Transformers: shining in **OOV inflection**, but **beaten on** true **neologisms** by a non-neural model

OOVs in the Spotlight: How to Inflect them?

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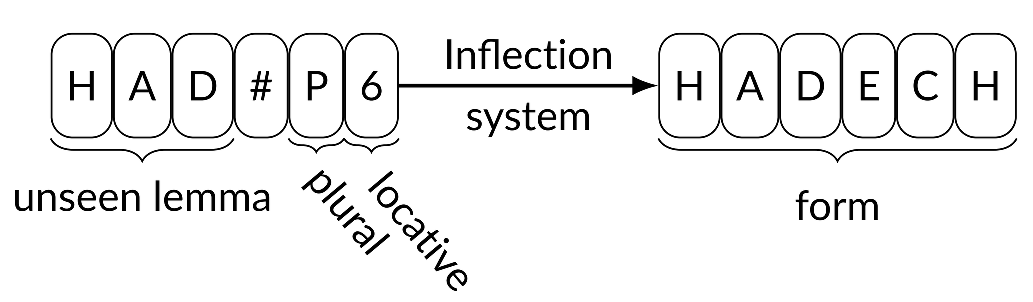
Introduction

- task:

  lemma + number + case → inflected form



- morphological inflection in out-of-vocabulary (OOV) conditions
- SOTA systems may struggle when asked to inflect unseen lemma
- focus on Czech nouns, extend to 16 languages and all POS

Data

- train-dev-test split of morphological dictionary (lemma-disjoint)
- additional test set of neologisms (real-world OOVs)
- released as Czech OOV Inflection Dataset

Methods

- non-neural retrograde model (based on suffix similarity of lemmas)
- LSTM- and Transformer-based encoder-decoder, trained from scratch, extensively tuned

Results

- SIGMORPHON'22 OOV conditions:
  - our seq2seq SOTA in 9 of 16 langs
- Czech simulated OOV conditions:
  - Transformer performs the best
- Czech true OOVs (neologisms):
  - overall performance drop
  - Transformer defeated by non-neural models

Discussion

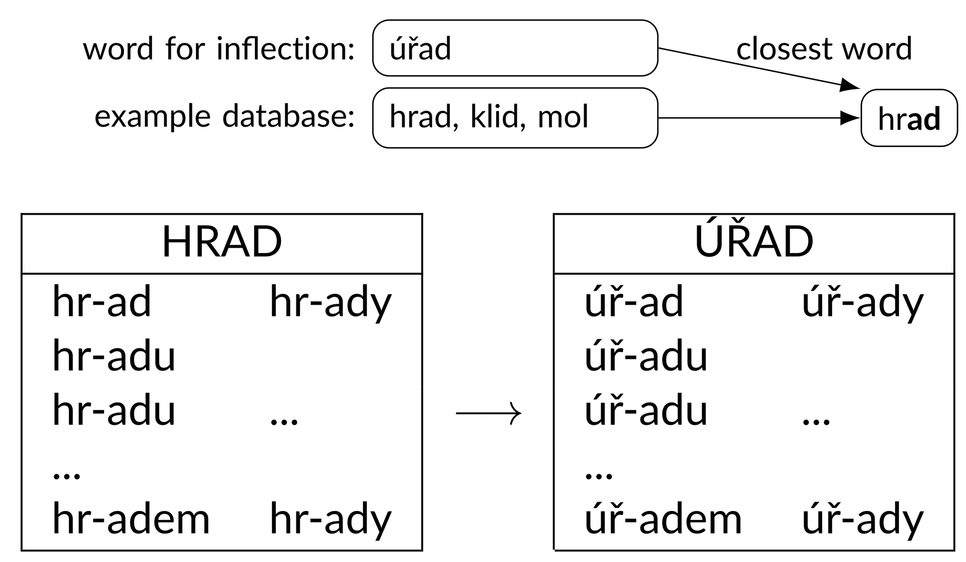
- small test set of neologisms: would the results scale on a large one?
- is morphological dictionary a good train set for inflecting true OOVs?
- if not, how to select the train data?

Datasets

lemma	tag	form
elektrořidič	S1	elektrořidič
elektrořidič	S2	elektrořidiče
elektrořidič	S3	elektrořidičovi
	…	
elektrořidič	P6	elektrořidičích
elektrořidič	P7	elektrořidiči

Set	lemmas	forms	Source
train	360k	5.04M	MorfFlex
dev	44k	616k	MorfFlex
test-MorfFlex	44k	616k	MorfFlex
test-neologisms	101	1.4k	Čeština 2.0

Non-neural retrograde model



Results

test set	MorfFlex		neologisms	
model	FA	FPA	FA	FPA
`copy`	22.6	1.5	13.1	0
`sklonuj.cz`	88.9	74.4	86.2	55
`SIG nonneur`	94.8	88.2	**89.5**	**71**
`SIG trm`	95.5	87.3	87.5	63
`SIG trm-tune`	96.2	90.2	86.5	55
`Retrograde`	94.9	88.6	89.3	**71**
`LSTM`	96.2	89.8	87.0	58
`Transformer`	**96.2**	**90.4**	87.2	61
`majority-vote`	96.4	90.7	90.4	64

SIGMORPHON 2022 comparison

	Submitted systems					Baselines		Ours	
Lang	CLUZH	Flexica	OSU	TüM	UBC	Neural	NonNeur	LSTM	TRM
ang	**76.6**	64.4	73.7	71.9	74.1	73.4	68.7	76.3	75.5
ara	81.7	65.5	78.7	78.5	65.5	81.9	50.8	79.2	**82.6**
asm	83.3	75.0	75.0	**91.7**	83.3	83.3	83.3	83.3	83.3
got	92.9	41.4	**94.1**	91.7	91.7	93.5	87.6	92.3	92.3
hun	93.5	62.9	93.1	92.8	91.5	**94.4**	73.1	92.8	**94.4**
kat	96.7	95.7	96.7	96.7	96.7	97.3	96.7	97.3	**97.8**
khk	94.1	47.1	94.1	94.1	88.2	94.1	88.2	**100.0**	94.1
kor	**71.1**	55.4	50.6	56.6	60.2	62.7	59.0	49.4	62.7
krl	87.5	69.8	85.9	57.8	85.4	57.8	20.8	**89.1**	85.9
lud	87.3	92.0	92.9	93.4	88.2	**94.3**	93.4	89.2	92.0
non	85.2	77.0	85.2	80.3	**90.2**	88.5	80.3	83.6	88.5
pol	**96.1**	85.9	94.9	74.0	95.7	74.4	86.3	**96.1**	95.6
poma	76.1	54.5	70.1	69.4	73.3	74.1	47.8	75.2	**76.3**
slk	93.5	90.0	92.2	70.4	**95.7**	71.1	92.4	95.2	**95.7**
tur	93.7	57.9	**95.2**	80.2	92.9	79.4	66.7	**95.2**	92.9
vep	**71.5**	58.8	70.0	57.5	68.8	59.2	60.4	70.7	68.8
average	**86.3**	68.3	83.9	78.6	83.8	80.0	72.2	85.3	86.1

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