Non-Sentential Utterances in Dialogue: Experiments in classification and interpretation

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Non-Sentential Utterances

What is an NSU?
Non-sentential utterance (NSU): utterance without a complete sentential form that conveys a full clausal meaning given the dialogue context.

A: How do you actually feel about that?
B: Not too happy.
A: They wouldn't do it, no.
B: Why?
A: [...] then across from there to there.
B: From side to side.

An Active Learning approach to the classification of NSUs

Approach
• Baseline, replicated approach from Fernández et al. (2007).
• Extended feature-set, 23 new features.
• Active learning techniques used to cope with scarcity of labeled data and strong class imbalance.
• Additional unlabeled data extracted from the BNC via simple heuristics.
• 100 newly labeled instances added to the training-set.

Baseline feature-set
• NSU features: syntactic and lexical properties of the NSU.
• Antecedent features: syntactic and lexical properties of the antecedent.
• Similarity features: similarity measures between NSU and antecedent.

Extended feature-set
• POS-level features: shallow syntactic properties using POS-tags.
• Phrase-level features: phrasal syntactic patterns.
• Dependency features: dependency syntactic patterns.
• Turn taking features: patterns in the conversational flow.
• Similarity features: longest common subsequences of words and POS tags.

Learning curve

Accuracy of the classifier throughout the active learning process using the baseline feature-set (dashed line) and the final feature-set (solid line).

Empirical results

<table>
<thead>
<tr>
<th>Training set (feature set)</th>
<th>Accuracy</th>
<th>Precision</th>
<th>Recall</th>
<th>F1-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train-set (baseline feature set)</td>
<td>0.881</td>
<td>0.884</td>
<td>0.881</td>
<td>0.875</td>
</tr>
<tr>
<td>Train-set (extended feature set)</td>
<td>0.899</td>
<td>0.904</td>
<td>0.899</td>
<td>0.896</td>
</tr>
<tr>
<td>Train-set + AL (baseline feature set)</td>
<td>0.903</td>
<td>0.903</td>
<td>0.903</td>
<td>0.900</td>
</tr>
<tr>
<td>Train-set + AL (extended feature set)</td>
<td>0.907</td>
<td>0.907</td>
<td>0.907</td>
<td>0.905</td>
</tr>
</tbody>
</table>

Interpretation of NSUs using probabilistic rules

Approach
• NSU resolution procedures based on Fernández (2006).
• Context update rules reinterpreted as probabilistic rules (Lison, 2015).
• Rules implemented with OpenDial.
• Ongoing evaluation of the rules over transcripts from the Communicator dataset.
• Proof of concept for a framework for the interpretation of NSUs based on the probabilistic rules formalism.

Why use probabilistic rules?
A: One of our salesmen acquired a new client.
B: Who? (= the salesman?/the client?)

Probabilistic update of the dialogue state

A: Is Jack coming to the party next Saturday?
B: Probably. / Unlikely.

Probabilistic account of ambiguities
A: One of our salesmen acquired a new client.
B: Who? (= the salesman?/the client?)

Probabilistic update of the dialogue state for the interpretation of NSUs based on the probabilistic rules formalism.

A: One of our salesmen acquired a new client.
B: Who? (= the salesman?/the client?)

Although the probabilities are handcrafted here, they could be learned from actual data.