A Modest Pareto Optimisation Analysis of Dependency Parsers in 2021

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Data

- Chinese-PTB (analytic)[1]
- Hindi-HDTB (fusional)[2]
- Polish-PDB (fusional)[3]
- Korean-Kaist (agglutinative)[4]

[1] N. Xue, F. Chiou, and M. Palmer, *Building a large-scale annotated Chinese corpus*, 2002
[2] R.A. Bhat et al., *The Hindi/Urdu treebank project.*, 2017
[3] A. Wróblewska, *Extended and enhanced Polish dependency bank in Universal Dependencies format*, 2018
[4] J. Chun el al., *Building Universal Dependency treebanks in Korean*, 2018

Parsers

- Biaffine (Graph-based)[1]
- Left-to-right Pointer (Transition-based)[2]
- Bracketed Sequence-labelling Parser[3]

All implemented in same framework (PyTorch). All BiLSTM networks.

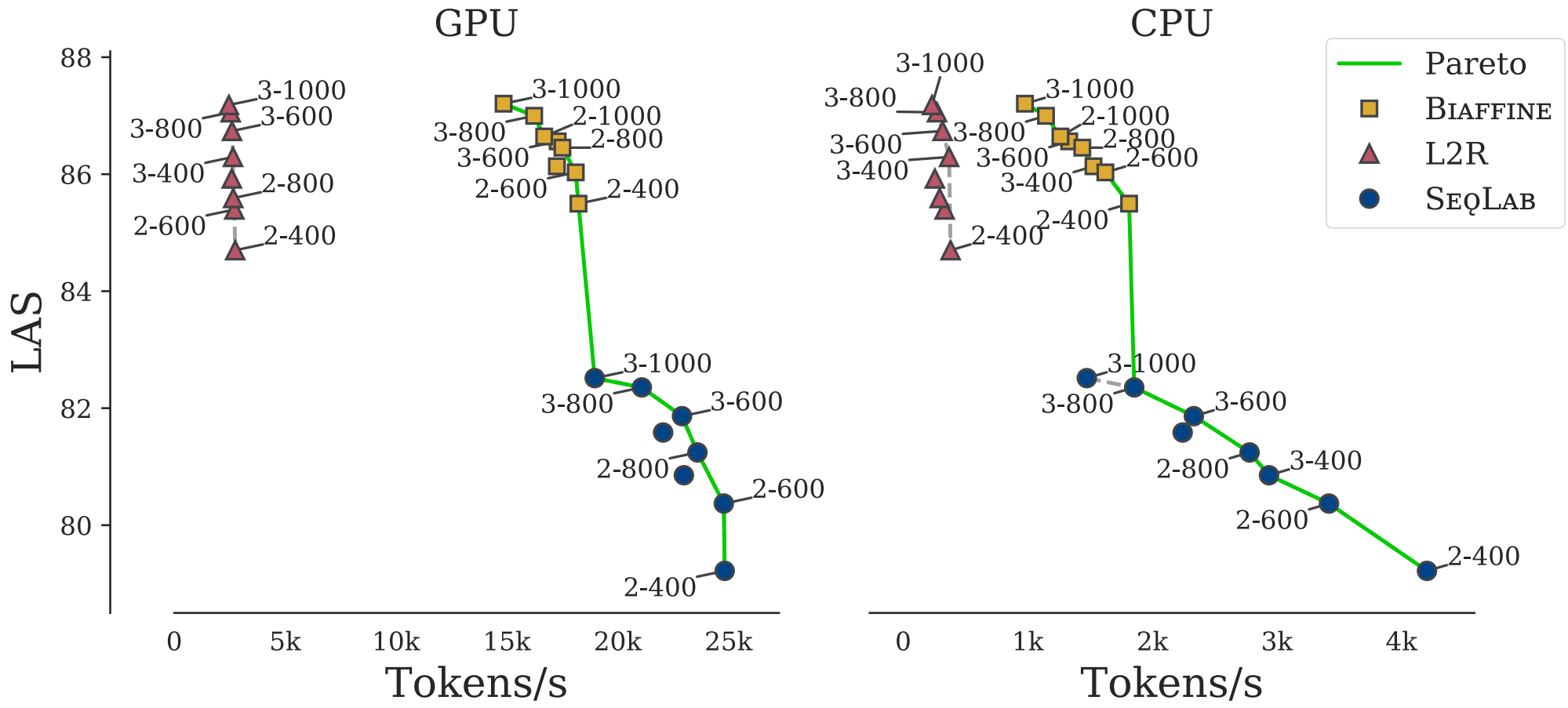
Available at: http://www.grupolys.org/software/iwpt2021/parsers-code.zip

