# Is Typology-Based Adaptation Effective for Multilingual Sequence Labelling?

*Ahmet Üstün, Arianna Bisazza, Gosse Bouma, Gertjan van Noord*

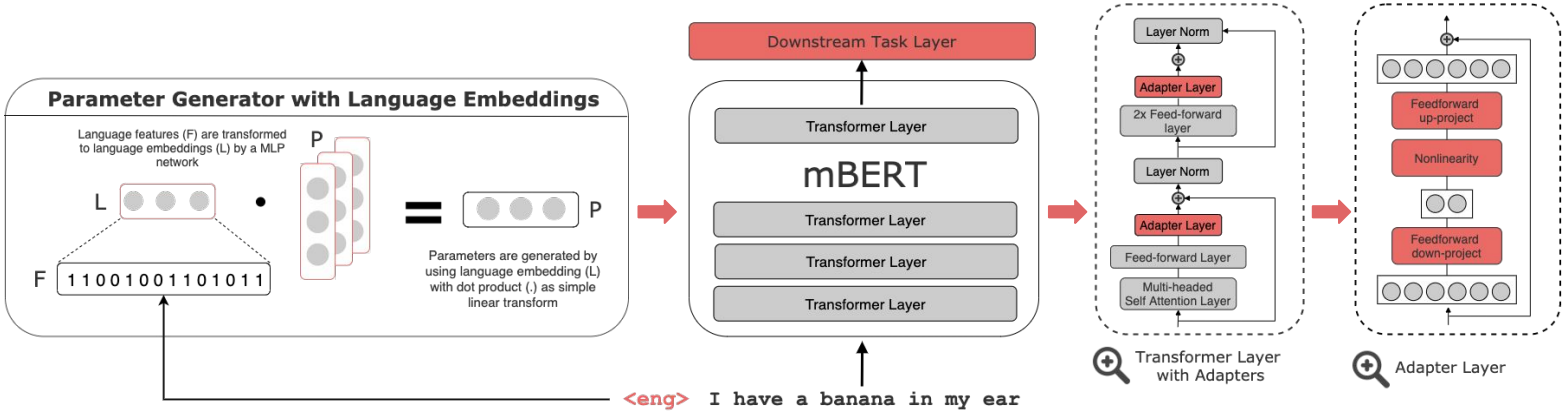
university of groningen

# Multilingual Sequence Labelling and Language Typology

- Multilingual models trained on large number of languages suffers from interference and limited capacity (Transfer-Interference Trade-off).

1. Can language-typology features guide a multilingual model for parameter sharing to increase language-specific capacity ?
2. Can language-typology features act as proxy information to run a multilingual model on low/zero resource languages (zero-shot) ?

# UDapter - Multilingual Adaptation with Typology




* Combining multilingual training and language-specific adaptation with contextul parameter generator approach based on mBERT

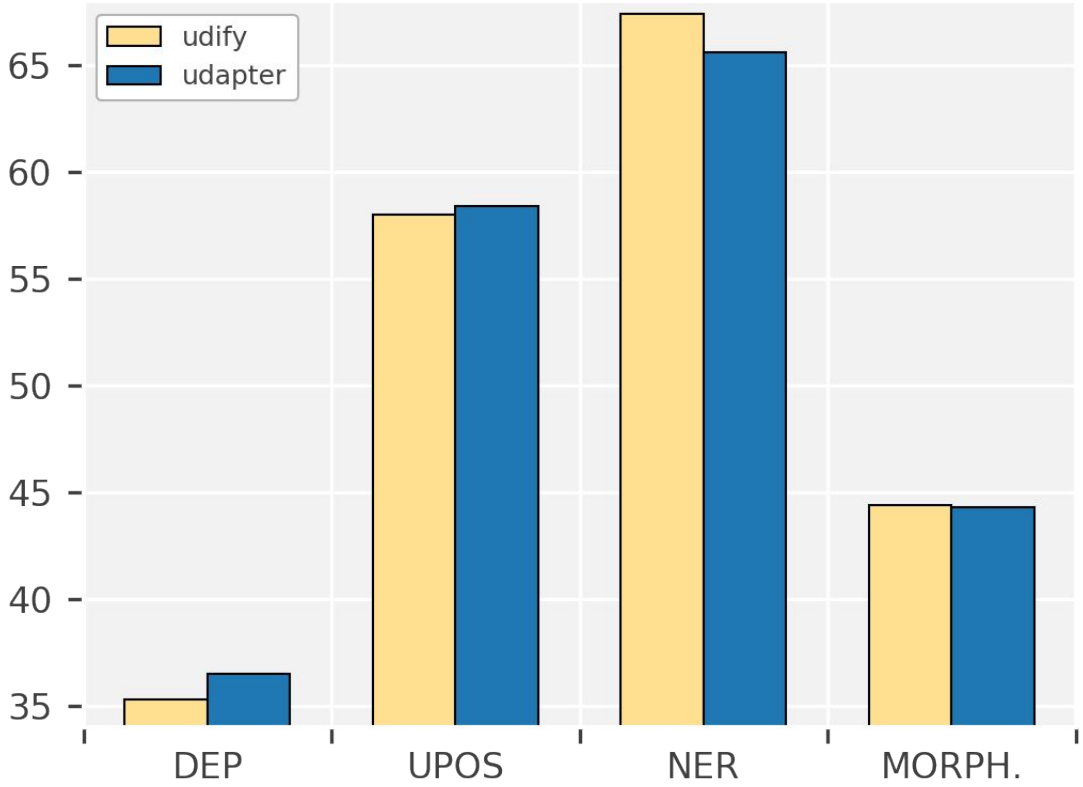
* Learning adapters via language embeddings

