Deep Reinforcement Learning for Chinese
Zero Pronoun Resolution

Qingyu Yin, Yu Zhang, Weinan Zhang, Ting Liu
and William Yang Wang (UCSB)

Challenges
• Traditional models are short-sighted
  • local decisions
  • Overlooking coreference impacts on future decisions.

Solutions
• Model the long-term influence of the single coreference decision in a sequential manner.
• Encoding antecedent information
• Link the zero pronoun to its potential antecedents incrementally

Deep Reinforcement Learning
  • Policy Gradient

State
• Zero pronoun
• Candidate
• Antecedent information
Action
• coreference
• non-coreference
Reward
• F-score of the sequence

Agent
• Input – state vector
• Output – action

Zero Pronoun (ZP) Resolution
[小明] 吃了 [一个 苹果]， <ZP> 非常 甜。
Xiaoming eats [an apple], <ZP> is very sweet.

Experimental Data
❖ OntoNotes Release 5.0 from CoNLL-2012
  • From six sources: Broadcast News (BN), Newswires (NW), Broadcast Conversations (BC), Telephone Conversations (TC), Web Blogs (WB), Magazines (MZ)
  • Gold AZP & Gold Parse

Performance on Test Data

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>MZ</th>
<th>WB</th>
<th>BN</th>
<th>BC</th>
<th>TC</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhao and Ng (2007)</td>
<td>40.5</td>
<td>28.4</td>
<td>40.1</td>
<td>43.1</td>
<td>44.7</td>
<td>42.8</td>
<td>41.5</td>
</tr>
<tr>
<td>Chen and Ng (2015)</td>
<td>46.4</td>
<td>39.0</td>
<td>51.8</td>
<td>53.8</td>
<td>49.4</td>
<td>52.7</td>
<td>50.2</td>
</tr>
<tr>
<td>Chen and Ng (2016)</td>
<td>48.8</td>
<td>41.5</td>
<td>56.3</td>
<td>55.4</td>
<td>50.8</td>
<td>53.1</td>
<td>52.2</td>
</tr>
<tr>
<td>Yin et al. (2017b)</td>
<td>50.0</td>
<td>45.0</td>
<td>55.9</td>
<td>53.3</td>
<td>55.3</td>
<td>54.4</td>
<td>53.6</td>
</tr>
<tr>
<td>Yin et al. (2017a)</td>
<td>48.8</td>
<td>46.3</td>
<td>59.8</td>
<td>58.4</td>
<td>53.2</td>
<td>54.8</td>
<td>54.9</td>
</tr>
<tr>
<td>Our model</td>
<td>63.1</td>
<td>50.2</td>
<td>63.1</td>
<td>56.7</td>
<td>57.5</td>
<td>54.0</td>
<td>57.2</td>
</tr>
</tbody>
</table>