A systematic comparison of methods for low-resource dependency parsing on genuinely low-resource languages

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Realistic Low-Resource Dependency Parsing

- Few resources — no taggers (POS or morphological) are available.
- Parsers must learn from words or characters only.

SCENARIOS: What can we do ...

S1: with a very small *target* treebank for a low-resource language?

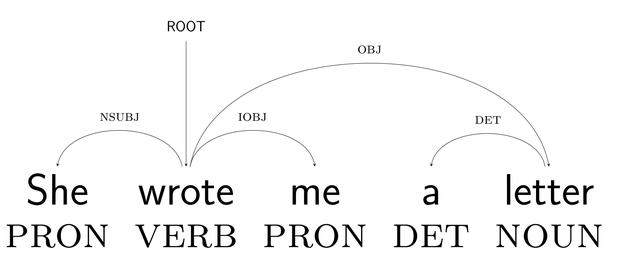
S2: if we also have a *source* treebank for a related high-resource language?

S3: if the *source* and *target* treebanks do not share a writing system?

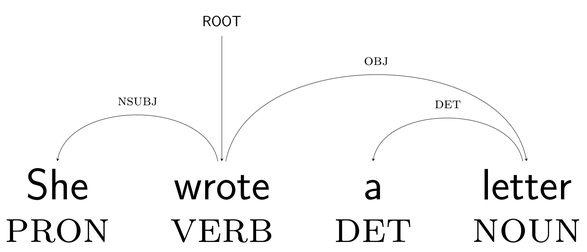
PARSING STRATEGIES

DATA AUGMENTATION [S1, S2, S3]

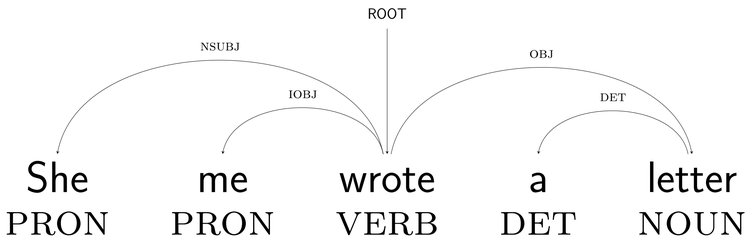
- Tree Morphing (Morph; Sahin and Steedman, 2018)



(a) Original sentence.



(b) Cropped sentence.



(c) Rotated sentence.

Figure 1: Operations on the sentence "She wrote me a letter".

- Nonce Sentence Generation (Nonce; Gulordava et al., 2018)

  *"He **borrowed** a **book** from a **library**."*

  ✓ He **bought** a book from the **shop**.
  ✗ He **wore** a **umbrella** from the library.

CROSS-LINGUAL TRAINING [S2, S3]

1. Train a multilingual model using the *source* and *target* treebanks.
2. Fine-tune by training the model further only on the *target* treebank.

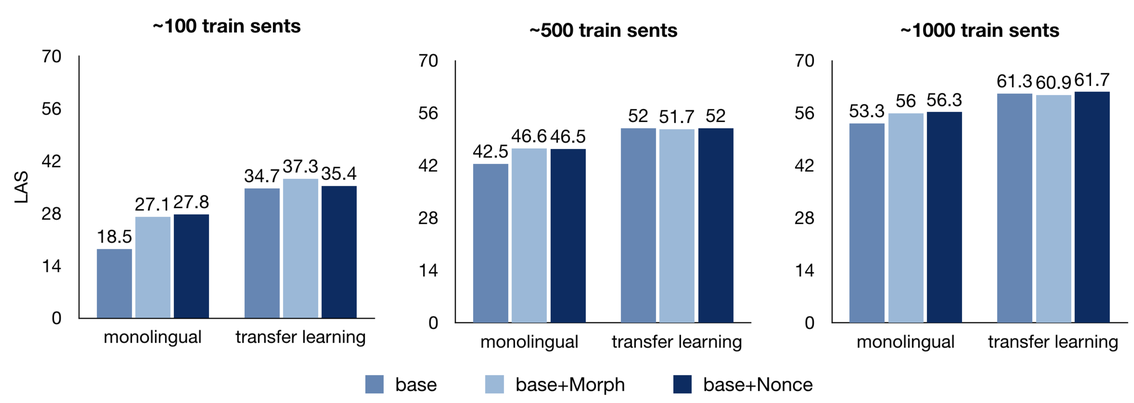
TRANSLITERATION [S3]

When the source and target treebanks do not share a writing system, we can map them into the same 'pivot' alphabet.

EXPERIMENTS & RESULTS

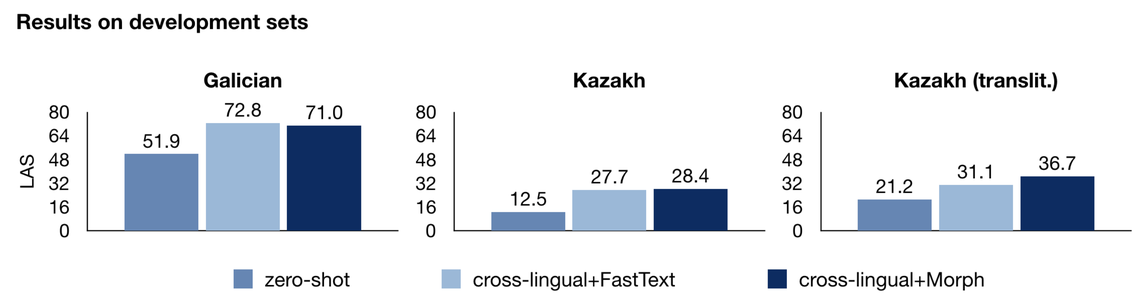
Parsing model: a neural transition-based dependency parser, with soft parameter sharing on words and characters. (de Lhoneux et al., 2018)

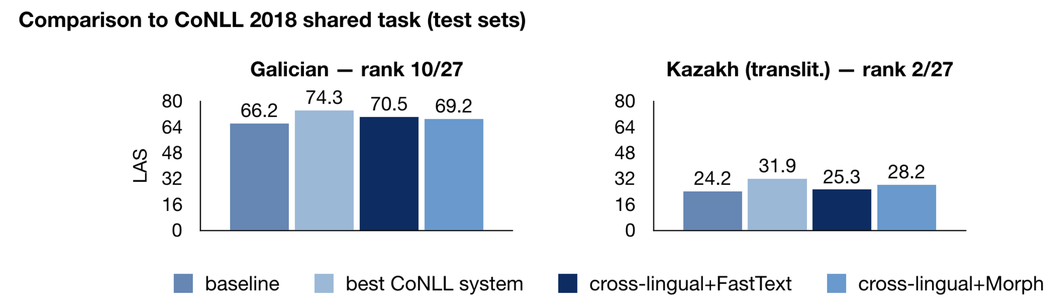
Parsing North Sámi



Data augmentation helps generate up to 4-5 times more training data.

Parsing truly low-resource languages





CONCLUSION

- **S1**: linguistically motivated data augmentation is helpful.
- **S2**: cross-lingual training gives the best improvement, but data augmentation still helps.
- **S3**: transliterating treebanks to a common orthography is very effective.