* **Learning language embeddings from typological features obtained from URIEL.**

* *All **syntactic, phonological and inventory** features* are used (289 features in total).

URIEL and lang2vec: Representing languages as typological, geographical, and phylogenetic vectors (Littell et. at., 2017)

# Zero-shot Results on Low-Resource (LR) Languages




* *Zero-shot results **highly differ** by tasks and languages*

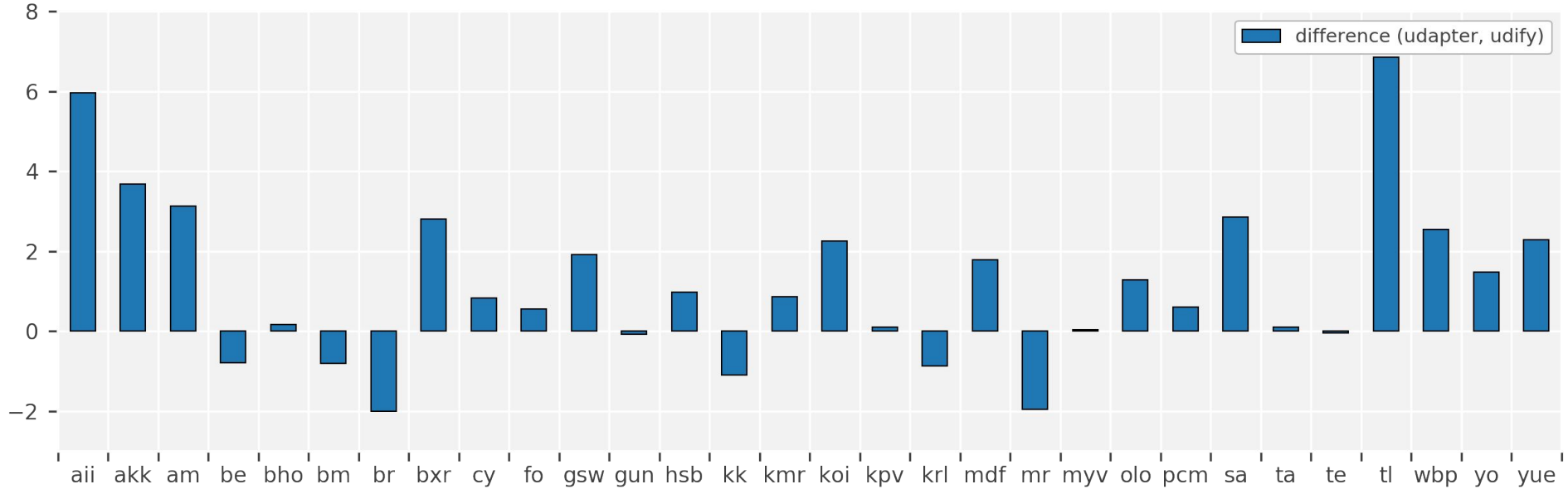
* *On dependency parsing and POS tagging, UDapter **slightly improves** overall result*

* *On NER, UDapter has **a visible performance drop***

* *On Morphological tagging (MORPH.), per-language results have **a large variation***

