Preposition error correction using Tree Convolutional Networks

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Problem

Preposition error correction $\subset$ Grammar error correction

The semester starts ~~on~~ January.

The semester starts in January.

(Replacement)

We reached ~~at~~ the airport on time.

We reached the airport on time.

(Deletion)

This is a comfortable house to live.

This is a comfortable house to live in.

(Insertion)

Problem

Preposition error correction $\subset$ Grammar error correction

The semester starts ~~on~~ January.

The semester starts in January.

(Replacement) - This project

We reached ~~at~~ the airport at 9 pm.

We reached the airport at 9 pm.

(Deletion)

This is a comfortable house to live.

This is a comfortable house to live in.

(Insertion)

Approaches

- Classification - Articles, Prepositions, Noun number
- Machine Translation - Broad class of errors

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In this project: Preposition classification

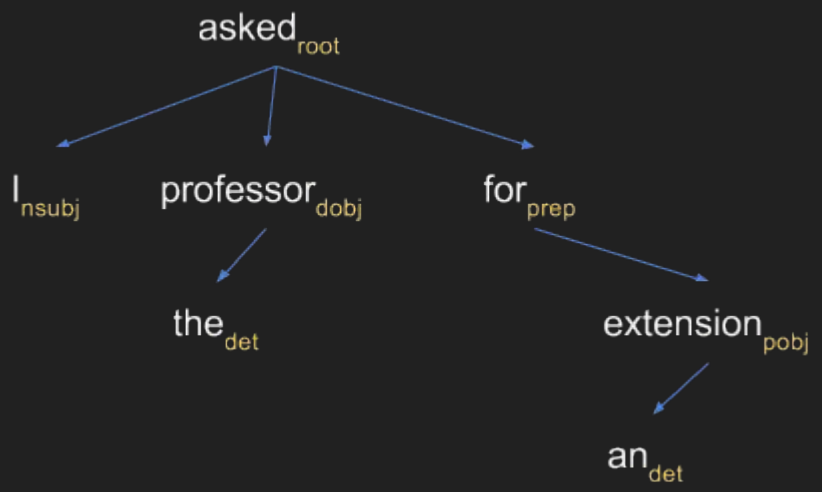
Idea

Use context (rest of sentence) to predict preposition

Dependency parse tree provides natural structure

Dependency parse tree

I asked the professor for an extension

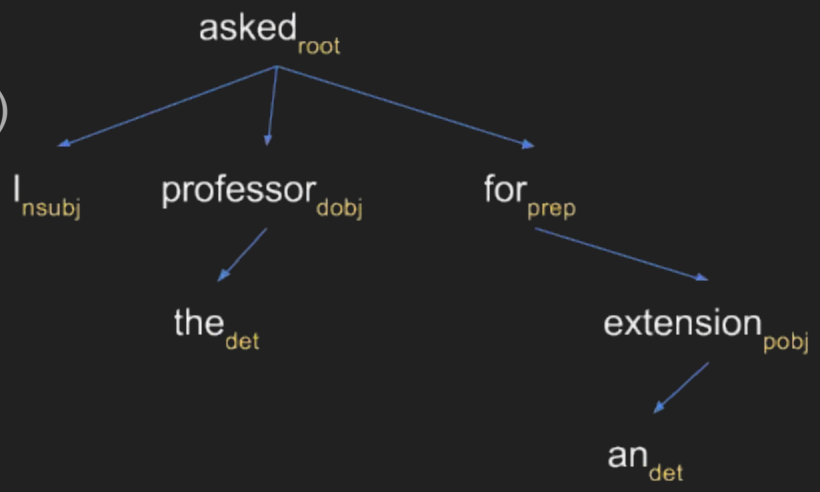


Idea

Perform convolutions on parse tree

Learn features (word -> phrase embeddings)

