Machine Learning for Semantic Parsing in Review

Ahmad Agha Ebrahimian, Filip Jurčiček

Charles University in Prague
Faculty of Mathematics and Physics
Institute of Formal and Applied Linguistics

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We’ll talk about:

• NLU, SLU and semantic parsing
• SLU sub tasks
• Machine Learning techniques
• Parsing approaches
• New challenges for SLU
NLU, SLU and semantic parsing - I

• NLU and SLU challenges
  • Variability
  • Ambiguity

• Semantic parsing as an act of translation
  • Natural Language
  • Formal Language

<table>
<thead>
<tr>
<th>Natural language</th>
<th>Formal representation</th>
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<tbody>
<tr>
<td>Lambda Calculus Expressions</td>
<td>( \lambda x. (\text{dog}(x) &amp; \text{disappeared}(x)) )</td>
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<tr>
<td>robot controller language</td>
<td>\text{turn-left:t}</td>
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<tr>
<td>BIO</td>
<td>\text{B-person I-person O O B-role}</td>
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<td>Marshal Hall was a professor</td>
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NLU, SLU and semantic parsing - II

LU at work:

- Dialogue systems
- Machine translation
- Information retrieval

LU component in dialogue systems:

ASR → SLU → DM → NLG → TTS
SLU sub tasks

- Domain detection
- Intent Determination
- Slot filling

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Book a flight
Ask for connection
...
Machine Learning techniques

- **CRF**
  Xu and Sarikaya, 2013

- **Neural Networks**
  Collobert et al., 2011

- **Deep Learning**
  Mesnil et al., 2013
Parsing approaches

- **CCG**
  Pennsylvania neighbors New York.
  - New York NP ⊨ new _york
  - Pennsylvania NP ⊨ pennsylvania
  - neighbors ⊨ S\NP/NP

- **DCS**
  What is the major city in California?
  \[ \lambda x. (x=\text{major city}) \land \text{Loc}(x, \text{CA}) \]
New challenges for SLU

✓ Open domain
✓ Knowledge graph
✓ Deep learning
✓ Multi agent conversation
✓ Socially aware SLU
✓ Multi-modality SLU
Thank you!

Your comments are welcome!
Ebrahimian@ufal.mff.cuni.cz