# Modeling Input Uncertainty in A Neural Network Dependency Parser.

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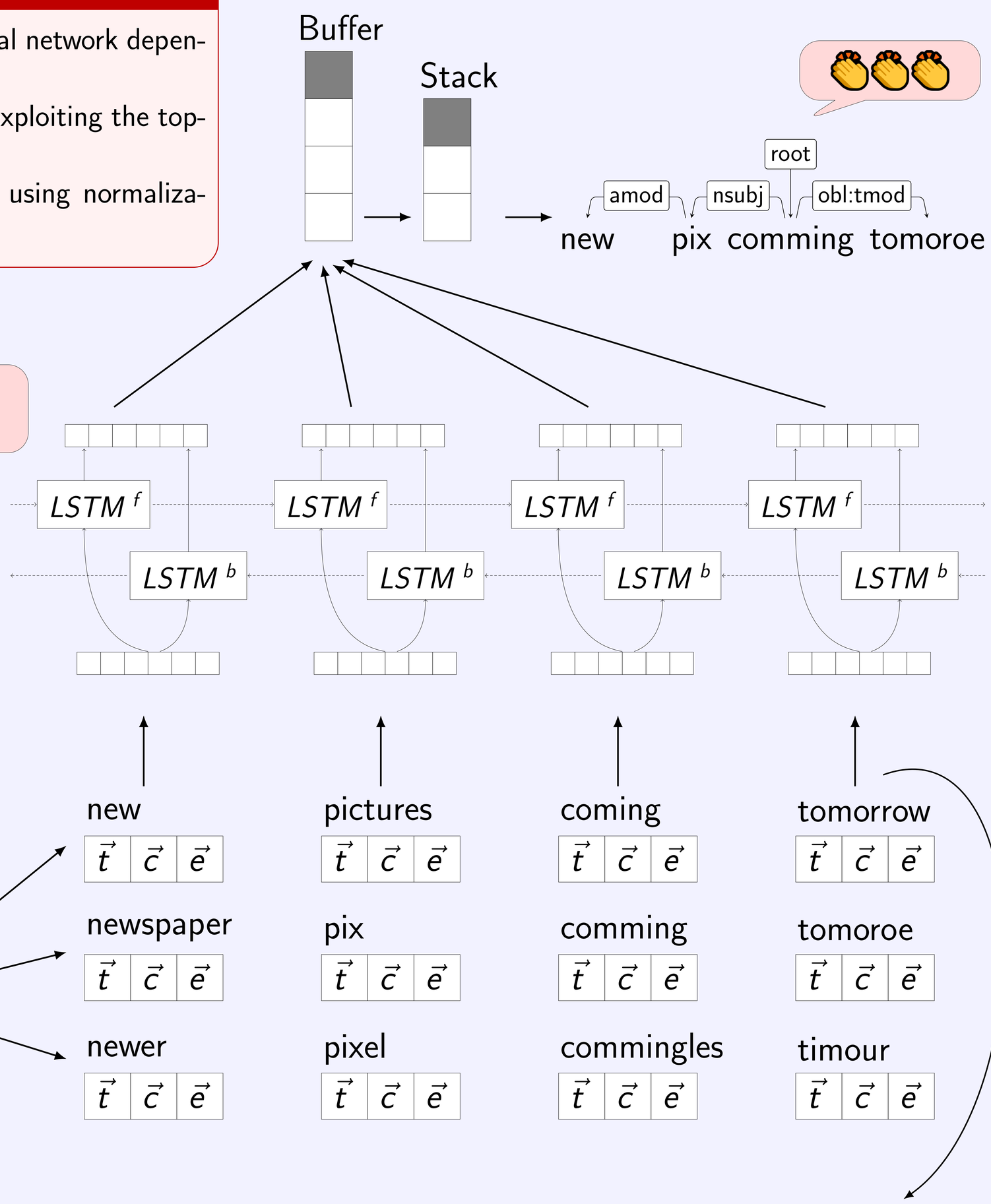
## Questions

- Is using normalization beneficial for neural network dependency parsers? (1-BEST)
- Can we improve parser performance by exploiting the top-N normalization candidates? (N-BEST)
- What is the theoretical upperbound of using normalization? (GOLD)




## New Treebank

- All tweets from Owoputi and LexNorm which are still available (10,005 tokens)
- Annotated tokenization, Normalization, POS tags and dependency structure
- Also version available with predicted normalization
- Guidelines similar to PoSTWITA-UD (Sanguinetti et al., 2018), UD-TwitterAAE (Blodgett et al., 2018) and Tweebank v2 (Liu et al., 2018)

## Settings

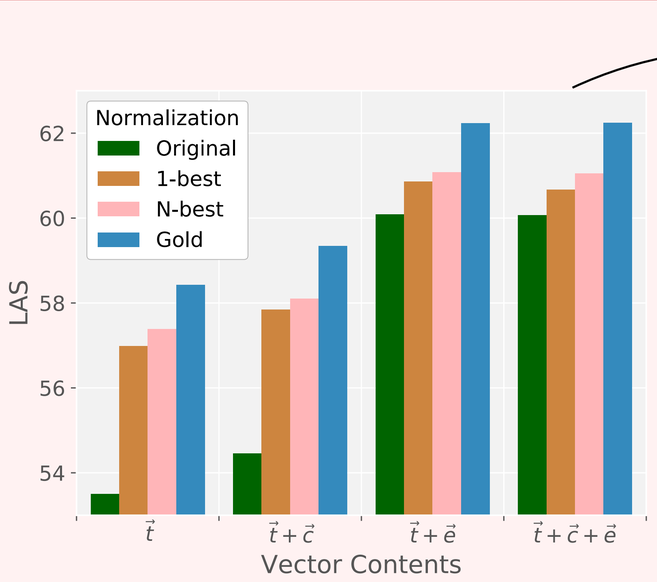
ORIGINAL: $\vec{v}_i = \vec{w}_i$

1-BEST: $\vec{v}_i = \vec{n}_{i0}$

N-BEST: $\vec{v}_i = \sum_{j=0}^{n} p_{ij} * \vec{n}_{ij}$

GOLD: $\vec{v}_i = \vec{g}_i$

## Results




| Model | UAS | LAS |
|---|---|---|
| ORIGINAL | 69.63 | 59.64 |
| 1-BEST | 70.51 | 61.76* |
| N-BEST | 70.62 | 62.30* |
| GOLD | 70.71 | 62.33 |

## Conclusions

- Using normalization directly is useful for dependency parsing, even when exploiting external and character embeddings
- Integrating normalization results in even higher performance
- When using normalization and external embeddings, character embeddings do not improve results

## Source code

www.bitbucket.org/robvanderg/normpar