Classify using features of neighbours



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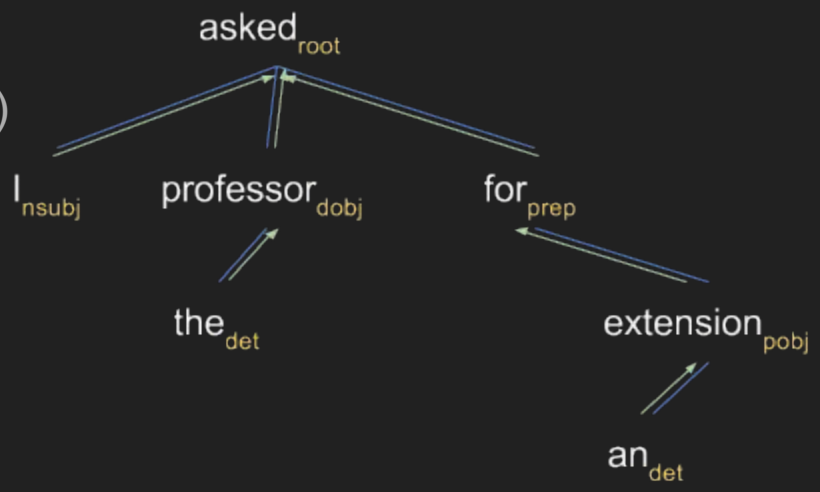

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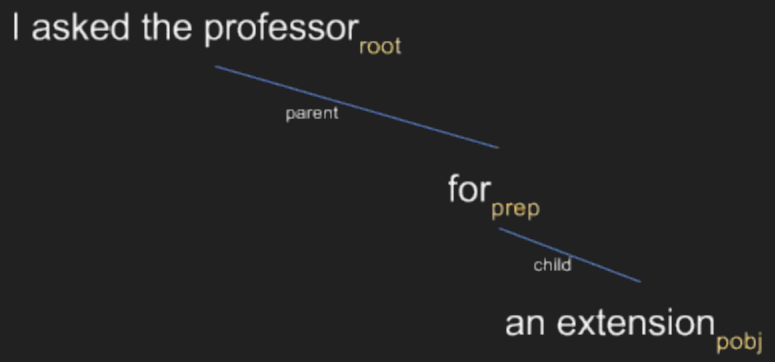
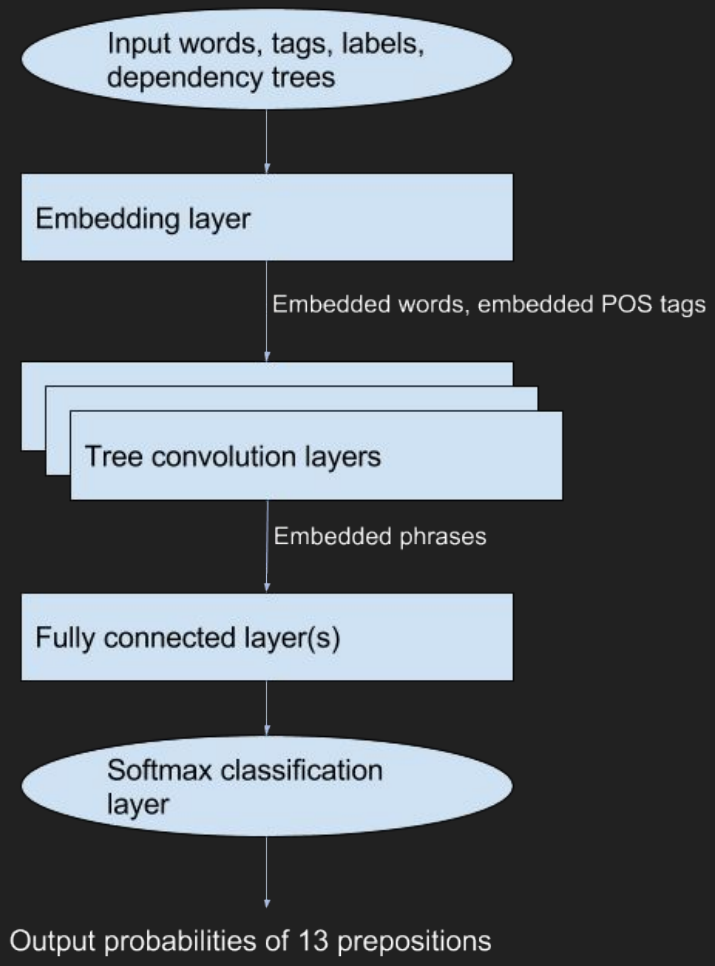