# Zero-shot Results - Dependency Parsing

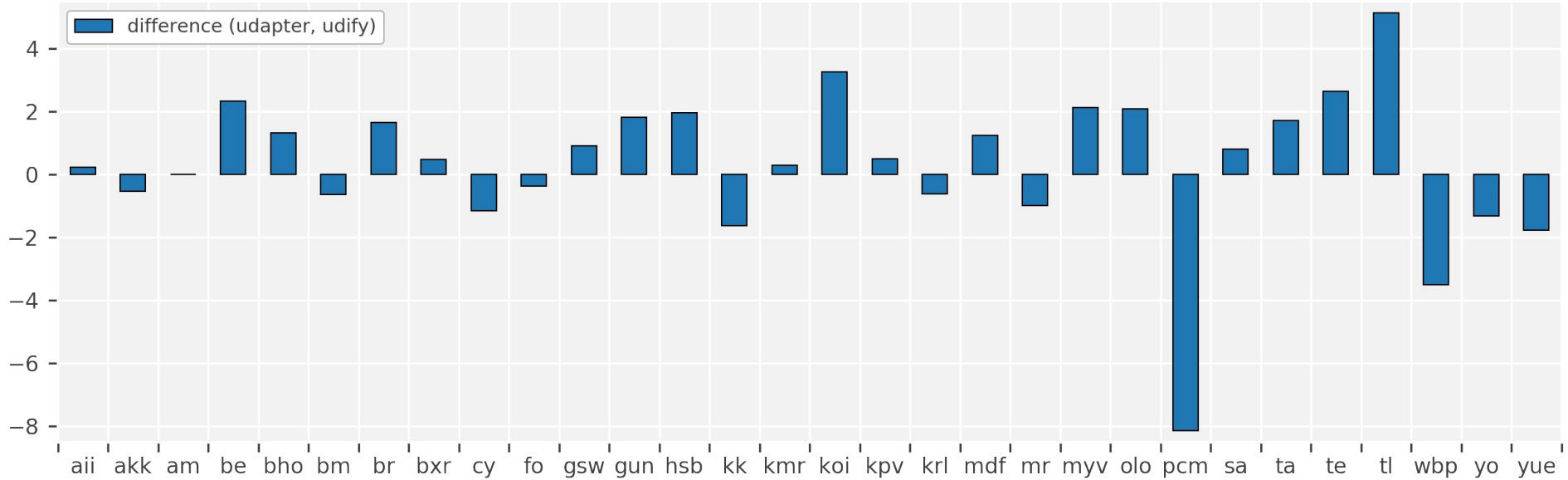
** UDapter outperforms the baseline on **majority of languages.***



# Zero-shot Results - POS Tagging

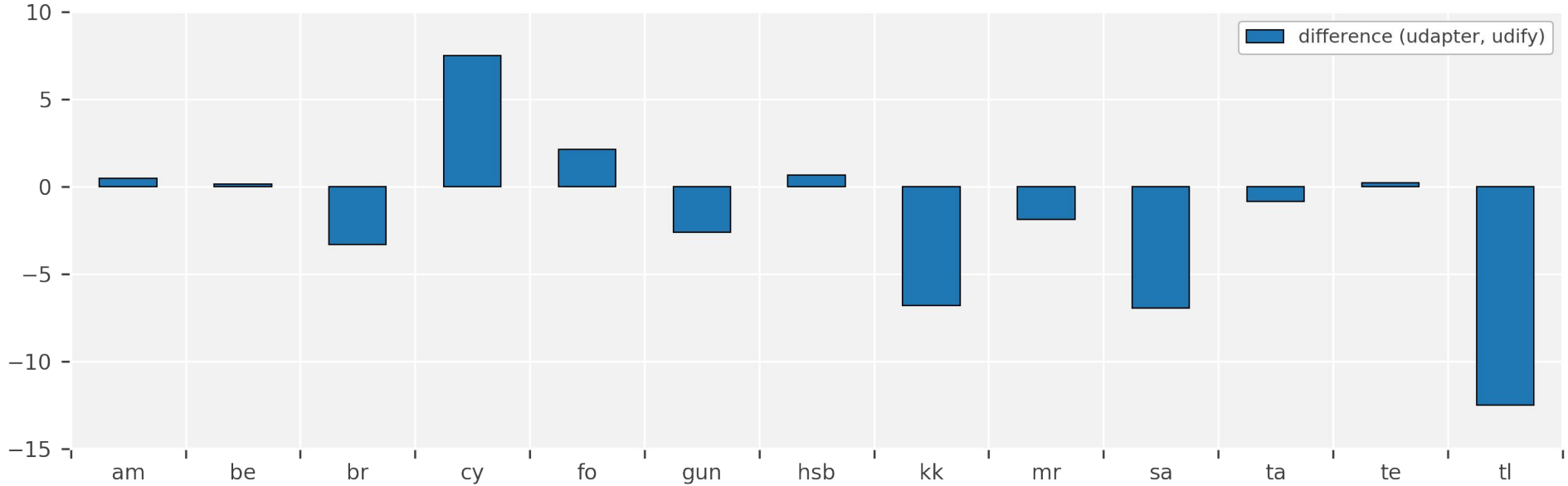
** UDapter outperforms the baseline on **majority of languages.*** ***