[1]T. Dozat and C.D. Manning, *Deep biaffine attention for neural dependency parsing*, 2017
[2]D. Fernández-González and C. Gómez-Rodríguez, *Left-to-right dependency parsing with pointer networks*, 2019
[3]M. Strzyz, D. Vilares, and C. Gómez-Rodríguez., *Viable dependency parsing as sequence labeling*, 2019

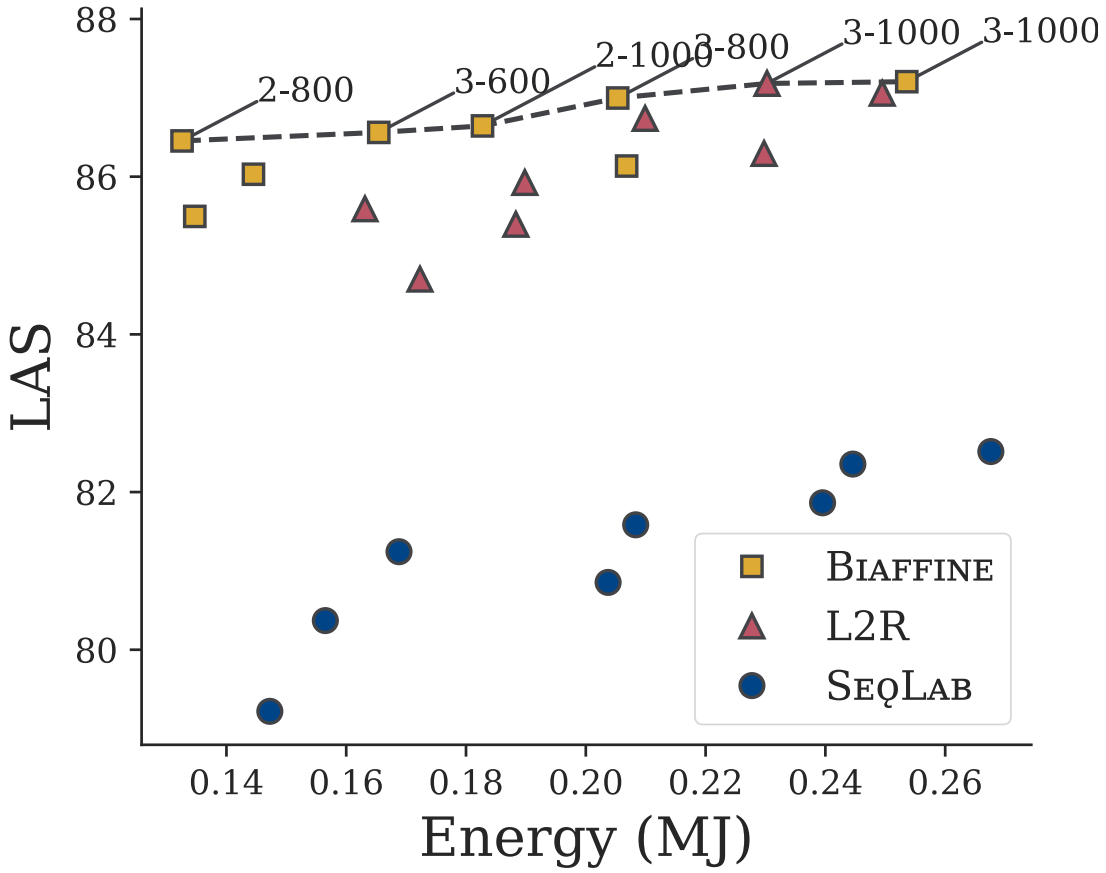
System

- **Hardware:** Intel Core i7-7700 and NvidiaGeForce GTX 1080
- **Software:** Python 3.7.0, PyTorch 1.0.0, and CUDA 8.0

