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Post-editing support based on source-target word alignment

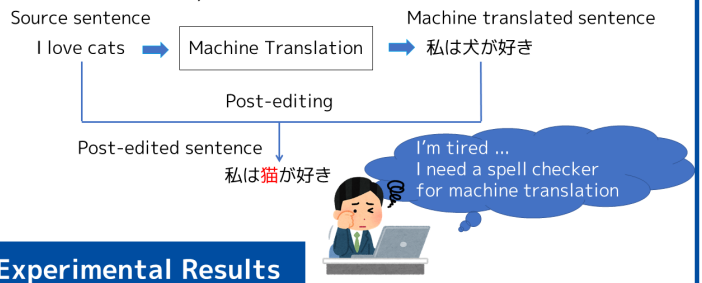
Looking for mistakes in machine translation

Abstract

Neural machine translation has the problem of generating fluent translations that do not necessarily match the content of the source text. We present technology that supports "post-editing," in which humans and machines cooperate to detect and correct errors in machine translation. We have developed a method to obtain word alignment between source and target sentences that are not necessarily semantically equivalent due to translation errors. It can present the user with the editing operations necessary to correct errors in the output of machine translation. We aim to realize interactive machine translation as easy to use as a spell checker.

Post-Editing for Machine Translation

Neural networks have greatly improved the accuracy of machine translation, but they will never eliminate machine translation errors. In fields where errors are not allowed, such as medicine and patents, post-editing (error detection and correction by humans) is essential.



Experimental Results

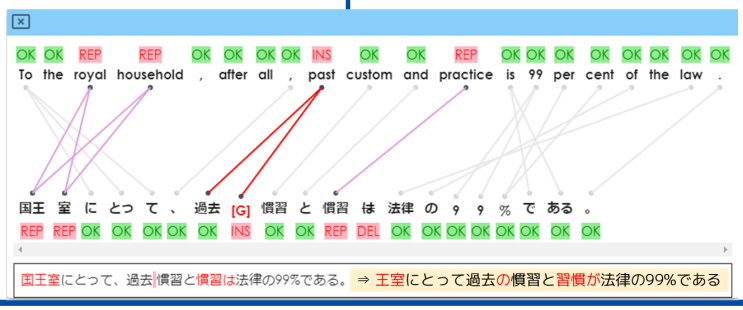
Quality Estimation Task datasets in WMT-2020

- 8,000 tuples of source, machine-translated, and post-edited sentences with OK/BAD translation tags for each word
- Of these, 1,000 tuples are manually word-aligned
- The accuracies (F1) of edit tags and word alignment are evaluated using the remaining 7000 + 800 tuples as training and 200 tuples for test data

	English to German			English to Chinese		
	SRC edit tag	MT edit tag	Word alignment	SRC edit tag	MT edit tag	Word alignment
Baseline	0.626	0.767	0.828	0.360	0.733	0.739
Proposed	0.755	0.827	0.916	0.849	0.897	0.888

User Interface

The post-editor edits the machine translated sentence referring to the word alignment and edit tags



Information display area
Edit tags
Source sentence
Word alignment
Machine translated sentence
Edit tags
Edit area

アプローチ

Predicts editing operations in the post-editing by combining word-level quality estimation (OK/BAD) and word alignment

Word-level quality estimation

One of WMT's shared task

OK OK BAD
I love cats
私 は 犬 が 好き
OK OK BAD OK OK

Predicts OK/BAD translation for each word

OK OK BAD OK OK BAD OK OK
Output layer for quality estimation
Multilingual pre-trained language model
I love cats [SEP] 私 は 犬 が 好き

Edit operation prediction (new technology)

OK OK REP
I love cats
私 は 犬 が 好き
OK OK REP OK OK

Insert: BAD SRC words without alignments
Delete: BAD MT words without alignments
Replace: BAD SRC word and BAD MT words with alignment

Word alignment (new technology)

Mistranslated word pairs are aligned as well.

I love cats
私 は 犬 が 好き

Predicts the alignment of words enclosed by the delimiter ¶

私
Output layer for word alignment
Multilingual pre-trained language model
¶ I ¶ love cats [SEP] 私 は 犬 が 好き

好き
Output layer for word alignment
Multilingual pre-trained language model
I ¶ love ¶ cats [SEP] 私 は 犬 が 好き

犬
Output layer for word alignment
Multilingual pre-trained language model
I love ¶ cats ¶ [SEP] 私 は 犬 が 好き

References

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[2] Y. Wei, T. Utsuro, M. Nagata, "Word-level quality estimation for machine translation based on source-MT word alignment," in *Proc. 27th Annual Meeting of the Association for Natural Language Processing*, 2021. (Joint Research with Tsukuba University)

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