*Similar characteristics with DEP. parsing, similar trends in results.*



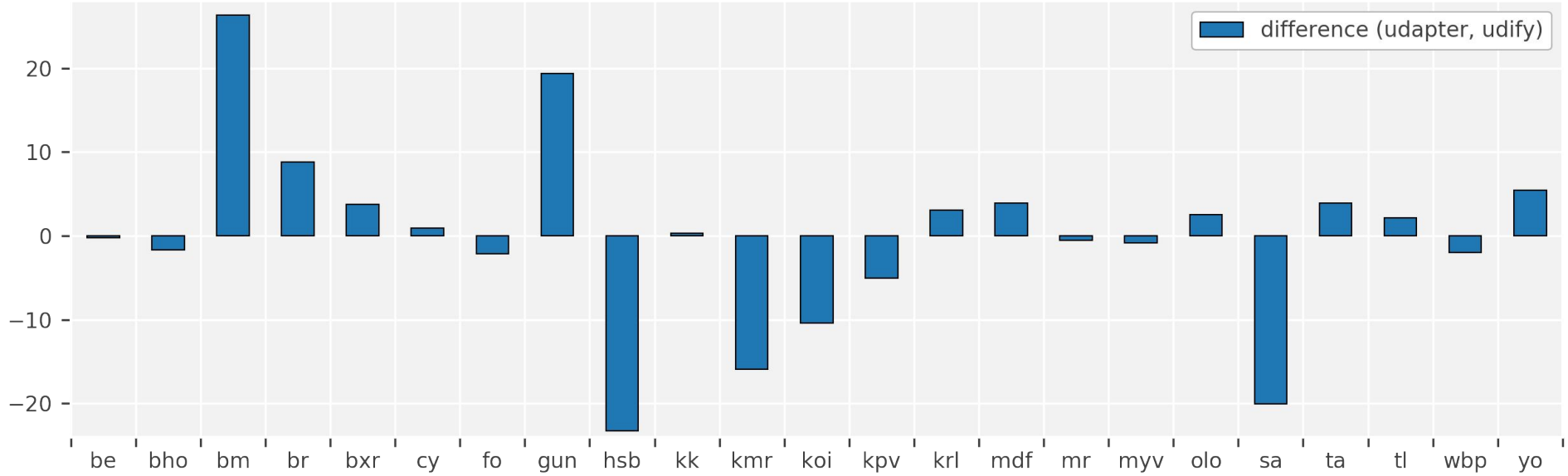
# Zero-shot Results - NER

* *UDapter has significantly lower performance on majority of languages*
* Unlike first two tasks, NER primarily requires **better word-level representations** (dissimilarity between NER and others)

