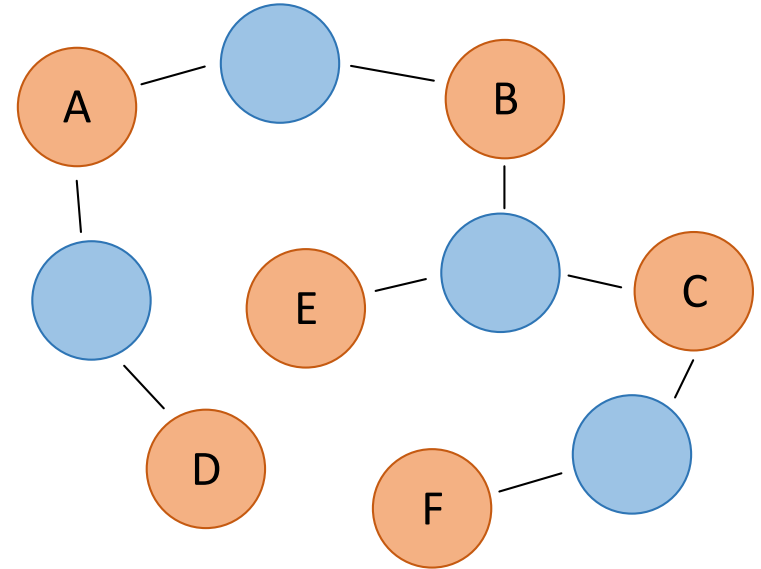
- 1-mode networks

- 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)

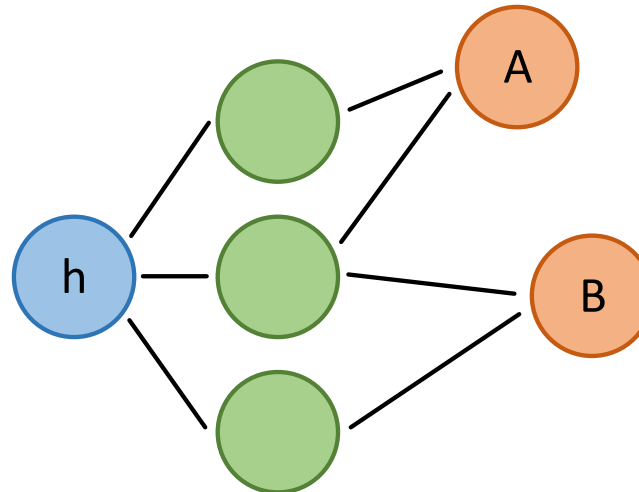
 Parking  Free WiFi  Family rooms  Pets allowed  Non-smoking rooms  Restaurant

- Guests reference amenities they (dis)liked in reviews

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

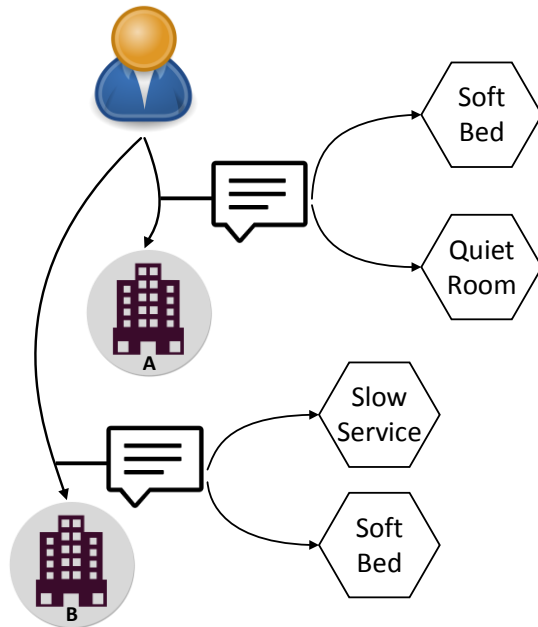
“ Our room was above the restaurant and very noisy.. ”
Excellent staff. Good breakfast

