Conclusion and Outlook

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1. Synthesis
2. Ensemble Systems
3. Domain Adaptation
4. Cross-Language Variation
5. Unsupervised Parsing
- Feature-rich discriminative factored models
- Global learning (conditional or discriminative)
- Dynamic programming or beam search decoding
Parser outputs (for sentence $x$): $y_1, \ldots, y_m$

Arc scores: $\text{Score}(i, l, j, x) = |\{y_k : (i, l, j, x) \in y_k\}|$

Maximum spanning tree parsing
<table>
<thead>
<tr>
<th></th>
<th>WSJ</th>
<th>Brown</th>
<th>Genia</th>
<th>SWBD</th>
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<td></td>
<td>89.7</td>
<td>84.1</td>
<td>76.2</td>
<td>76.7</td>
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<td>Language</td>
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<td>Basque</td>
<td>Catalan</td>
<td>Chinese</td>
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<td></td>
<td>76.5</td>
<td>76.9</td>
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<td>76.3</td>
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<td>84.4</td>
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Cross-Language Variation
\[ P(x|y) = \prod_{1 \leq i < j \leq n} P(x_i, \ldots, x_j|y_{ij}) P(x_{i-1}, x_{j+1}|y_{ij}) \]
\[ P(T(h)) = \prod_{d \in l, r} \left[ \prod_{a \in D(h, d)} P!(-!|h, d, ?)P_v(a|h, d)P(T(a)) \right] P!(!|h, d, ?) \]