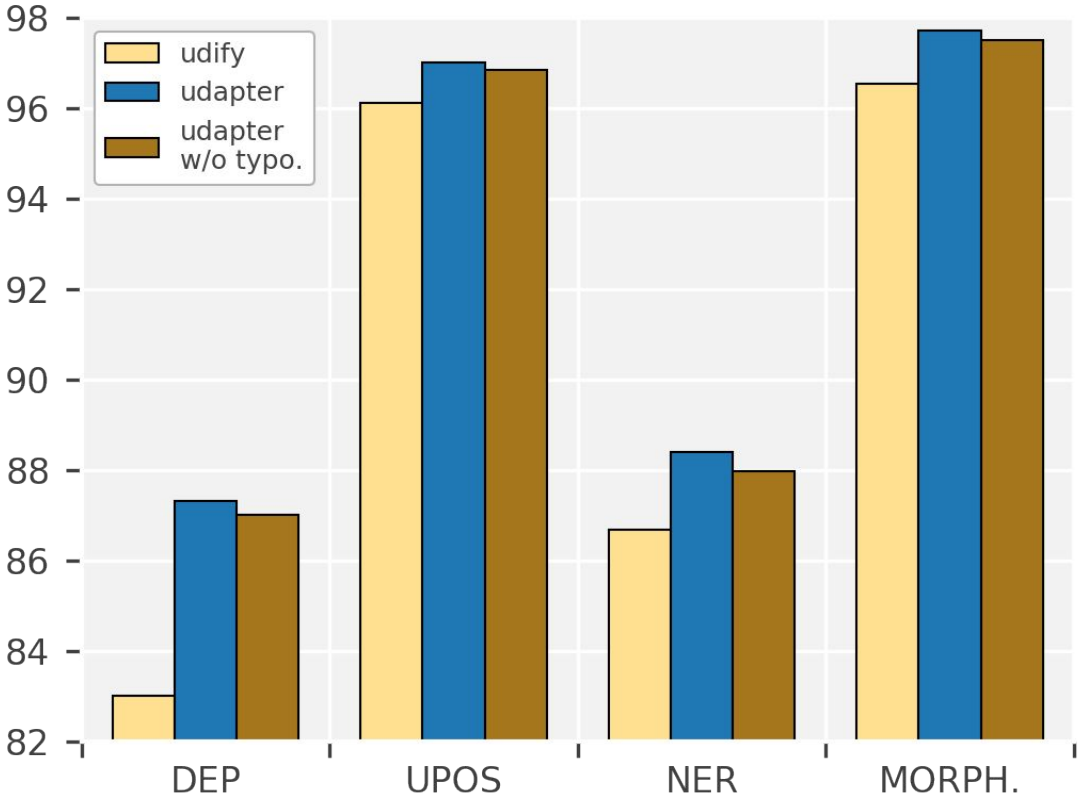


# Zero-shot Results - Morphological (FEATS) Tagging

* ***A large variation*** *on per-language results (F1 score).*
* Impact of ***language-specific morphological attributes*** *and* ***words without an annotation****.*



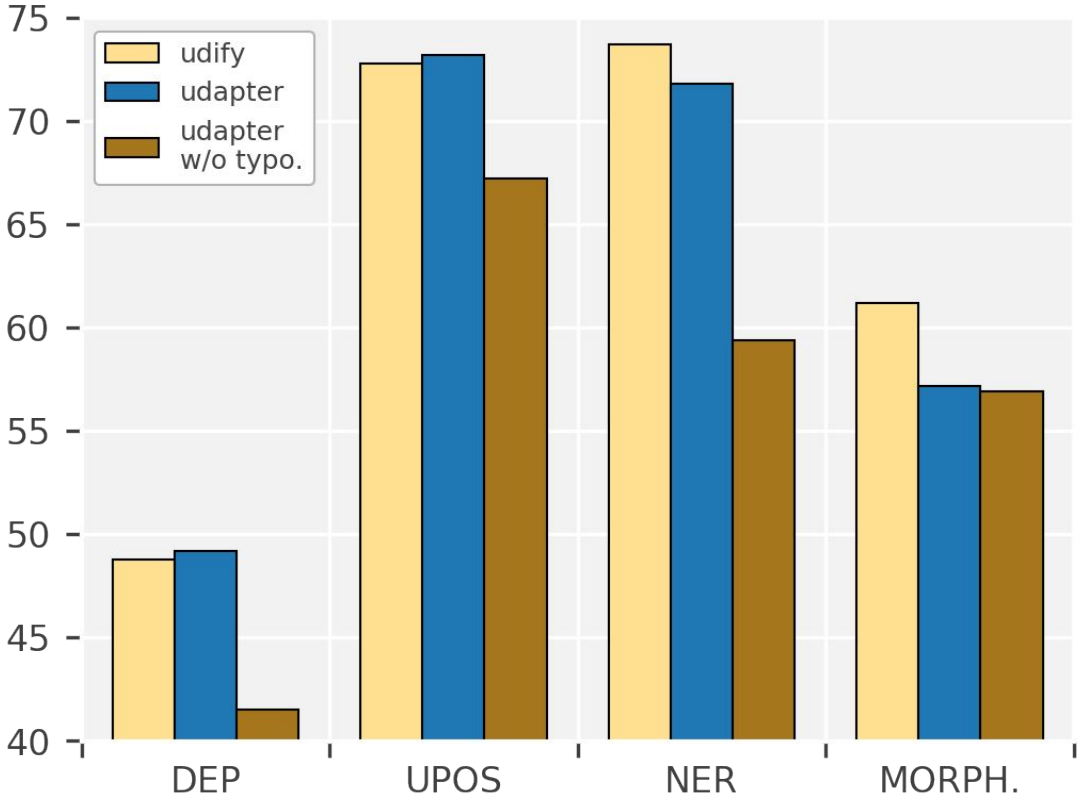
# Impact of Language-Typological Features on HR Languages




