Towards Controllable Explanation Generation for Recommender Systems via Neural Template

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Explanation for Recommender Systems

• Explain why an item is recommended

• Benefits of Explanation (Tintarev and Mashoff. Handbook’15)
  • Increase users’ confidence in the system (Trust)
  • Help users make good decisions (Effectiveness)
  • Convince users to try or buy (Persuasiveness)
  • Help users make decisions faster (Efficiency)
  • Increase the ease of use or enjoyment (Satisfaction)
  • ......
Motivation

- Textual explanation
  - Template-based
  - Generation-based

<table>
<thead>
<tr>
<th>Controllable, but inflexible</th>
<th>Flexible, but uncontrollable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>Flexible and controllable</td>
</tr>
<tr>
<td>EFM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customers who bought this item also bought.</td>
</tr>
<tr>
<td></td>
<td>You may be interested in <em>variety</em>, on which this product performs well.</td>
</tr>
<tr>
<td>Att2Seq</td>
<td>I’m not sure if i need to go back.</td>
</tr>
<tr>
<td>NETE</td>
<td>They have a <em>variety</em> of things to choose from.</td>
</tr>
<tr>
<td>Reference</td>
<td>They have a huge <em>variety</em> of things.</td>
</tr>
</tbody>
</table>

Combine their merits!!!
- Introduce features to maintain the controllability
- Employ generation method to produce flexible “templates”
System Architecture

- With requests, the server returns
  - Predicted rating
  - Generated explanation
  - Target user review

MLP Encoder: MLP
Decoder: Modified GRU
Datasets

• TripAdvisor (hotel)
  • For demonstration
• Yelp2019 (restaurant)
  • For human evaluation
• The explanation is a review sentence containing features.

<table>
<thead>
<tr>
<th></th>
<th>TripAdvisor</th>
<th>Yelp2019</th>
</tr>
</thead>
<tbody>
<tr>
<td># of users</td>
<td>9,765</td>
<td>27,147</td>
</tr>
<tr>
<td># of items</td>
<td>6,280</td>
<td>20,266</td>
</tr>
<tr>
<td># of reviews</td>
<td>320,023</td>
<td>1,293,247</td>
</tr>
<tr>
<td># of features</td>
<td>5,069</td>
<td>7,340</td>
</tr>
<tr>
<td>Avg. # of reviews / user</td>
<td>32.77</td>
<td>47.64</td>
</tr>
<tr>
<td>Avg. # of reviews / item</td>
<td>50.96</td>
<td>63.81</td>
</tr>
<tr>
<td>Avg. # of words / explanation</td>
<td>13.01</td>
<td>12.32</td>
</tr>
</tbody>
</table>
Human Evaluation

• 10 volunteers were invited.
• Each question contains 20 cases.

• NETE’s explanations are
  • High-quality relative to Att2Seq
  • helpful to better understand the products

Attribute-to-sequence (Dong et al. EACL’17)
Demonstration

Neural Template Demo

Please select user and item below.

User: Teresa_v828

Item: Royal View Hotel

Rating: 4.8954

Predict Rating

Please input (update) rating and select feature below.

Sentiment (Rating): 4.8954

Feature: room

Explanation: the room is spacious and comfortable

Generate Explanation

Pleasant experience, wonderful staff, delicious food

Review of Royal View Hotel

Reviewed December 15, 2019

Very friendly and attentive staff. Spacious and comfortable rooms compared to other ones in Hong Kong. We got a free room upgrade to a room with a scenic view of the ocean and bridge from Hugo, which was very nice of him. They offer an extensive array of food for the breakfast buffet with a full spread of Chinese (congee bar, noodles, fried rice...) and American (hash browns, cereal, scrambled eggs, toast). The hotel’s breakfast makes for a particularly nice start to the day. The proactive and generous hospitality made for an enjoyable stay.

Massive thanks to Hugo again!
Case Study

- **Controllable**
  - Fill the feature in the explanation like a template
  - Capture the variance of three different types of input

- **Flexible**
  - Produce diverse expressions

<table>
<thead>
<tr>
<th>Rating</th>
<th>Feature</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>floors</td>
<td><em>The view from some rooms and higher floors is hard to beat.</em></td>
</tr>
<tr>
<td>4.09 (+1)</td>
<td>floors</td>
<td>Ask for higher floors.</td>
</tr>
<tr>
<td>2.00 (-1)</td>
<td>floors</td>
<td>It was not a high floor.</td>
</tr>
<tr>
<td>4.09 (+1)</td>
<td>rooms</td>
<td>The rooms are very comfortable.</td>
</tr>
<tr>
<td>2.00 (-1)</td>
<td>rooms</td>
<td>The rooms are not very comfortable.</td>
</tr>
<tr>
<td>3</td>
<td>floors</td>
<td><em>Rooms on the higher floors have a nice view.</em></td>
</tr>
<tr>
<td>3.73 (+1)</td>
<td>floors</td>
<td>Rooms on the higher floors are better.</td>
</tr>
<tr>
<td>2.00 (-1)</td>
<td>floors</td>
<td>I was given a room on the higher floors and the rooms are very spacious.</td>
</tr>
<tr>
<td>3.73 (+1)</td>
<td>rooms</td>
<td>The rooms are spacious and the rooms are very comfortable.</td>
</tr>
<tr>
<td>2.00 (-1)</td>
<td>rooms</td>
<td>The rooms are very small and the rooms are very spacious.</td>
</tr>
</tbody>
</table>
Conclusion

• We present a neural template explanation generation system that is both controllable and flexible, as confirmed by the demonstration.
• The human evaluation shows that it produces high-quality and useful explanations.

• Future Work
  • Verify its controllability quantitatively
  • Integrate more features to make the explanations more expressive
References


Thank you!