Findings of ACL 2022

Why don't people use character-level MT?

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Outline

1. Extensive survey of research papers and WMT submissions.

2. Explore both existing and new character-level architectures.

3. Systematic evaluation of WMT-scale models.

Motivation

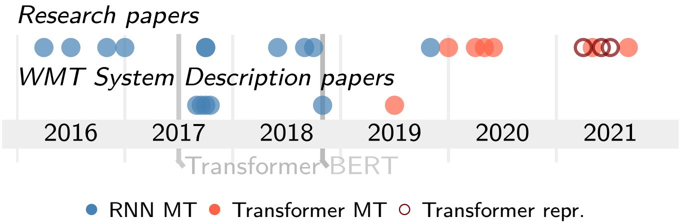
Subwords are sort of ugly

`_The _c at _s le eps _on _a _m at .`

Wishful thinking: what we could get from the character-level

- Simpler processing pipelines
- Learn better segmentation
- Noise robustness
- Generalize towards morphology and domain-specific vocab

Character-level MT in time

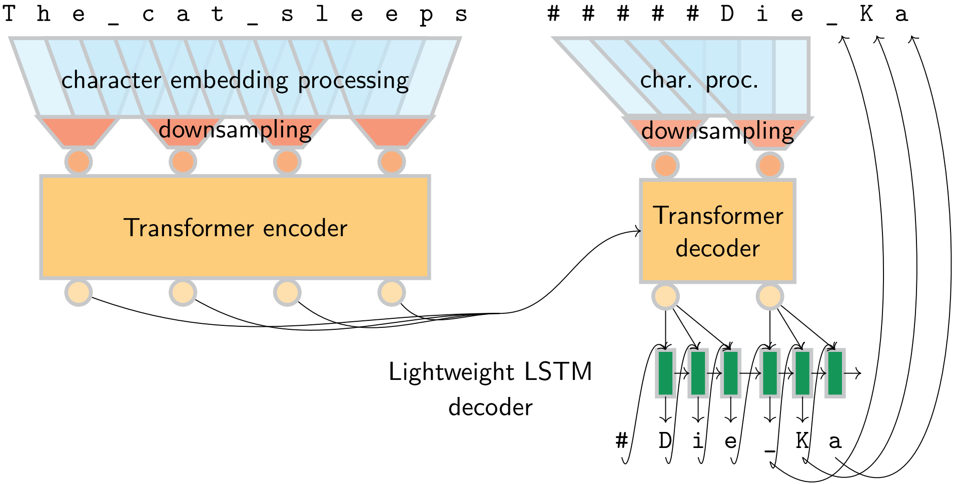


	2018	2019	2020
Subwords	92%	93%	97%
Morphological	4%	2%	3%
Words	2%	3%	—
Character	2%	2%	—

- Research papers often report parity or outperforming subwords
- The results of research papers got never confirmed in the competitive WMT setup
- Suspected reasons:

  not better quality, 5–6× slower

State-shrinking and Two-step decoding



Explore various architectures on small data

Convolutional encoder w/ downsampling + vanilla decoder

Competitive data setup

Previous work makes optimistic conclusions based on small and old datasets…
…let's do it properly

🇬🇧 → 🇨🇿

- CzEng 2.0 corpus
- 61M authentic parallel sentences
  50M back-translated

🇬🇧 → 🇩🇪

- Data mix Edinburgh used for WMT'21 submission
- 66M authentic parallel sentence
  52M back-translated

…data almost comparable to best WMT submissions
(tagged back-translation, Transformer BIG architecture, FairSeq)

Extensive evaluation

Character-level methods often motivated by morphological generalization and noise robustness.

- Quality in News, IT and medical domain
- Gender dataset
- Morpheval: Specific morphological phenomena
- Recall of novel forms and lemmas (in news)
- Quality under sampled noise

Characters are better in noise robustness

Summary

- Research in character-level MT is not used in practice
- Machine translation benefits from word-like units
- The best character-level architecture:
  convolutions + downsampling
- The only advantage of character-level: noise robustness

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