** On high-resource languages, typological features have **a very small impact** in UDapter.*

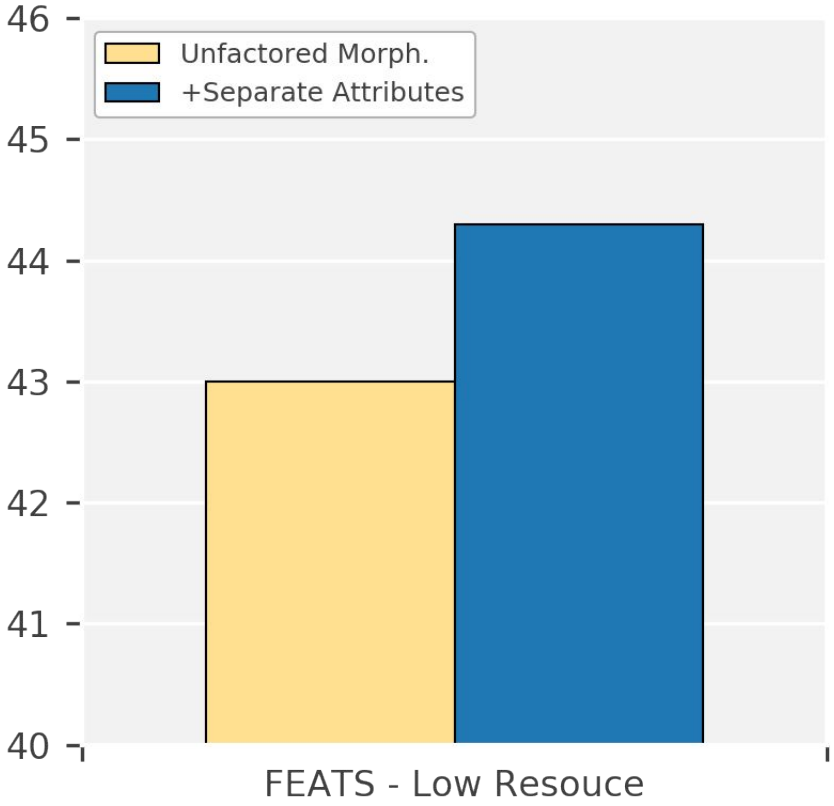
** **Language embeddings learned from scratch can guide model on HR**, for sharing parameters and increasing capacity.*

# Impact of Language-Typological Features on LR Languages




** On low-resource languages, UDapter without typological features suffers a **significant performance lost** in all tasks except morphological tagging.*

# Impact of Morphological Tagging Architecture

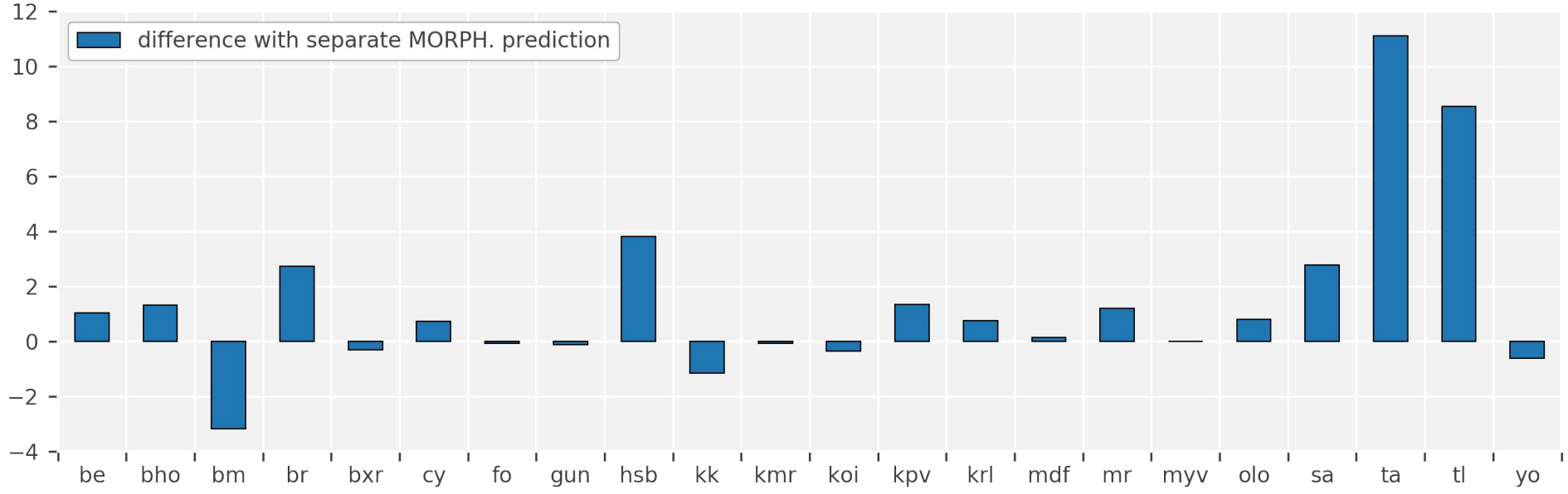



* ***Predicting individual morphological attributes during training*** *improves the performance on low-resource languages.*

* *This architecture forces UDapter* ***to generate an annotation instead of empty label*** *which has an heavy impact on results.*

