

Challenges in Recommender Systems for Tourism

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Introduction

- Tourism accounts for 10% of the world's GDP
 - Supports about 1 in 11 jobs around the globe
- Classified into: medical, educational, artistic, sports etc.
- Enormous information is stored digitally that not used to its maximum potential
- Recommender systems play a very important role
 - Can personalize the experience of tourists
- Position paper aims to highlight the open problems in this area for researchers to work on

Dynamic Itinerary Planning

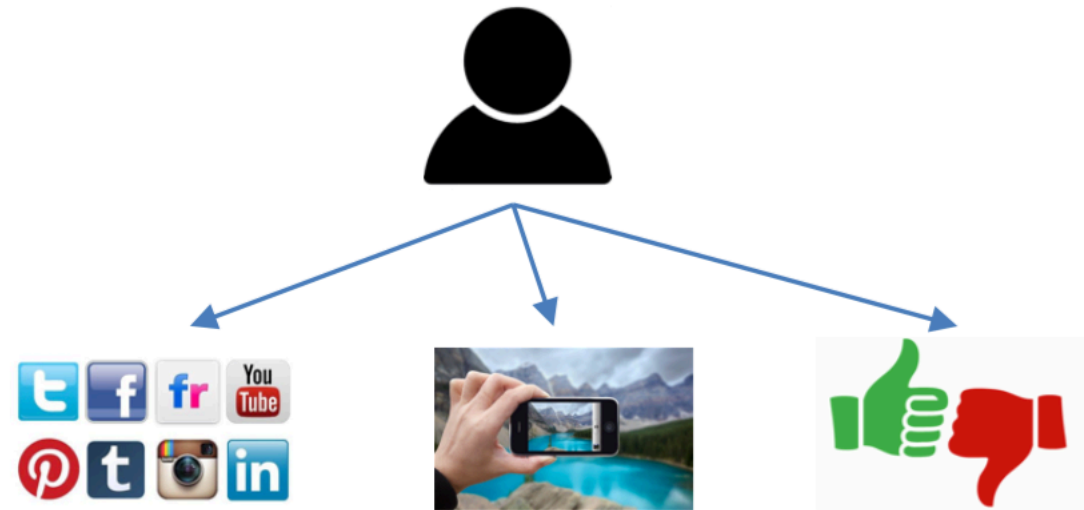
- Tourists generally have an agenda in mind
 - Places to visit in a city or events to attend, restaurants to try etc.
- But existing systems are all static in nature
 - They do not take into account changes that take place in real-time
- Can be modeled as a optimization problem
 - Objective function is to maximize a user specific satisfaction metric
 - Subject to constraints such as opening times, budget etc.
- Human interface also plays an important role
- Design needs to ensure minimal amount of cognitive effort is required

Mobile

- Future of computing is mobile
 - Tourists are always on the move
- Take advantage of contextual information
 - Location, time, weather etc.
- Capture multi-modal interactions
 - Emotion, travelling individual or as a group
- Ubiquitous nature
 - Notify users about right information at the right time and right location
 - Ex: Google Now that leverages information from multiple sources
- Ultimately, personalize the user experience

Evaluation methods

- Current evaluation methods mostly consider explicit feedback
 - Root Mean Squared Error (RMSE) and MAE (Mean Average Error)
- Need to go beyond and explore implicit feedback
- Analyze user's social media, pictures being taken etc.



Group Recommendation

- Tourists generally travel in groups
- Current systems mainly focus on a single user rather than a group
- Challenge is to combine individual preferences
- Variables to considered are:
 - Number of members in the group
 - Individual restrictions
 - Group characteristics.

Social Network & Integration

- Social connections play an important role in the recommendation for tourism
- Various types of social influence that ranges from different degrees
 - Integrate social media such as Facebook, Twitter etc.
- Integrate all tourist requirements in an end-to-end system
- Allows all computation to be done without switching between apps



Serendipity & User Modeling

- Serendipity refers to the idea of discovering a new interest that the user had no idea about.
- These types of recommendations are the most effective but also the riskiest.
- The reward is high but the accuracy also tends to be low.
 - For example, users interested in art history, might also be interested in ancient monuments.
- Such models can be learnt using machine learning techniques that process large amounts of behavioral data.

Privacy & Robustness

- Privacy

- These systems contain a lot of personal information
- One method is differential privacy, that aggregates information to prevent identification of individual records.

- Robustness

- Systems are vulnerable to manipulation and important to protect them from various types of attacks.
- A malicious user might target a competitor by creating fake accounts and down-rating their system, meanwhile increasing the rating of own system.

Conclusion

- Tourism domain presents an exciting opportunity for recommender systems
- Outlined the main challenges in this position paper
- Enhanced collaboration with tourism domain experts needed