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Regarding Dependency parse using tree LSTM for FOL statements

Sushma Akoju <sushmaakoju@arizona.edu>

Wed, Sep 14, 2022 at 12:09 PM

To: Mihai Surdeanu <surdeanu@gmail.com>, Mihai Surdeanu <msurdeanu@arizona.edu>

Dear Sir,

As per discussion on dependency graph as well as First Order logic comparison, I am planning on presenting following:

1. A simple parser for the FOL premises to be visualized in a tree form.
2. I discussed about dependency graph using treeLSTM for parsing NL/FOL statements with Zheng & Robert.
3. We first compare the Dependency graph with that of a parser for FOL premises and generate a parse tree for FOL premises. This is what I plan to show tomorrow.
4. To attempt to show Z3 prover results just over FOL premises.
5. To discuss how to represent the Grammar and parser results in a dataset for encoding: I created a couple of FOL data representations that are better interpreted by the Encoder-decoder model vs FOL data representations.
6. Lastly I am working on implementing an encoder-decoder for NL to FOL and working on input/output format for the pipeline which I hope to complete in sometime.
7. Generally Robert seems to be more familiar with Natural Language and has helped with how to work through problem for understanding NL dependency graph.

Best Regards,
Sushma Akoju

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From: **Sushma Akoju** <sushmaakoju@arizona.edu>

Date: Wed, Sep 14, 2022 at 11:21 AM

Subject: Regarding Dependency parse using tree LSTM for FOL statements

To: <rvacareanu@arizona.edu>, <zhengtang@email.arizona.edu>

Cc: Mihai Surdeanu <surdeanu@gmail.com>, Mihai Surdeanu <msurdeanu@arizona.edu>

Dear Zheng, Robert,

Thank you for your valuable time and discussion, guidance on approaches to construct dependency graph tree LSTM for FOL statements using FOLIO dataset.

Discussion with Zheng and Robert about FOL using Dependency graph:

1. Discussed my problem of Natural Language (NL) to FOL conversion. I shared the tree LSTM for NeuralMath problems and Dependency graph using tree LSTM .
2. Discussed the problem of FOL conversion representation using dependency graphs.
3. Robert suggested using CoreNLP to visualize the dependency parse graph to find the similarities/alignment between FOL and Natural language.
4. My approach I thought was more relevant was to use Named Entities from CoreNLP that do exist in FOL statements from the FOLIO dataset and then construct a dependency graph for just FOL statements. This approach is similar to NeuralMath using tree LSTM to prove theorems as well as verify them over example value dataset. here though symbols are encoded.
5. Zheng's suggestion was to use Graph Convolutional Neural Networks.
6. Additionally, we explored one example using CoreNLP dependency parse. to verify NL premise with that of FOL premise.
7. This dataset has not been tested over FOL statements, but was verified using a parser that converts FOL to python code and proves.

8. We first compare the Dependency graph with that of a parser for FOL premises and generate a parse tree for FOL premises. This is what I plan to show tomorrow.
9. Lastly I am working on implementing an encoder-decoder for NL to FOL and working on input/output format for the pipeline.

Please let me know in case I missed anything or if anything needs changing plus in case you have any other directions to explore this problem.

Best Regards,
Sushma Akoju