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

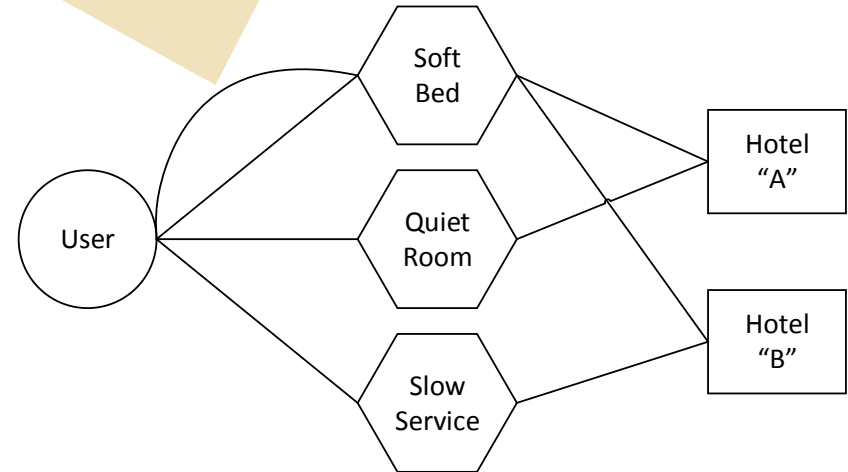


Co-Staying Network

- Relationships between **users** and **hotels** can be modeled based on the **topics** mentioned in reviews