# Impact of Morphological Tagging Architecture on LR Languages

** Increase with individual attributes prediction is **consistent across languages.***

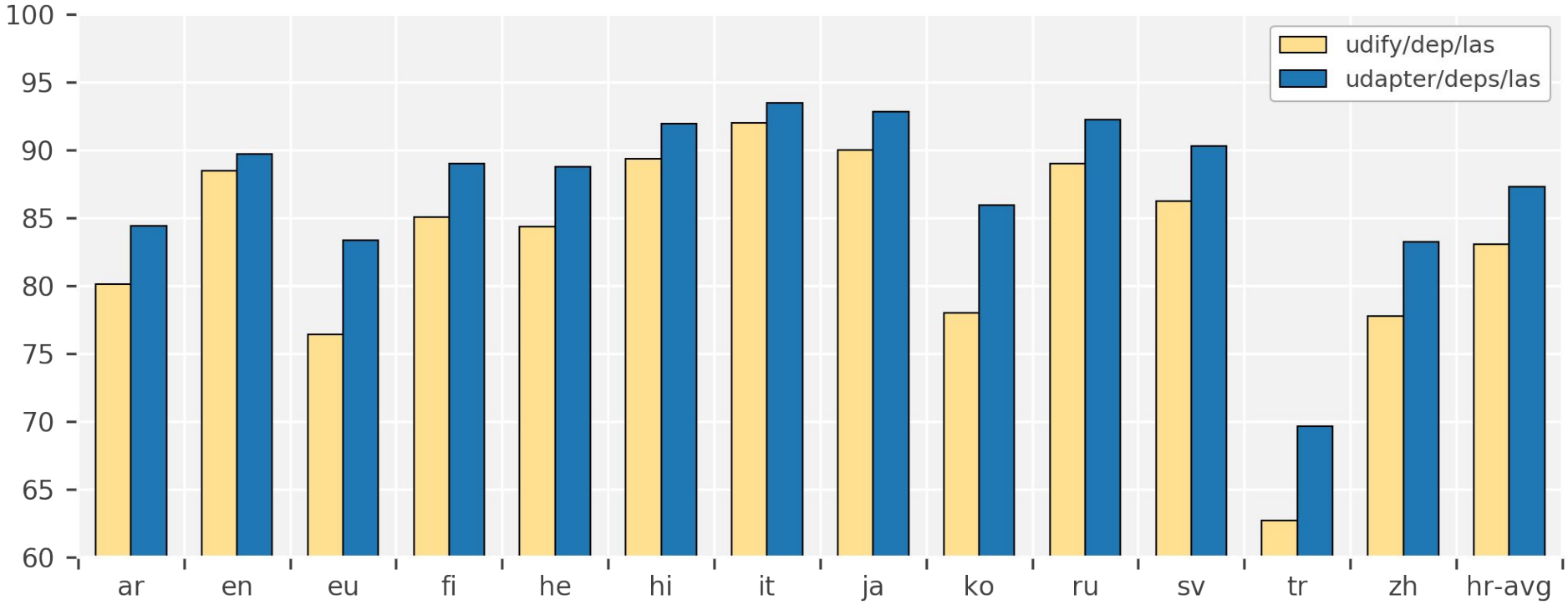


# Check the UDapter paper

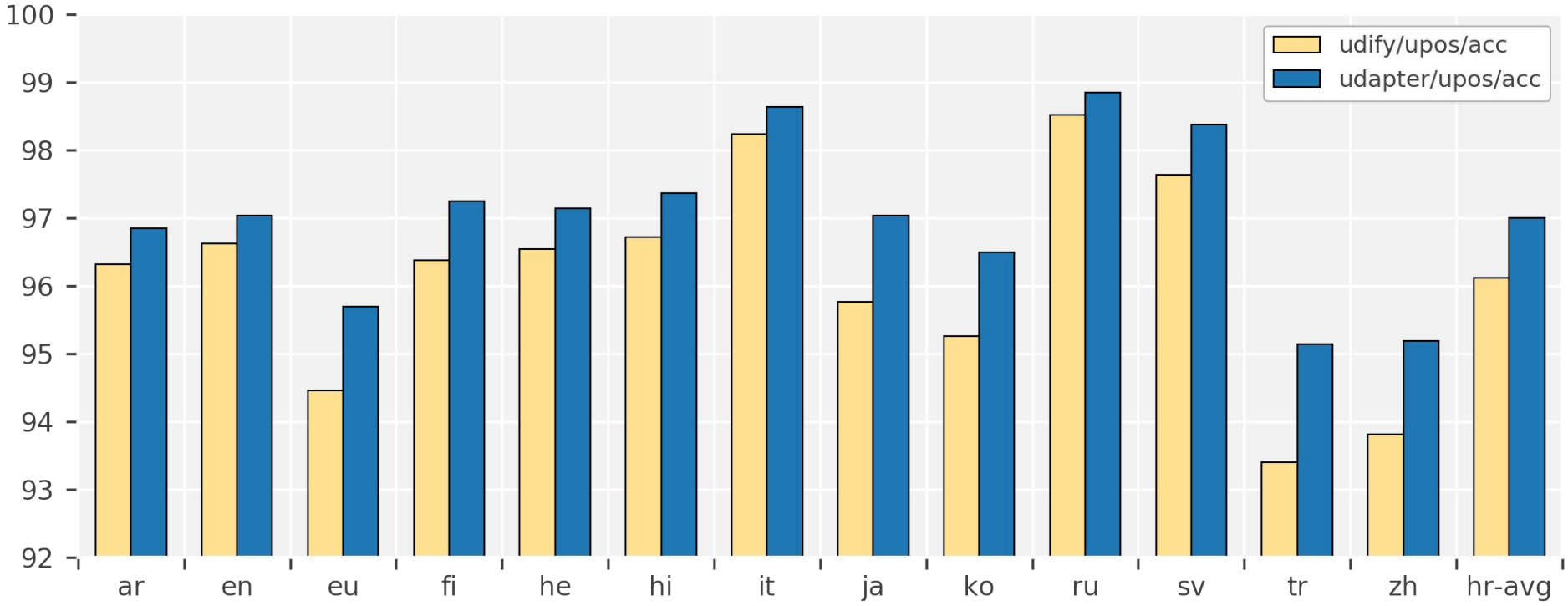
https://ahmetustun.github.io/udapter

