REVIEW RECOMMENDATION FOR POINTS OF INTEREST OWNERS

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POI
- Attraction
- Restaurant
- Hotel

Rate (grade)
Review (text) <<<
1. Bad reviews may damage business reputation

Service failure recovery
Reputation management industry
eg. reviewsthatstick.com
2. Volume of data
500 million reviews
7 million places
135,000 destinations

HOW TO FIND A USEFUL REVIEW?!
(a) Regular users: Where to? visit stay eat shop
(a) How to find a useful review for the regular user

Assessing Review Recommendation Techniques under a Ranking Perspective
Maroun, Moro, Almeida, C. Silva @ Hypertext 2016
doi>10.1145/2914586.2914598
http://dl.acm.org/citation.cfm?id=2914598
(b) It's all about
Our goal: Ranking reviews according to their relevance for POI decision making
Why traditional techniques do not work for owners?

The relevance of a review to an establishment is different

- The goal is not to help decide which product to buy or which place to visit or stay
- The focus is to identify comments that address important issues to increase customer satisfaction
Motivating Example

Real reviews for a real hotel at TripAdvisor
Motivating example

“Lovely hotel, room service terrible”

Reviewed November 23, 2016

The hotel was great, staff was friendly and helpful, room was clean and modern and delicious breakfast. Location is central and we really enjoyed that.
The room service at night was an issue, we asked them to order us a pizza since we don’t speak Finnish, and they said they couldn’t because they had room service. So we ordered room service and it was absolutely disgusting. The burger was raw on the inside. They took it off our bill after we complained and we went to bed hungry lol...
Oh well, the price you pay for not speaking the language.

Room Tip: Don’t get the room service. Upgrade to a larger room

Stayed November 2016, traveled as a couple

Sleep Quality  Service

Helpful? Thank Marigo2015

Ask Marigo2015 about GLO Hotel Kluuvi Helsinki

This review is the subjective opinion of a TripAdvisor member and not of TripAdvisor LLC.
Motivating example

“Nice hotel - terrible room service”

Reviewed January 23, 2017 via mobile

Nice enough hotel, good breakfast, bedroom is a good size with all the right amenities however the room service was appalling. This for me is a must when travelling for business and wanting to work in the evenings in the room.

There were no menus in the room and so assumed that they didn’t offer this but was advised that they did it when requiring for local restaurants to order some delivery food. The food was very over cooked (burger) and under cooked (chips). Won’t be staying again.

Stayed January 2017, traveled on business

Helpful? Thank andrew p

Ask andrew p about Residence Inn Edinburgh

This review is the subjective opinion of a TripAdvisor member and not of TripAdvisor LLC.
Motivating example
Wake up manager!
Do something and answer properly those complains about room service!
SOLUTION
OwnerView

Recommend useful reviews for the POI owner
1 Aspect Extraction + Sentiment Analysis
2 Aspect Weight
3 Review Score
1. Aspects extraction + Sentiment analysis

- **Goal**: Given an opinion, return the aspects and the user's sentiment about them
- **Key characteristic**: An opinion always has a target
- **Target**: Aspect or topic to be extracted from a sentence
Aspects extraction + Sentiment analysis

Example

"The air conditioning unit was very noisy and there was also a lot of noise from the lift at night, not only noise but vibrations in the room. Saying that the room although small was clean and as was the rest of the hotel. Staff were friendly. " 
### Aspects extraction + Sentiment analysis

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Sentiments</th>
<th>Score [-1, 1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>room</td>
<td>clean</td>
<td>0.62</td>
</tr>
<tr>
<td>staff</td>
<td>friendly</td>
<td>0.79</td>
</tr>
<tr>
<td>air conditioning unit</td>
<td>very noisy</td>
<td>-0.78</td>
</tr>
</tbody>
</table>
2. Calculate Aspect Weight

Aspects

- **Positive**: help identify reviews with compliments about features or services
- **Negative**: help to find reviews with possible problems or features that clients do not like

Positive and negative: separately as two perspectives of the same aspect

Review date

- **Ignore**: useful to identify the main reviews and discover general aspects
- **Consider**: useful to monitor the variation of customer opinion over time, and separate old/new
3. Review Score