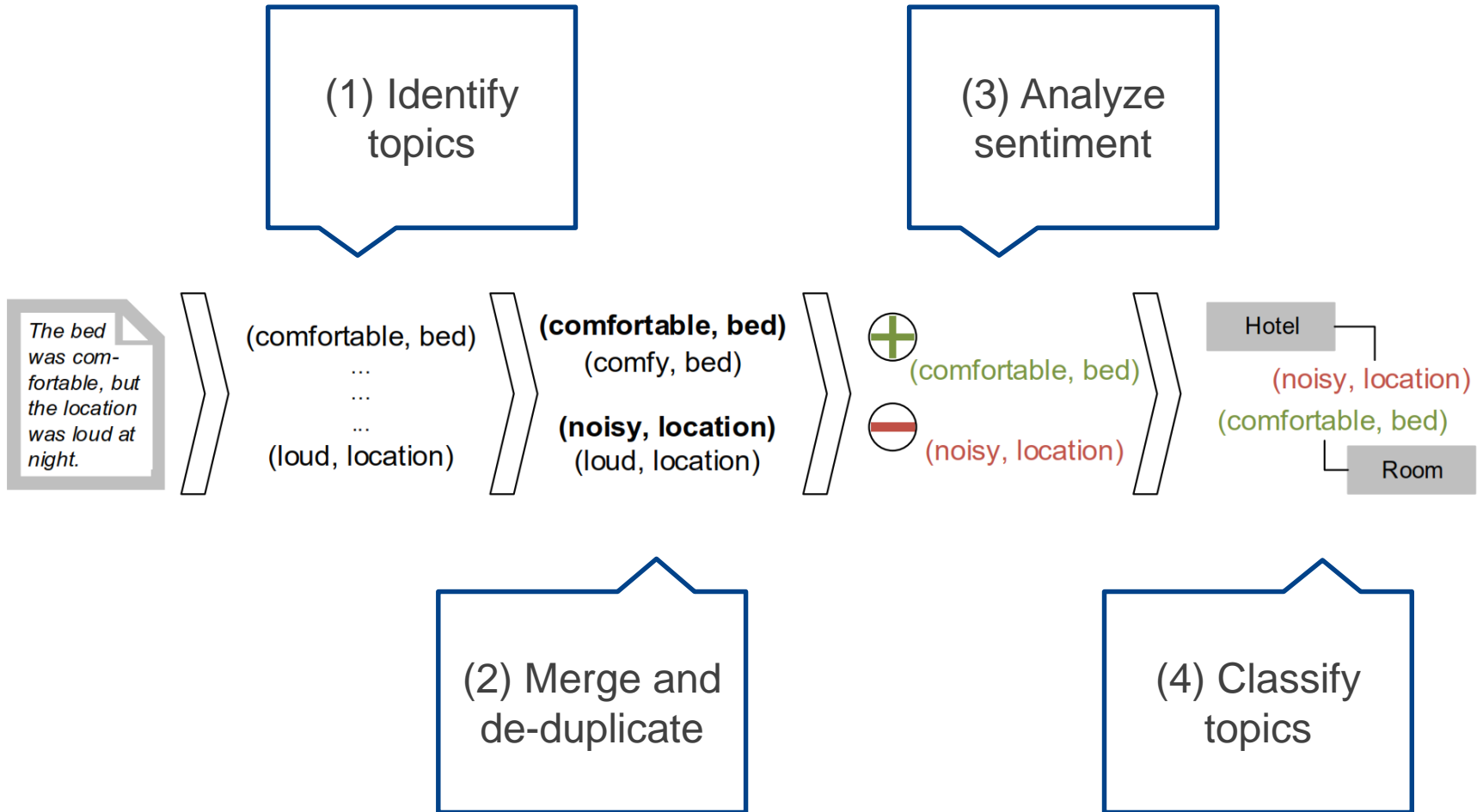


Several paths between a user and a hotel: one for each topic referenced in the user's review



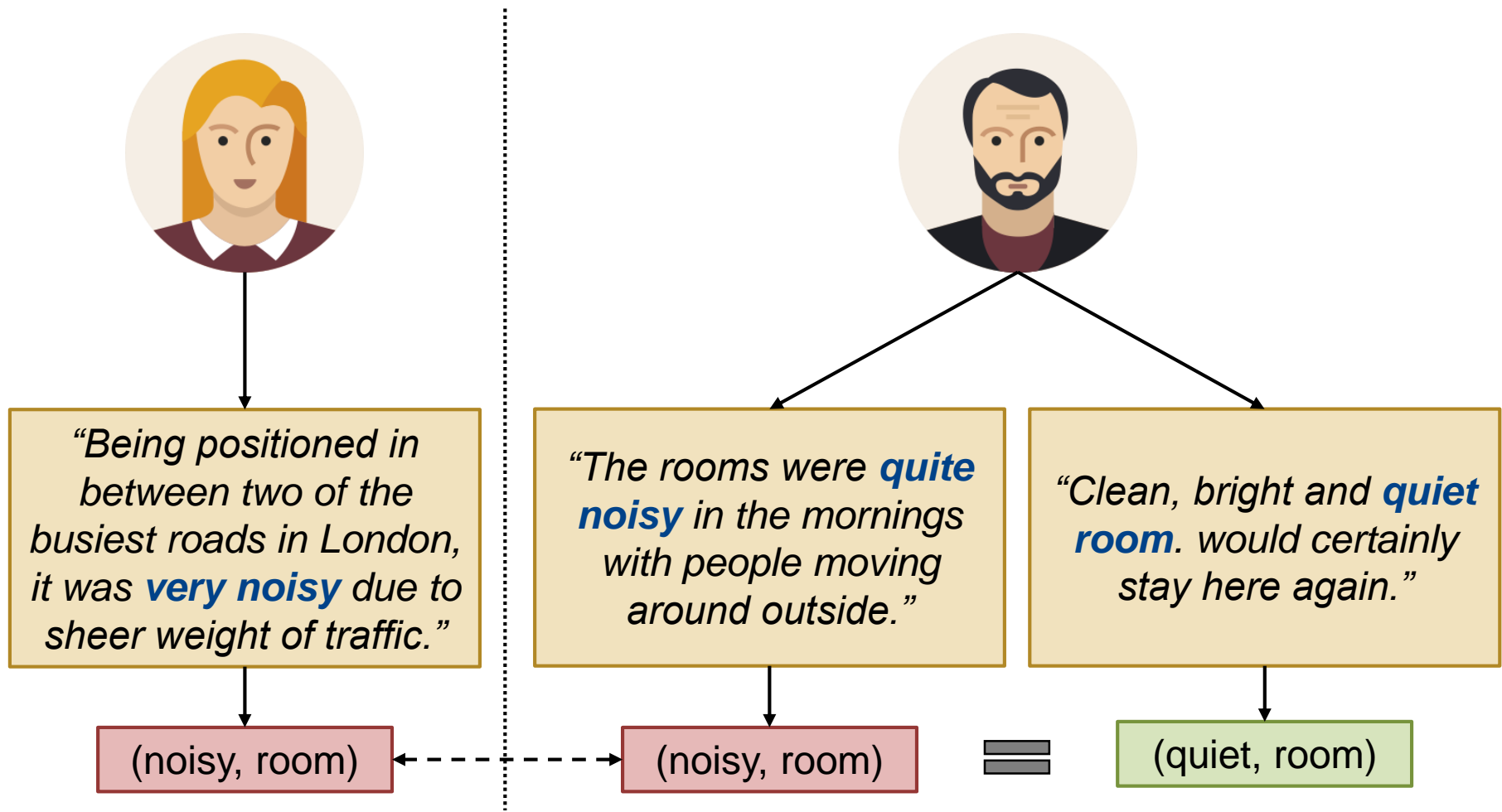
Topics extracted from user reviews give a broader range of (subjective) preferences

