**Achieving Open Vocabulary Neural Machine Translation with Hybrid Word-Character Models**

**Summary**

The paper proposes a hybrid neural machine translation model concerning both words and characters, which mainly contributes to the translation of rare or unknown words. They use a long short-term memory (LSTM) neural network combined with global attention mechanism to achieve high training efficiency and translation quality.The paper presents a novel open vocabulary NMT(Neural Machine Translation) system that translates mostly at word level and falls back to character level models for rare words.

**Strengths**

* Faster and easier to train(word models) as compared to character models.
* Only uses character-level models in case of out-of-vocabulary words(rare words)
* Does not produce unknown words in the translations which need to be removed using unk replacement techniques.

**Observations:**

* Hybrid model surpasses all the other systems (neural/non-neural) and establishes a new state-of-the-art result for English-Czech translation in WMT’15 with 19.9 BLEU.
* Character-level models, when used as a replacement for the standard unk replacement technique in NMT, yields an improvement of up to +7.9 BLEU points.
* Attention is very important for character-based models as the non-attentional character models perform poorly.
* Character models with shorter time-step backpropagation perform inferior as compared to ones with longer backpropagation.

**Weakness:**

* More work needed to increase the speed of character-based models.
* Memory usage is very high which can be improved