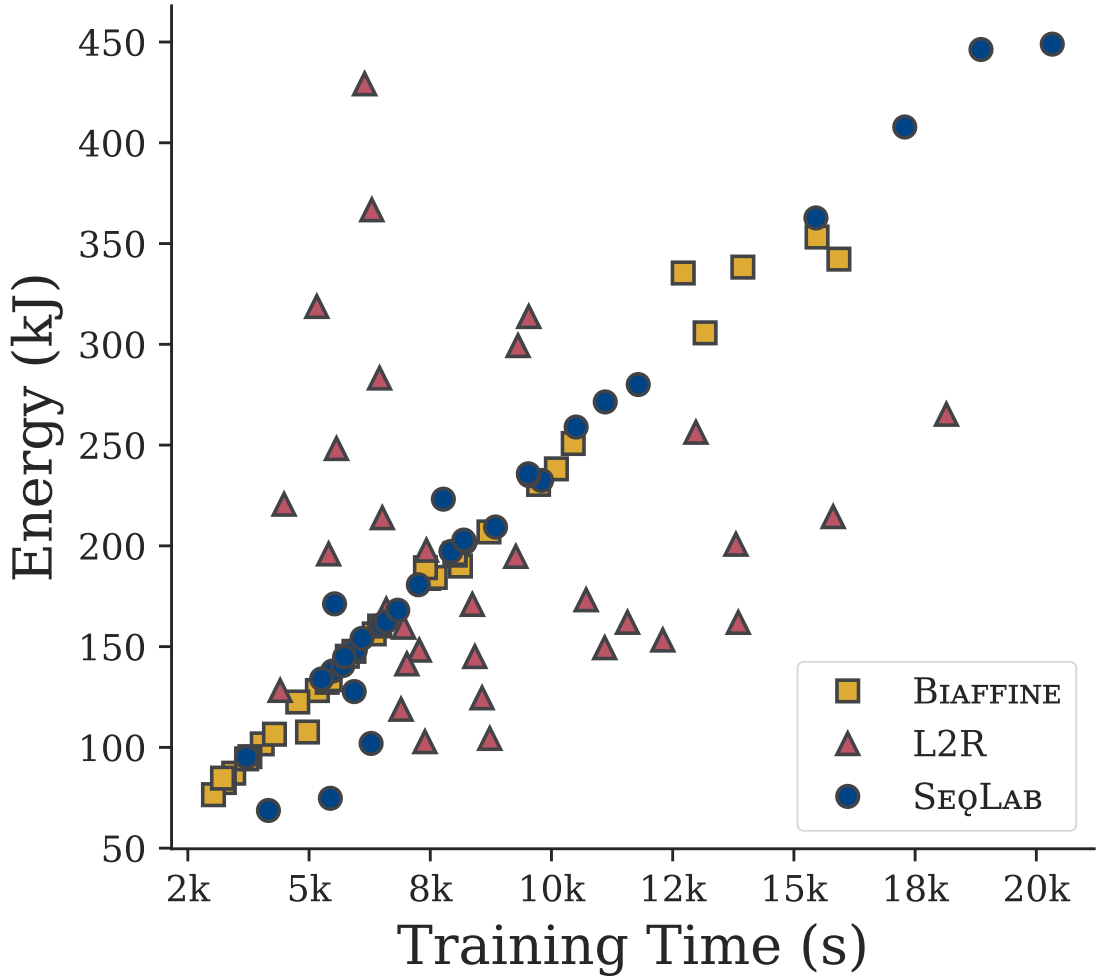
Speed


GPU
CPU
LAS
Tokens/s
Tokens/s
Pareto
Biaffine
L2R
SeqLab
88
86
84
82
80
0
5k
10k
15k
20k
25k
1k
2k
3k
4k
3-1000
3-800
3-600
3-400
2-1000
2-800
2-600
2-400