Extracting Topics from User Reviews



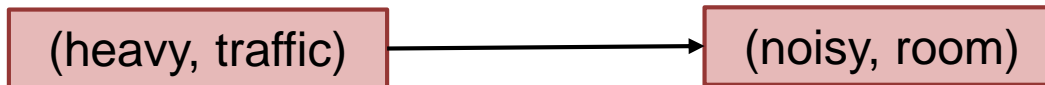
[Feuerbach et al., 2017]

Clustering Users Based on Topics (and Sentiment)



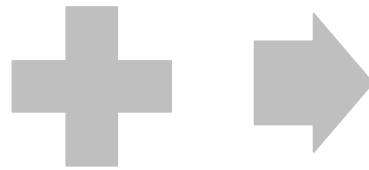
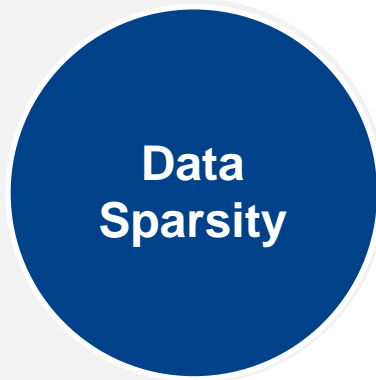
Clustering Based on Topics

