Detecting Argumentative Discourse Units with Linguistic Alignment

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Discourse acts and argument maps

**Linguistic alignment**

<table>
<thead>
<tr>
<th>A’s message has pronoun</th>
<th>A’s message no pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>B’s reply no pronoun</td>
<td>2</td>
</tr>
<tr>
<td>B’s reply has pronoun</td>
<td>5</td>
</tr>
<tr>
<td>B is “pure questioning”</td>
<td></td>
</tr>
<tr>
<td>B is “assertive questioning”</td>
<td></td>
</tr>
</tbody>
</table>

- Pure questioning is not an argumentative discourse unit
- But assertive questioning is
- Judging pure versus assertive questioning requires complex pragmatic judgments

Discourse acts and argument maps

**Research questions**

- Are different discourse acts associated with different alignment effects?
- Are alignment calculations useful for predicting argumentative discourse acts?

**Data**

- We annotate replies (just B) in message-reply pairs, taken from below-the-line comments on an academic news website, The Conversation
- This data point is annotated as {Asserting (blue), Disagreeing (red), Assertive Questioning (green)}
- In this preliminary work we only have 800 data points marked by a single annotator

**Bayesian Model**

- Message is treated as a bag of words and category usage as a binomial draw
- We cannot aggregate statistics over messages in a conversation like WHAM
- Average comment length is 82.5 words ($\sigma = 66.5$)
- Lowest category usage frequency is 0.8% ($\mu = 3.6\%$, $\sigma = 2.2\%$)
- Therefore this likely systematically underestimates alignment
- However we do have very reliable baseline estimates from $\sim 1$M comments

**Different discourse acts have different alignment effects**

- Error bars are 95% credible intervals on the Bayesian posterior
- Pairwise t-test for difference in means yields only 6.4% (22/342) insignificant at $p < 0.05$
- Given the limitations of our preliminary study we cannot draw general conclusions about the specific patterns observed

**Alignment is useful for predicting argumentative discourse acts**

- Logistic regression with BoV
- Concatenating an 11-dim vector of alignment scores over categories improves ROC AUC
- Let $C_c$ be the set of categories in the original message
- $\eta^c$ is the replier’s logit-space baseline usage of category $c$
- $r^c$ is the observed rate of usage of category $c$ in the reply
- Each category alignment score $s^c$ is $\log(r^c/\eta^c)$ if $c \in C$ else 0

**Future work**

- Expanding the dataset and using multiple annotators
- Cross-linguistic comparison with Mandarin
- What is the relationship between alignment and different argumentation schemes?