Network Architecture

Pretrained word embeddings (GloVe)



Experiment details

Training and eval data

- BAWE corpus
- Collection of assignment texts from universities, English discipline assignments
- 22,000 + 2,500 train-dev split

Test data

- CoNLL-14 shared task test data
- 2650 correct examples, 107 erroneous examples

Experiment details

Frameworks used

- SyntaxNet (Dependency parsing and POS tags)
- Tensorflow (for training)

Results

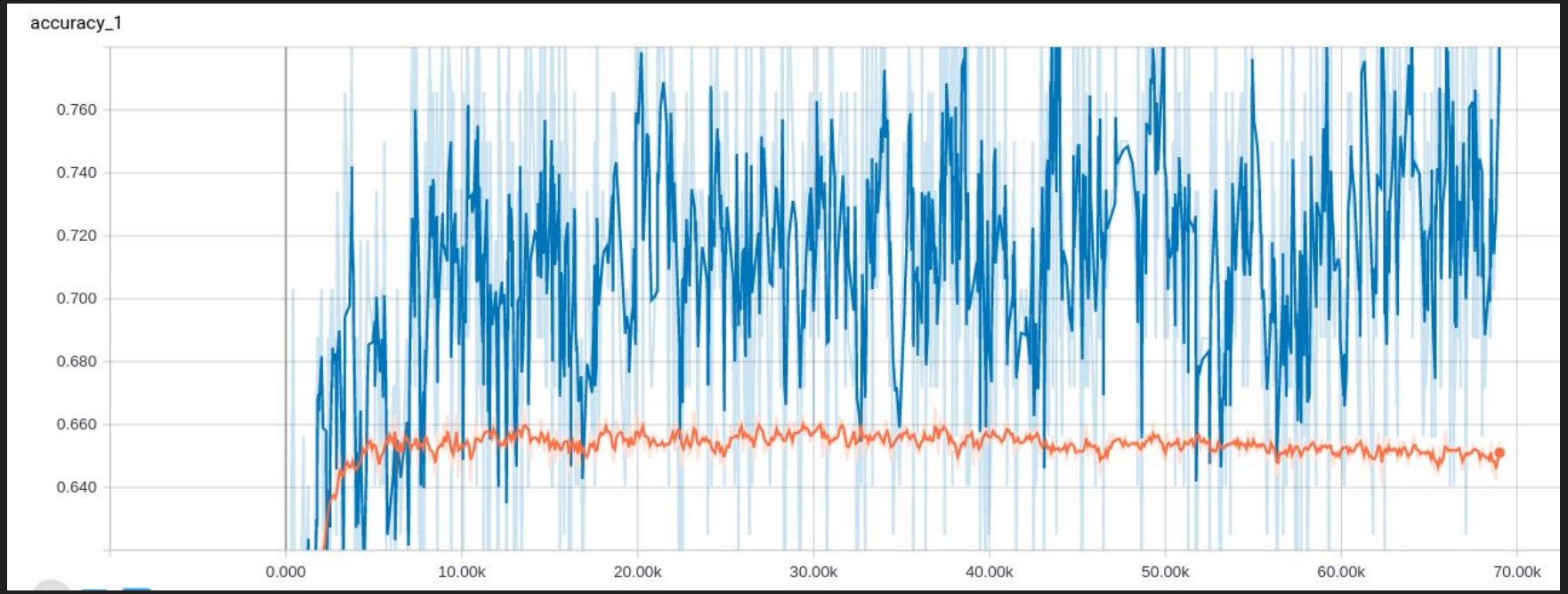
Baseline (parent child word embeddings, fully connected layers):

