Confirmation Generation for Almond Virtual Assistant

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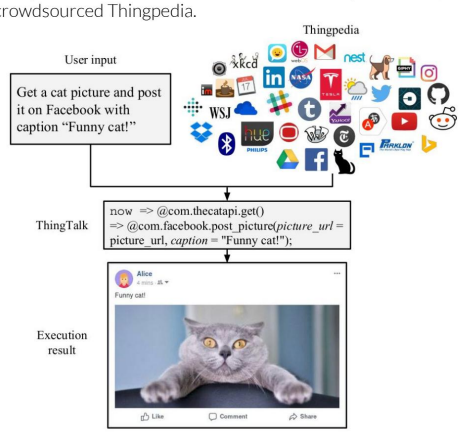
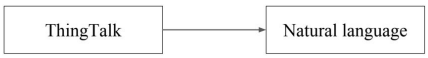
Almond Virtual Assistant

Almond lets users issue compound commands in natural language and automatically translates them to programs in a formal language called ThingTalk.
Compound commands combine APIs from an open-source, crowdsourced Thingpedia.



Confirmation Generation

It's a hard problem to translate from NL to ThingTalk, and different from Q&A, virtual assistant commands make side effects! We need confirmation!
Since there are infinite number of possible compound commands, it's impossible to provide manually created confirmation. We need machine learning!



Model

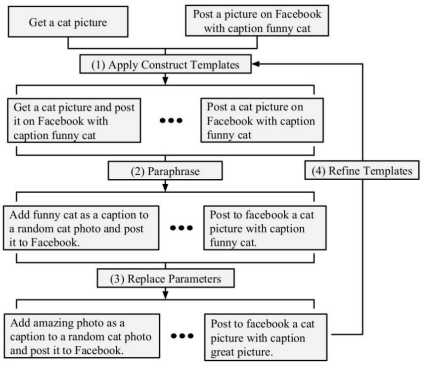
A Seq2Seq Model with attention

- Encoder: 1 embedding layer; 1 layer, bi-directional GRU
- Decoder:
  - 1 embedding layer
  - 1 layer GRU with attention (Luong et al 2015)
- Loss function: masked cross entropy
- Hyperparameters
  - Learning rate: 0.01
  - Batch size: 128
  - # of hidden units: 64
  - # of epochs: 100~300
  - Early stop after BLEU score stop improving within 10 epochs

Dataset

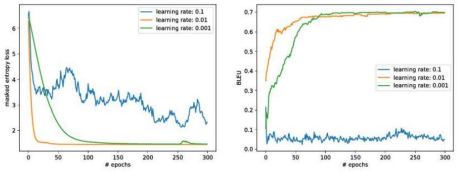
Dataset collected via Amazon Turk

- Primitives: 14,789 paraphrases (1,772 programs)
- Total: 9,777 paraphrases (1,638 programs)
- Total: 24,566 paraphrases (3,410 programs)

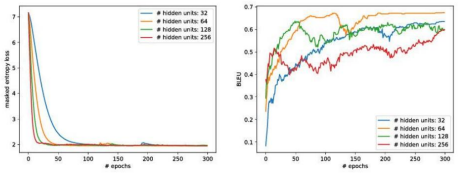


Experimental results

Different learning rate:



Different size of neural network:



Discussions

The work is still very raw and incomplete at the current state:

- Training loss is still relatively high despite overfitting

A couple insights gained from a smaller training set:

- The model tend to append random tokens after a perfect confirmation, penalty for duplication & long output is added, but does not seem to improve much
- The loss function is not a very good measurement of the accuracy, BLEU score is used for early stopping