- Consider positive and negative aspects
  - Only positive
  - Only negative
  - Positive & Negative

- Weight review by the writer's reputation
  - Helpful votes
  - Number of reviews
Algorithms and formulas in the paper
Experimental Evaluation

1. Data
2. Ground truth
3. Baseline
1. Data and Pre-processing *

- 72,876 reviews
- 9,676 hotels from US (07/16)
  - Reviews
  - Answers
- Category that most provides feedback to users through review responses

* Details on extra slides
2. Ground Truth *

- ARE OUR RESULTS CORRECT?
- None of the existing methods estimates the helpfulness of a review for a POI owner
- Built from experts evaluations
- Randomly selected 25 hotels and the last 200 reviews from each hotel
- Ideal rank

* Details on extra slides
3. Baseline *

- **IS OUR SOLUTION GOOD ENOUGH?**
- **Hypothesis after analysing reviews**
  - Relation between review quality and the answer given by the POI
  - POI owners may explicitly mention the important aspects in the reviews

* Details on extra slides
Experimental Results

- OwnerView vs. Ground Truth
- Baseline vs. Ground Truth
- OwnerView vs. Baseline
OwnerView vs. Ground Truth

OwnerView configurations

a. Only positive aspects
b. Only negative aspects
c. Positive and negative aspects combined
d. Review writers score
OwnerView vs. Ground Truth
OwnerView vs. Ground Truth

OwnerView average results

a. Only positive aspects
   nDCG: 0.4

b. Only negative aspects
   nDCG: 0.6

c. Positive and negative
   nDCG: > 0.6

d. Review writers score
   nDCG: 0.8
Baseline vs. Ground Truth

Valid baseline?

- Lowest nDCG: 0.76
- Average nDCG: 0.82
- Greatest nDCG: 0.90

Yes! Ranking close to the ideal one.
OwnerView vs. Baseline

Cumulative Distribution Function

- nDCG for all 9,676 hotels
- Both ranking are tied
- nDCG > 0.6: 20% chance

Worst results

- Hotels that provide generic or vague answers
I was greatly looking forward to trying Hotel 41. Unfortunately, it was a disappointing experience. It’s difficult to know whether this is really a hotel.... **Staff:** they indeed seem to try, but they are not very capable. *Don't expect minor repairs* to be made properly, your room service order to be correct, or any insight or help from the concierge service. They're a chatty bunch, inquiring all about your day, your plans, etc, etc. **Rooms:** *Uncomfortable and unsettling.* The black and white decor might look good in photos, but is *neither warm nor welcoming.* The bath had some expensive-looking fittings, but besides that, the room seemed much past its prime.

Thank you for taking the time to post your review of 41 on Tripadvisor. I am most grateful for your feedback, which is such a valuable source of information for me, regardless of whether it is good or bad, and helps me monitor the service we provide.
Conclusion

● New problem
  ○ rank reviews according to their helpfulness to the business owner

● Creation of two datasets
  ○ Ground truth
  ○ Baseline

● Most reviews are not helpful at all to the owners

● Proposed solution
  ○ Consider positive and negative aspects of a review
  ○ Negative aspects are more relevant to a POI owner
  ○ Consider writer’s reputation
Future Work

- Investigate the benefits of adding new features like geographic ones
- Analyze the temporal dynamics of the reviewing process and the correlation to POI popularity
REVIEW RECOMMENDATION FOR POI's OWNERS

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UFMG, Brazil
Funding from CNPq and FAPEMIG
1. Data and Pre-processing

Filtering

- Eliminate 16% of reviews
- Final set of 61,815 reviews

<table>
<thead>
<tr>
<th>Category</th>
<th># reviews</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated reviews</td>
<td>728</td>
<td>0.99</td>
</tr>
<tr>
<td>Reviews with less than ten words</td>
<td>2,796</td>
<td>3.83</td>
</tr>
<tr>
<td>Reviews with non English words</td>
<td>7,537</td>
<td>10.34</td>
</tr>
</tbody>
</table>

Review data

- Writer's
  - username
  - # reviews made
  - # positive votes
- Review date
- POI answer (optional)
## Data and Pre-processing