- 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

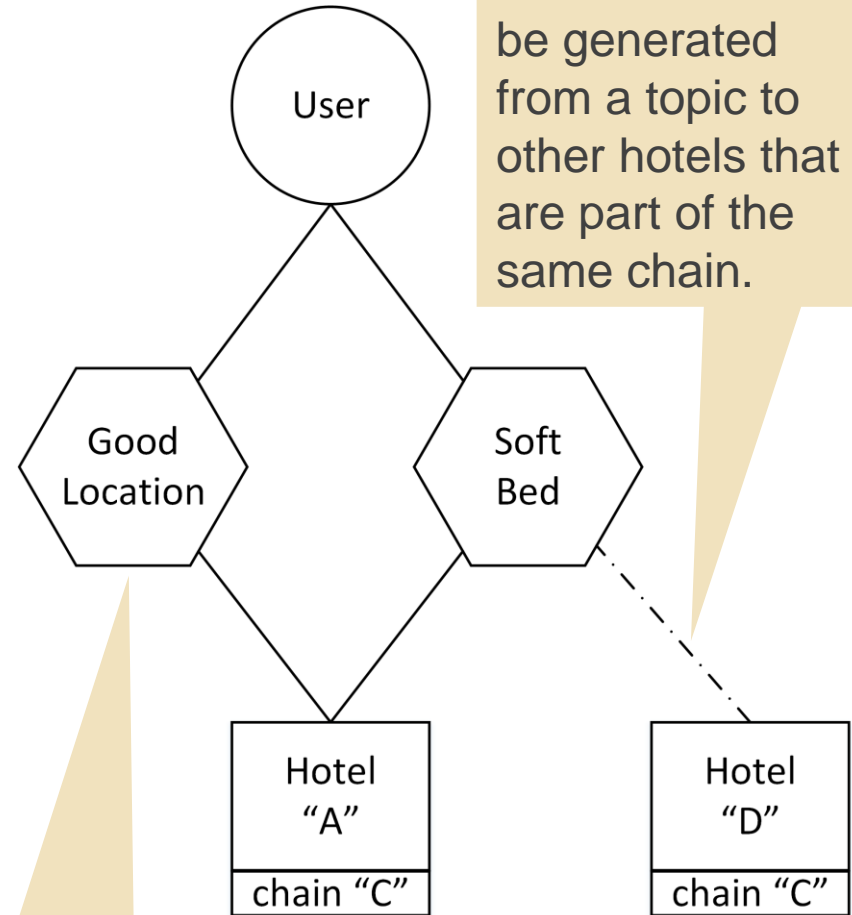


Exploiting Hotel Chains to Alleviate Data Sparsity

Most hotels have **few** reviews



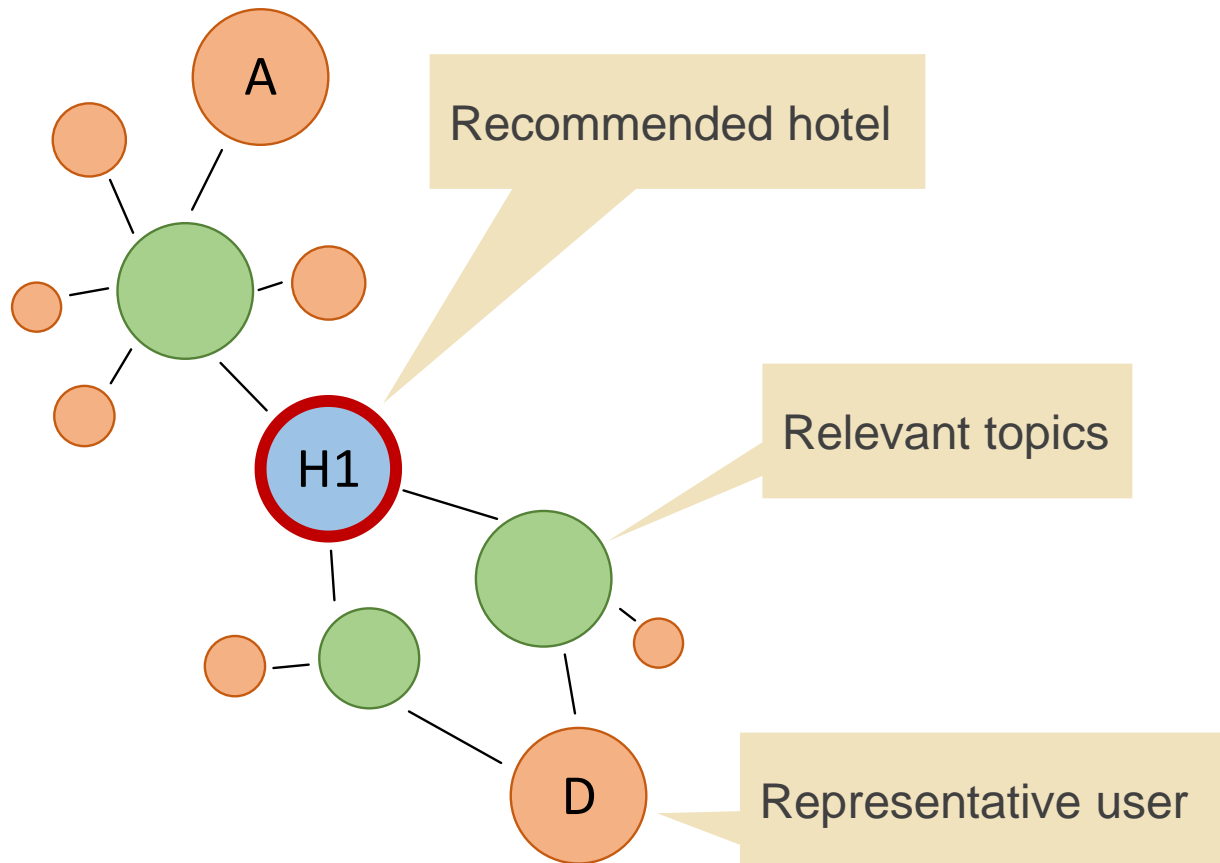
Brands aim for **consistent** user experience



