Universal Decompositional Semantic Parsing

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Key Takeaways

First parsing model for UDS

Pipeline and end-to-end prediction

Unique task: graph structure + scalar values, jointly
Universal Decompositional Semantics (UDS)

- Semantics representations (often)
  - Hard to annotate
  - Brittle to non-prototypical instances

- UDS: decompose into simple questions
  - Scalar-valued, feature-based
  - Easy to annotate
  - Flexible
The Universal Decompositional Semantics Dataset and Decomp Toolkit

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Abstract

We present the Universal Decompositional Semantics (UDS) dataset (v1.0), which is bundled with the Decomp toolkit (v0.1). UDS1.0 unifies five high-quality, decompositional semantics-aligned annotation sets within a single semantic graph specification—with graph structures defined by the predicative patterns produced by the PredPatt tool and real-valued node and edge attributes constructed using sophisticated normalization procedures. The Decomp toolkit provides a suite of Python 3 tools for querying UDS graphs using SPARQL. Both UDS1.0 and Decomp0.1 are publicly available at http://decomp.io.
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Universal Decompositional Semantics

• Factuality

Jo didn’t leave

Cole thought that Jo had left

Jo left
Universal Decompositional Semantics

- Factuality
- Genericity
  - E.g. pred-particular

I ate pizza every day

I ate pizza today
Universal Decompositional Semantics

- Factuality
- Genericity
- Time
  - E.g. dur-minutes

Tom left

Tom was singing
Universal Decompositional Semantics

• Factuality
• Genericity
• Time
• Wordsense
  • E.g. sup.person

Sandy led **Rufus** by a leash

-3

Sandy led Rufus by a leash

3
Universal Decompositional Semantics

- Factuality
- Genericity
- Time
- Wordsense
- Semantic proto-roles
  - E.g. volition

Derek broke his arm

Derek broke the wishbone

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Why UDS?

• Annotation flexibility
  • Crowdsourced
  • Simple questions
• Rich meaning representation
  • Flexible inferences
  • Richer analysis

🤔 Hmmm, Patient? Theme?

Was the participant changed during the event?

😊 Was the participant changed during the event?
What’s Transductive Parsing?

Hiller asked Bush to name the leaders of Chechnya, Taiwan, India, and Pakistan.
Arborescence

Assign head labels
Copy re-entrant nodes
Explicitly represent embedded predicates
Flatten syntax graphs
Linearization

Pre-order linearization
Hiller asked Bush to name the leaders of Chechnya, Taiwan, India and Pakistan.
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Evaluation Metrics

• S score (Zhang et al. 2016)
  • Extension of SMATCH (Cai et al. 2013)
  • How well do two graphs match?
  • Structure and attributes

• For attributes under oracle setting
  • Pearson’s R between predicted and gold attributes
  • F1 score on binarized values (> threshold, <= threshold)
Graph Structure Matching
(Syntax included)

<table>
<thead>
<tr>
<th>F1</th>
<th>Pipeline</th>
<th>Parser</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>79.74</td>
<td>81.62</td>
</tr>
</tbody>
</table>
\[
\psi(j, k) = \tanh\left(1 - \frac{|\text{corr}(\nu^j - \nu^{j*}, \nu^k - \nu^{k*})|}{|\text{corr}(\nu^{j*}, \nu^{k*})|}\right)
\]

Pearson’s R between true attributes

Pearson’s R between residuals

Systematic over/under prediction

No significant correlation present/captured

Correlation well-captured

-1

0

1
Conclusions

• Motivating
  • UDS as a dataset and task
  • Transductive paradigm for parsing

• Showing
  • Challenges of UDS parsing (scalar + structure)
  • Benefits of end-to-end transductive system

• Analyzing
  • interactions between UDS subspaces