<table>
<thead>
<tr>
<th>#Aspects</th>
<th>#pos. rev.</th>
<th>#neg. rev</th>
<th>#pos. ans.</th>
<th>#neg. ans.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>490</td>
<td>3,900</td>
<td>96</td>
<td>5,468</td>
</tr>
<tr>
<td>1</td>
<td>685</td>
<td>1,508</td>
<td>435</td>
<td>945</td>
</tr>
<tr>
<td>2</td>
<td>953</td>
<td>783</td>
<td>840</td>
<td>537</td>
</tr>
<tr>
<td>3</td>
<td>1,165</td>
<td>424</td>
<td>1,222</td>
<td>181</td>
</tr>
<tr>
<td>4</td>
<td>1,147</td>
<td>244</td>
<td>1,374</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>859</td>
<td>147</td>
<td>1,123</td>
<td>35</td>
</tr>
</tbody>
</table>
Data and Pre-processing

Interesting facts

○ Only 1,673 (17%) from 9,676 POI owners answer user reviews
○ Answered 7,271 (12%) reviews
○ POI owners are consistent, as when answering one, they usually answer almost all received reviews
2. Ground Truth: statistics

<table>
<thead>
<tr>
<th>Score</th>
<th># of evaluations</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/5</td>
<td>2,041</td>
<td>10.12%</td>
</tr>
<tr>
<td>4/5</td>
<td>3,917</td>
<td>19.6%</td>
</tr>
<tr>
<td>3/5</td>
<td>5,130</td>
<td>25.6%</td>
</tr>
<tr>
<td>2/5</td>
<td>4,099</td>
<td>20.5%</td>
</tr>
<tr>
<td>1/5</td>
<td>4,813</td>
<td>24.0%</td>
</tr>
</tbody>
</table>
Ground Truth: hotels average evaluation score
3. Baseline: Review-answer similarity

- A user writes a review mentioning aspects with positive and negative opinions

- **Negative reviews** usually point out problems and dissatisfaction on the establishment

- POI owner may answer a review
  - thanking the positive compliments
  - explaining that a solution is on the way for the negative aspects
Baseline: Review-answer similarity

- Either positive or negative, the owner usually mentions again the aspects being answered
- Cosine similarity between review aspects and the response given by the establishment
  - **High similarity**: the establishment took time in answering the points addressed in the review
  - **Low similarity**: may indicate generic responses
Methods for Comparison: Review-answer similarity

Examples of POI answers

● "The room size will be improved in the upcoming restoration."
● "We are planning regular meetings with the staff regarding how to properly treat our guests."
● "Thanks for point it out, we will improve it soon"
We booked a room for 4 persons and they gave us room with one bed only. It was unbelievable, we just didn't have were to sleep!!! My room was close to some kind of machinery and it was so noise that became quite hard even to those who had bed to get some sleep. The hotel is quite old and the rooms are small but not so bad if you have bed for everybody… Never again anyway!!

<table>
<thead>
<tr>
<th>Review</th>
<th>Answer</th>
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<tbody>
<tr>
<td>We booked a room for 4 persons and they gave us room with one bed only. It was unbelievable, we just didn't have were to sleep!!! My room was close to some kind of machinery and it was so noise that became quite hard even to those who had bed to get some sleep. The hotel is quite old and the rooms are small but not so bad if you have bed for everybody… Never again anyway!!</td>
<td>Thanks for... After doing some research, we were able to figure out that your reservation was made through a discount website that does not guarantee your room preference. While you can make a room request, the room type is not guaranteed. If our hotel had the availability, we would obviously have been happy to place you in the room type you preferred. We certainly hope you give our hotel another chance.</td>
</tr>
</tbody>
</table>
Evaluation Metrics

- Extremely relevant documents are more important (valuable) than documents with marginal relevance.
- The lower the position of the document in the ranking, the lower the value of such a document for the user.

\[
DCG_k = \sum_{i=1}^{k} \frac{2^r_{rel} - 1}{\log_2(i + 1)}
\]

\[
nDCG_k = \frac{DCG_k}{IDCG_k}
\]

*nDCG: Normalized Discounted Cumulative Gain*