Neural Adversarial Training for Semi-supervised Japanese Predicate-argument Structure Analysis

Shuhei Kurita, Daisuke Kawahara and Sadao Kurohashi
Kyoto University, Japan

Introduction & Task

We propose a novel GAN-like model: generator and validator networks that enable the model to learn from an unlabeled corpus.

- Japanese predicate-argument-structure (PAS) analysis is a task to find an argument for each case of a predicate.
- PAS analysis relies on the numerous pairs of predicates and their arguments depending on their contexts. However, annotated corpora for PAS analysis are very limited.
- Our validator scores the generator outputs and enables the generator to learn predicate and argument pairs from unlabeled corpora.

Model

Our entire model consists of the generator network that predicts the arguments for each predicate and the validator network that scores the outputs of the generator network.

Generator

- The generator consists of two neural networks: the bi-LSTM based sentence encoder and the FNNs for argument selection.
- There are three FNNs for NOM, ACC, and DAT cases.

Validator & Overall Model

- We propose the validator network that has inputs from the generator network and outputs the validity of the generator outputs.
- The generator and the validator networks are coupled by the weighted sum of the validator embeddings (attention mechanism).
- We firstly train the generator by a supervised method. Then we train the validator and the generator using this validator.

Experiments & Results

- We use the KWDLC dataset [Hangyo+ 12] for evaluations, following [Hangyo+ 13, Shibata+ 16].
- We evaluate our model in two tasks: case analysis and zero anaphora resolution.
- Gen is the generator network trained with the supervised learning method, while Gen+Adv is the proposal model trained with the validator, compared with [Ouchi+ 15, Shibata+ 16].
- We observe large increases of scores in ACC and DAT cases. They have fewer training instances and relies on external knowledge resources of predicates and arguments.

Conclusion

- We propose novel adversarial training model for PAS analysis.
- Our validator enables the generator to learn from an unlabeled corpus as an external knowledge resource.
- We achieve SOTA scores in all cases of KWDLC.

References