Paper, Code and Slides

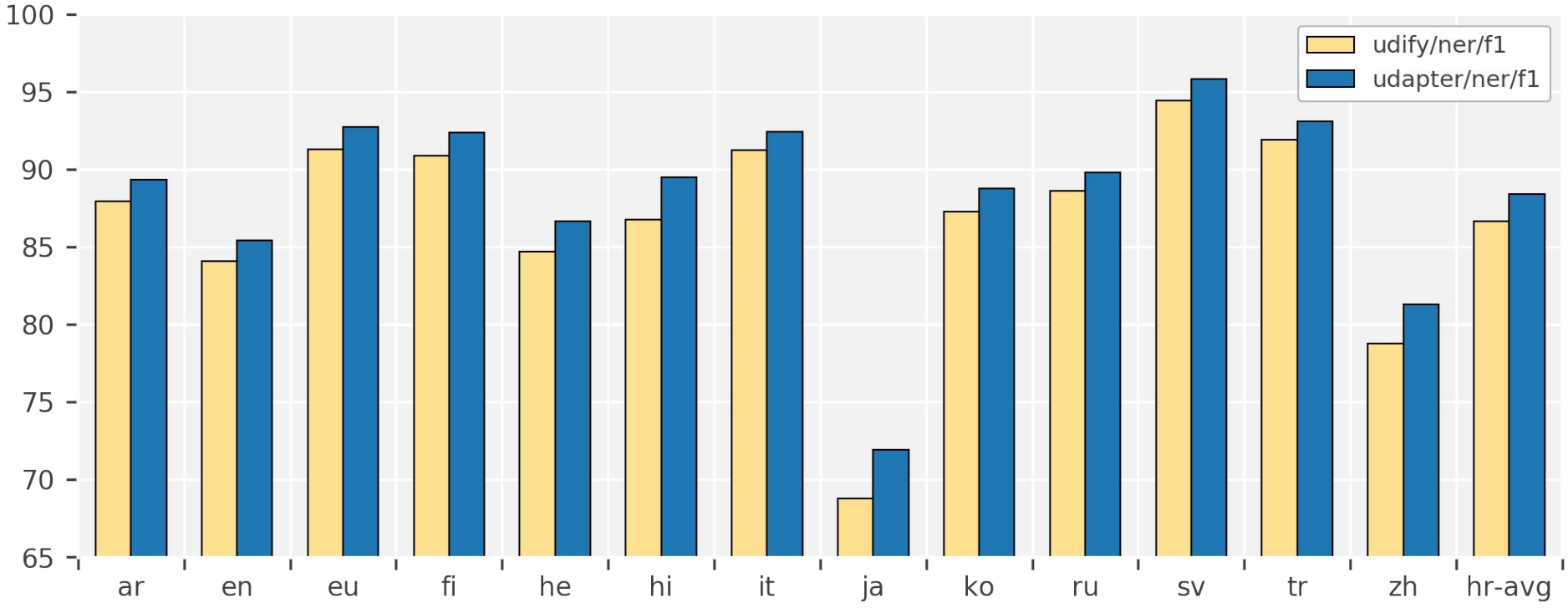
# Dependency Parsing Results



# POS Tagging Results



# NER Results


udify/ner/f1
udapter/ner/f1
100
95
90
85
80
75
70
65
ar
en
eu
fi
he
hi
it
ja
ko
ru
sv
tr
zh
hr-avg

# Morphological Tagging Results