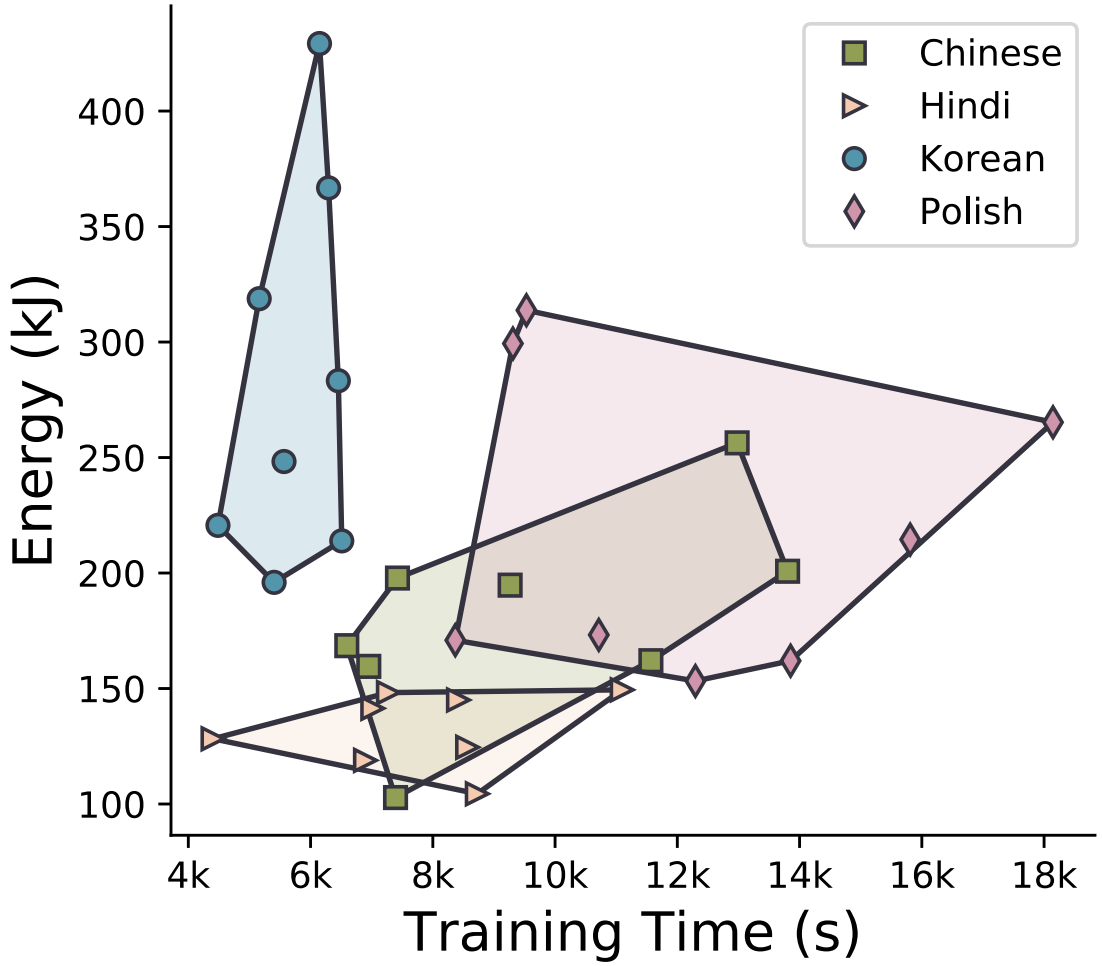
Energy


88
86
84
82
80
LAS
2-800
3-600
2-1000
3-800
3-1000
3-1000
0.14
0.16
0.18
0.20
0.22
0.24
0.26
Energy (MJ)
Biaffine
L2R
SeqLab

Energy-time


Energy (kJ)
450
400
350
300
250
200
150
100
50
2k
5k
8k
10k
12k
15k
18k
20k
Training Time (s)
Biaffine
L2R
SeqLab

L2R?


Chinese
Hindi
Korean
Polish
Energy (kJ)
400
350
300
250
200
150
100
4k
6k
8k
10k
12k
14k
16k
18k
Training Time (s)