Summary

- We show that incorporating linguistically motivated features to ensure correct animacy, number agreement, and punctuation balancing in an averaged perception ranking model for CCG realization helps improve a state-of-the-art baseline even further.
- Traditionally, these features have been modeled using hard constraints in the grammar.
- Given the graded nature of grammaticality judgments in the case of animacy and the heterogeneous nature of agreement, we argue that a case for the use of a statistical model to rank competing preferences.
- Compared to writing grammar rules, our method is more robust and allows incorporating information from diverse sources in realization.
- Our efforts result in fewer agreement errors and yield a state-of-the-art BLEU score of 0.8446.

Section 23 of the CCGbank

The Graded Nature of Animacy Agreement

- In English, an animate noun can be modified by a relative clause introduced by that or while an animate noun combines with who(m).
- With some nouns though — such as form, group, spam, etc. — animacy status is uncertain, and these can be found with all the three relative pronouns (who, which, and that).
- Google counts suggest that all three choices are almost equally acceptable.
- OpenCCG takes as input LFs underspecified for relative pronouns, thus keeping the ranking model to enforce the correct choice.

Chart Realization

<table>
<thead>
<tr>
<th>Feature</th>
<th>Model</th>
<th>% Exact</th>
<th>% Complete</th>
<th>BLEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>baseline</td>
<td>37.97</td>
<td>82.47</td>
<td>0.8340</td>
<td></td>
</tr>
<tr>
<td>wh-punct</td>
<td>39.51</td>
<td>82.53</td>
<td>0.8360</td>
<td></td>
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<tr>
<td>full-model</td>
<td>40.47</td>
<td>82.53</td>
<td>0.8400</td>
<td></td>
</tr>
</tbody>
</table>

The Heterogeneous Nature of Number Agreement

- Subject-verb agreement has often been considered to be a syntactic phenomenon and grammatical implementations generally use syntactic features to enforce agreement constraints (e.g., Yedidia and Oepen, 2005).
- However, a closer look at our data and a survey of the theoretical linguistics literature (Kathol, 1999; Pollard and Sag, 1994) points toward a more heterogeneous conception of English agreement.
- Kathol (1999) proposes an explanation where agreement is determined by the semantic properties of the noun rather than by its morphological properties.
- However, the semantic view of agreement is not completely convincing due to counterexamples like the following discussed in the literature (reported in Kiso (2004)).
- Suppose you meet someone and they are totally of themselves.
- (4) Those scissors are missing.
- We investigate here the extent to which a machine learning-based approach is a simpler, practical alternative for acquiring the relevant generalizations from the data by combining information from various information sources.

Presenting Balanced Punctuation

The task of ensuring the correct realization of commas introducing noun phrase appositives:

(5) John, CEO of ABC, loves Mary.
(6) Mary, CEO of ABC loves John.
(7) Mary loves John, CEO of ABC.
(8) * Mary loves John, CEO of ABC.
(9) Mary loves John, CEO of ABC, madly.
(10) * Mary loves John, CEO of ABC madly.

- Using syntactic features to block unwanted derivations (Braice, 1994) does not work for CCG.
- We modified the result categories of unbalanced appositive commas and dashes to include a feature marking unbalanced punctuation.
- During feature extraction, derivations were examined to detect categories such as np/np and np/np and checked to make sure this NP is followed by another punctuation mark in the string such as a full stop.

Realizer Evaluation

A Section 02-21 lexico-grammar extracted from the CCGbank (with NE collapsing) is used to realize Section 02 and Section 23 LFs. The ungrammatical examples below produced by the baseline ranking model are realized correctly by the model with all the features.

(11) Neither Lionel nor the researchers who/that studied the workers were aware of any research on smokers of the Kent cigarettes...
(12) While many of the risks were/was anticipated when minneapolis-based Crary Research first announced the spin-off....
(13) Giant Group led by their Rally’s directors, Burt Sugarman, James M. Trotter III and William E. Trotter II that last month indicated that they hold/holds a 42.5% stake in Rally’s and plans/plans to seek a majority of seats on...
(14) the ban we don’t stop tissue-planting privately funded research or federally funded fetal-tissue research that does n’t take in involve transfusions...

Acknowledgements

This work was supported in part by NSF grant IIS-0612295 and by an allocation of computing time from the Ohio Supercomputer Center. Our thanks also to Robert Levine and the anonymous reviewers for helpful comments and discussion.