NB: Not all topics are suitable for soft linking.

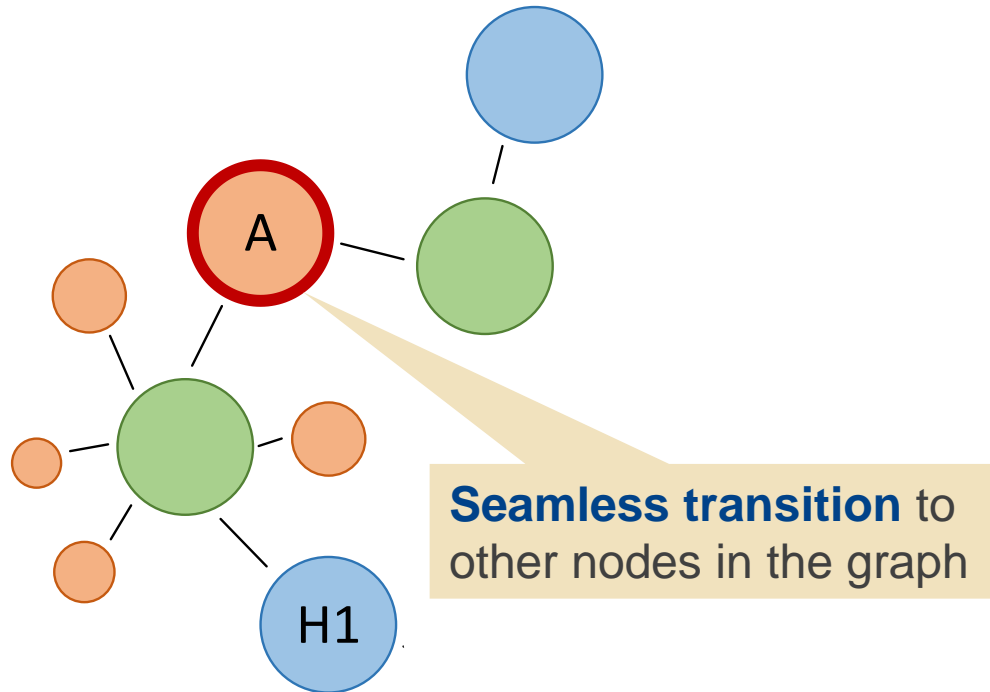
Interactive Mechanisms for Visualization (1/4)

- Explore underlying graph



Interactive Mechanisms for Visualization (2/4)

- Change focus



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?

References

Borgatti, S. P. & Everett, M. G. Network analysis of 2-mode data. *Social networks* 19, 243–269 (1997).

Feuerbach, J., Loepp, B., Barbu, C.-M., & Ziegler, J. Enhancing an Interactive Recommendation System with Review-based Information Filtering. In *Proc. IntRS '17*. ACM (2017).

Latapy, M., Magnien, C., & Del Vecchio, N. Basic notions for the analysis of large two-mode networks. *Social networks* 30-1, 31–48. (2008).

Linden, G., Smith, B., & York, J. Amazon. com recommendations: Item-to-item collaborative filtering. *IEEE Internet computing*, 7(1), 76–80. IEEE (2003).