A Corpus of Word-Aligned Asked and Anticipated Questions in a Virtual Patient Dialogue System

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Motivation

- Many systems for detecting paraphrases or measuring semantic similarity rely on alignments of words and phrases.
- Gold standard monolingual alignment corpora MSIP (Brockett, 2007) and Edinburgh (Cohn et al., 2008) corpora do not take paraphrase status into account when annotating word alignments.
- There can be benefit to modeling word alignment and paraphrase classification as a joint process (Xu et al., 2014).

Contribution

We developed a corpus and methodology of annotation that accounts for word alignment and paraphrase status jointly. Our resources include:

1. A corpus of virtual patient dialogues with gold standard alignment and paraphrase annotations.
2. Alignment annotation guidelines to account for both paraphrases and non-paraphrases, extending Cohn et al. (2008).
3. GoldAlign, the graphical alignment and paraphrasing annotation interface used to create the corpus.

The Application: Virtual Patient Dialogue System

The Virtual Patient

An Example Dialogue

<table>
<thead>
<tr>
<th>Input</th>
<th>Gold Label</th>
<th>ChatScript System Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>hello there, why did you come in to see us today</td>
<td>what brings you in today</td>
<td>I was hoping you could help me with my back pain, it really hurts! It has been awful. I can barely even tie my shoes.</td>
</tr>
<tr>
<td>could you rate the pain</td>
<td>rate the pain</td>
<td>right now, I would call my pain a 7. When I take the ibuprofen, it goes down to about a 5 or 6</td>
</tr>
<tr>
<td>is the pain constant</td>
<td>is the pain constant</td>
<td>it is pretty constant although sometimes it is a little better or worse...</td>
</tr>
<tr>
<td>how is this affecting your life</td>
<td>how is this affecting you</td>
<td>I haven’t been able to work, I am a little worried about the bills...</td>
</tr>
<tr>
<td>what do you do for work</td>
<td>what do you do for work</td>
<td>I am an auto mechanic. I have a garage a couple of blocks from here...</td>
</tr>
</tbody>
</table>

Corpus Annotation Process

The Virtual Patient

Annotator A Alignments

Alignments

GoldAlign: Alignment Annotation Tool

GoldAlign, a graphical interface for gold-standard corpus annotation of alignment and paraphrasing, was created to streamline the creation of our corpus (and potentially others like it).

Corpus Statistics

- 104 dialogues containing 5437 user turns with 290 unique labels
- average of 52 turns per dialogue and 19 turns per label
- 157 annotated-and-arbitrated batches with 6 sentence pairs in each:
  - selected by maximum confusability, i.e., the least similar paraphrases and most similar non-paraphrases
  - yielding 942 total sentence pairs
  - of these, 441 paraphrases and 495 non-paraphrases

Inter-Annotator Agreement

<table>
<thead>
<tr>
<th>Annotators</th>
<th>F1 (words)</th>
<th>F1 (phrases)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sure</td>
<td>Poss</td>
</tr>
<tr>
<td>M G</td>
<td>0.72</td>
<td>0.81</td>
</tr>
<tr>
<td>A G</td>
<td>0.79</td>
<td>0.81</td>
</tr>
<tr>
<td>J G</td>
<td>0.63</td>
<td>0.64</td>
</tr>
<tr>
<td>A M</td>
<td>0.63</td>
<td>0.64</td>
</tr>
<tr>
<td>J M</td>
<td>0.53</td>
<td>0.68</td>
</tr>
<tr>
<td>A J</td>
<td>0.57</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Agreement of the annotators (A and J) relative to one another and to the gold annotations (G) are consistently higher (shown above in bold) than agreement between the Meteor alignments (M) and all human annotations.

Acknowledgments

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Corpus Data (Batch)

Selection

Gold Align, a graphical interface for gold-standard corpus annotation of alignment and paraphrasing, was created to streamline the creation of our corpus (and potentially others like it).

GoldAlign: Alignment Annotation Tool

Corpus Annotation Process

The Virtual Patient

Initial Paraphrase Labels

Automated Alignments

Data (Batch) Selection

Annotator Grids (A & J)

Annotator A Alignments

Annotator J Alignments

Arbiter (Gold) Labels

Arbiter (Gold) Alignments

Sentence Contexts

Paraphrase Judgments

Grid Color Key

User/Arbiter POSS

User/Arbiter SURE

User only SURE

User only POSS

No Selection

Inter-Annotator Agreement

Agreement between the Meteor alignments (M) and all human annotations.