- Evaluation accuracy: 65.78%
- Test accuracy: 50.20%

Experiment (tree convolution):

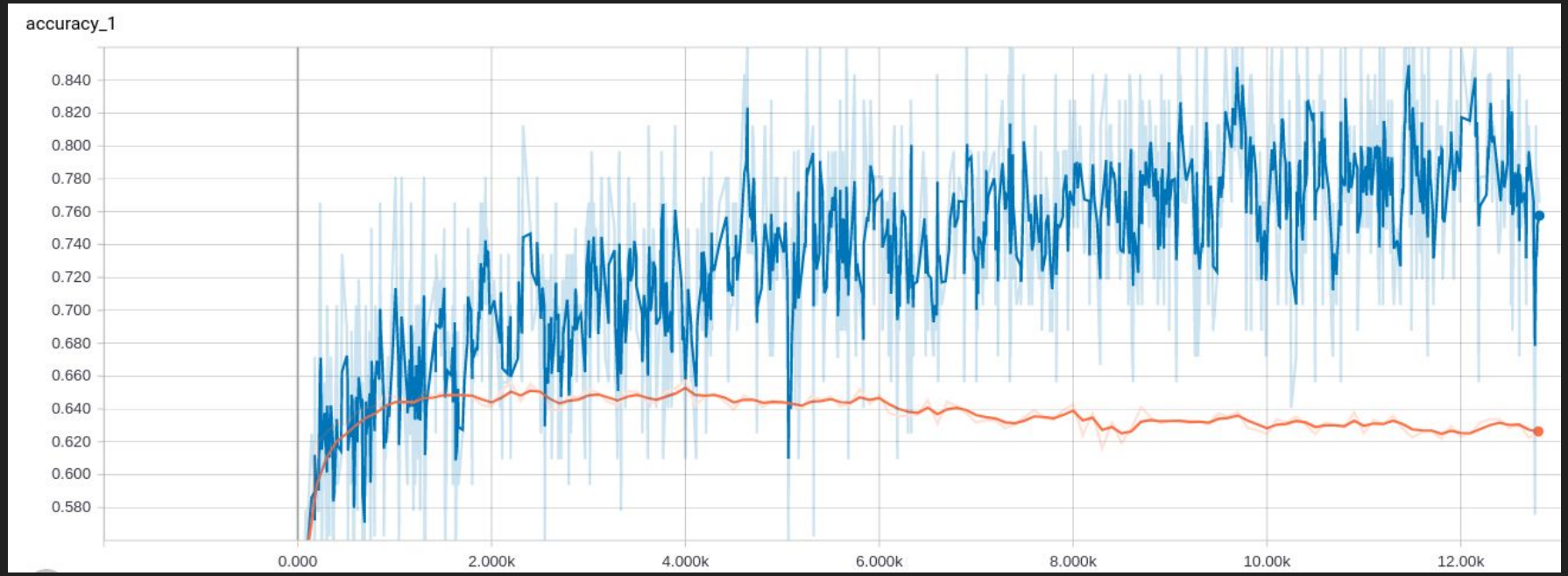
- Evaluation accuracy: 66.56%
- Test accuracy: 54.15%

Plots



Training and eval accuracy vs # training steps (Experiment)

Plots



Training and eval accuracy vs # training steps (Baseline)

Future work

Try higher dimension embeddings with more training data

Look at other ways to learn phrase embeddings

Identify which examples are “hard” (need more context than just parent and child)

References

http://tcci.ccf.org.cn/conference/2015/papers/173.pdf
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