האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

BLEU is Not Suitable for the Evaluation of Text Simplification

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BLEU

- BLEU (Paninени et al., 2002)
- Reference-based evaluation metric for MT
- Widely used in monolingual translation tasks, in particular:

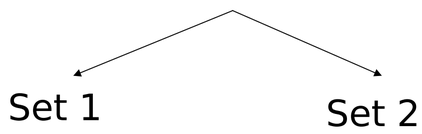
Text Simplification and **Split and Rephrase** Sub-task

HSplit Corpus

New Dataset

Input: Test set of Xu et al., 2016 (359 sentences)

Output: **Gold-standard sentence splitting**
Each sentence is modified by 4 annotators, according to **2 guideline sets**.



Split the original as much as possible, while preserving grammaticality, fluency and meaning

Split the original as much as possible, while preserving grammaticality, fluency and meaning, **if it simplifies the original**

- **4 structural paraphrases** for each of the sentences
- Average: **2.02** splits per sentence
  70 % of the sentences are split
- The mention of simplicity less affects the number of splits than the inter-annotator variability.
- It enriches the set of existed references focused on lexical operations (Xu et al., 2016) and is a new out-of-domain test set for Split and Rephrase.

Correlation with Human Evaluation

- **Hsplit as Reference Setting**

	Grammaticality (G)	Meaning Preservation (M)	Simplicity (S)	Structural Simplicity (StS)
BLEU	0.36	0.43	0.17	0.17
iBLEU	0.32	0.40	0.15	0.15
SARI	-0.05	-0.11	0.18	0.19
$-LD_{SC}$	**0.65**	**0.66**	**0.21**	**0.20**

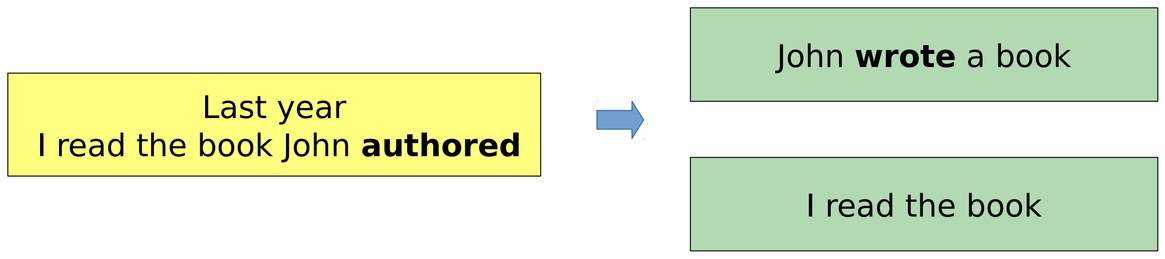
Spearman correlation at the sentence level between the automatic metrics and of human judgments

Systems: DSS, DSS^m, SEMoses, $SEMoses^m$, $SEMoses_{LM}$, $SEMoses^m{}_{LM}$
(Sulem et al., ACL 2018)

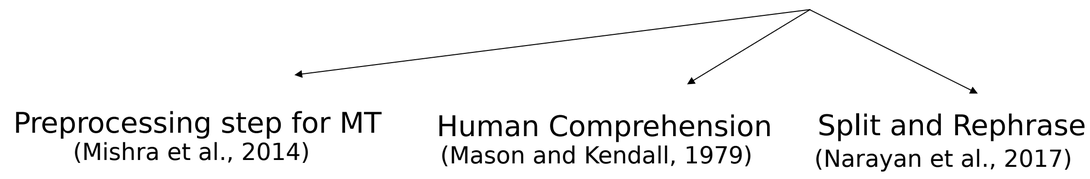
Correlation at the System-level: high for G (0.57), low for M (0.11), negative for S (-0.70) and StS (-0.60).

→ With references adapted to sentence splitting, BLEU still fails to assess this operation.

Text Simplification



Operations:
Word or phrase substitution, deletion, **sentence splitting**



Correlation with Human Evaluation

- **Standard Reference Setting**

	Systems/Corpora without Splits ; All Systems/Corpora			
	Grammaticality (G)	Meaning Preservation (M)	Simplicity (S)	Structural Simplicity (StS)
BLEU-1ref	0.43 ; 0.11	1.00 ; 0.08	-0.81 ; -0.60	-0.43 ; -0.67
BLEU-8ref	0.61 ; 0.26	0.89 ; 0.13	-0.59 ; -0.42	-0.11 ; -0.50
iBLEU-1ref	0.21 ; 0.02	0.93 ; 0.07	-0.85 ; -0.61	-0.61 ; -0.71
iBLEU-8ref	0.61 ; 0.26	0.89 ; 0.13	-0.59 ; -0.42	-0.11 ; -0.50
-FK	-0.21 ; -0.05	-0.57 ; -0.03	0.67 ; 0.51	0.39 ; 0.64
SARI-8ref	-0.64 ; -0.6	-0.86 ; -0.62	0.52 ; 0.26	0.00 ; -0.02
$-LD_{SC}$	0.29 ; 0.21	0.86 ; 0.51	-0.88 ; -0.68	-0.57 ; -0.52

Spearman correlation at the system level between the automatic metrics and of human judgments

- **Metrics**: BLEU, iBLEU (Sun and Zhou, 2012),Flesh Kincaid Grade Level (FK; Kincaid et al., 1975), SARI (Xu et al., 2016), Levenshtein distance to the source (LD_{SC}).
- **References:** 1ref: reference from Simple Wikipedia
  8ref: 8 crowdsourced references (Xu et al., 2016).
- **Human evaluation**: Sulem et al., ACL 2018, extended to Hsplit using the same protocol. We focus on the first 70 sentences for each system/corpus.
- **Systems/Corpora without Splits**: NTS (Nisioi et al., 2017) in 4 variants: h1, h4, w2vh1, w2vh4; Moses (Koehn et al., 2007); SBMT-SARI (Xu et al., 2016); Identity.
- **All Systems/Corpora**: Additionally includes the 4 HSplit corpora and the Hsplit average scores.

→ In all cases BLEU and iBLEU negatively correlate with Simplicity and Structural Simplicity.

→ Where sentence splitting is involved, the correlation with G and M disappears.

→ In this case, BLEU's correlation with M is considerably lower than that of $-LD_{SC}$ and its correlation with G is comparable.

→ Sentence-level correlation: for G and M the correlation with BLEU is lower than its correlation with $-LD_{SC}$ in both cases.

Conclusion

- Our findings suggest that BLEU should not be used for the evaluation of Text Simplification in general and sentence splitting in particular.
- It motivates the development of alternative methods for the evaluation of structural simplification. (Sulem et al., NAACL 2018).