Controllable User Dialogue Act Augmentation for Dialogue State Tracking

http://github.com/MiuLab/CUDA-DST

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Summary

- CoCo (Li et al., 2020) improved DST by data augmentation for better robustness and generalizability.
- Only a simple type of utterances is considered for augmentation.
- Our goal is to augment user utterances with diverse dialogue acts for better generalization capability.
- Our proposed CUDA achieves SOTA performance and better robustness on MultiWOZ 2.1.

Framework

User Utterance Generation

1. Thank you, can you also find me a hotel with parking near the restaurant?
2. Thank you, can you also find me a hotel without parking near the restaurant?
3. Thank you, can you also find me a hotel with parking in the center?
4. Thank you, can you also find me a hotel with free wi-fi near the town?

User Dialogue Act Generation

- Goal: simulate reasonable user behavior
- Method: use a random process to augment more diverse behaviors
- User behaviors:
  - Confirm: The user confirms the system’s recommendation.
  - Reply: The user replies what the system requests.
  - Inform: The user actively informs desired slot values to the system.

State Match Filtering

- Slot appearance classifier
  - Goal: check if the given slots are included
  - Method: BERT for multi-label classification
- Value consistency filter
  - Goal: ensure consistent values between states & utterances

Experiment

MultiWOZ 2.1 TripPy TRADE

<table>
<thead>
<tr>
<th></th>
<th>Original</th>
<th>CoCo</th>
<th>Cuda</th>
<th>Cuda (-coref)</th>
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</thead>
<tbody>
<tr>
<td>System</td>
<td>57.72</td>
<td>60.46</td>
<td>61.28*</td>
<td>62.93*</td>
</tr>
<tr>
<td>TripPy</td>
<td>44.08</td>
<td>43.53</td>
<td>44.86*</td>
<td>42.98</td>
</tr>
<tr>
<td>TRADE</td>
<td>42.98</td>
<td>43.53</td>
<td>44.86*</td>
<td>42.98</td>
</tr>
</tbody>
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Improvement

- CUDA improves TripPy and TRADE results.
- The models trained on our augmented data show better generalization.
- CUDA improves more on informed, refer, and dontcare slots than CoCo.
- CUDA augments diverse user dialogue acts for helping informed and refer, and the proposed filter ensures value consistency for improving dontcare.