Word-Dropout and PointNet
Novel Methods For Question-Answering
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Introduction
Question-Answering is an important task in modern machine learning. Given a question and a context paragraph, the model predicts the answer. We evaluate on the Squad 2.0 dataset, which has questions with no answers.

We experiment with 4 alterations to BiDAF: character embeddings, word dropout, PointNet attention, and self attention, of which word-dropout and PointNet attention are novel methods for the task.

Char-Level Embeddings
Problem: Unknown words in context and question
Solution: Character level embeddings to represent unknown words consistently.

| known emb | word emb | char emb |
| unknown emb | <unk> | char emb |

PointNet Attention
PointNet: used in computer vision to learn order-independent representation. We apply to query.

| Grow ind. | Grow ind. | Grow ind. | Max Pool | OUT Sim Vecs for each cont word |
| word embs | Conv | C |

Self-Attention
Problem: Model is not understanding the context paragraph because context words do not communicate.

Solution: While the original BiDAF implementation contains an Attention Flow layer which exchanges information between the context and query, it relies on the modeling layer to exchange information within the context layer.

Self-Attention directly aggregates information within the context, without relying on an RNN which may have trouble capturing long term dependencies.

Quantitative Results
- Char Embeddings: EM + 1.37 F1 + 1.28
- Word Dropout: EM - 2.72 F1 - 2.13
- Self Attention: EM - 1.03 F1 - 2.35
- PointNet Attention: EM - 0.58 F1 - 1.23

Discussion
- Char-level embeddings provide information about unknown words, particularly when query and context words match
- Word-Level Dropout drops important terms and prevents the model from learning
- Self-Attention and PointNet Attention overcomplicate the model and do not provide the hoped for context

Error Analysis
Question: Who designed the garden for the University Library?
Context: The building was designed by architects Marek Budziński and Zbigniew Badowski and opened on 15 December 1999. It is surrounded by green. The University Library garden, designed by Irena Bajerska, ...

Answer: Irena Bajerska
Prediction: Marek Budziński and Zbigniew Badowski

References