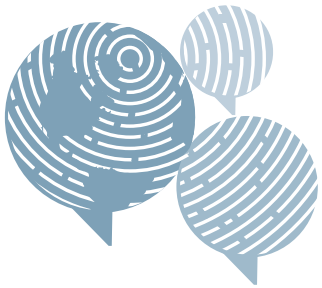
Judging Grammaticality with Tree Substitution Grammar Derivations

Matt Post



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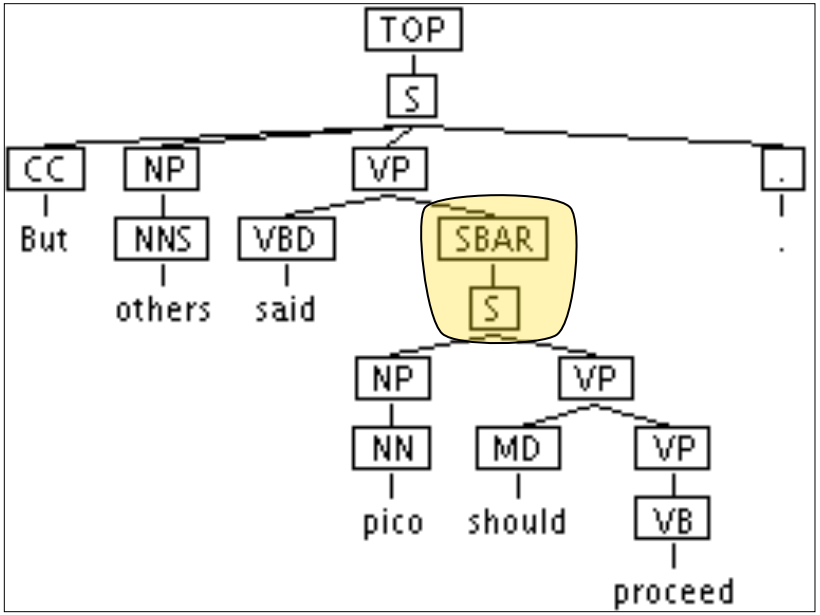
Overview

- Features from TSG derivations are helpful in distinguishing real text from "pseudo-negative" text

Standard CFG

Nonterminals rewrite as sequence of child nonterminals



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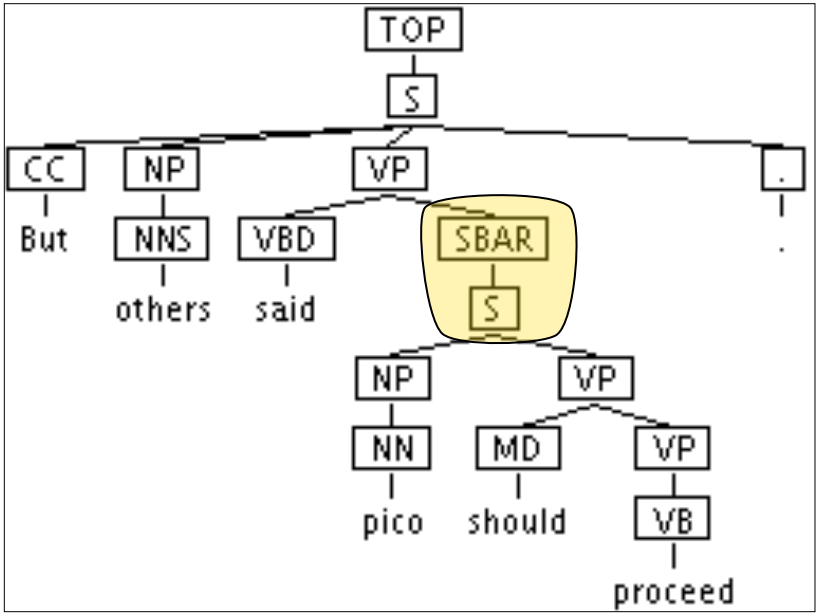
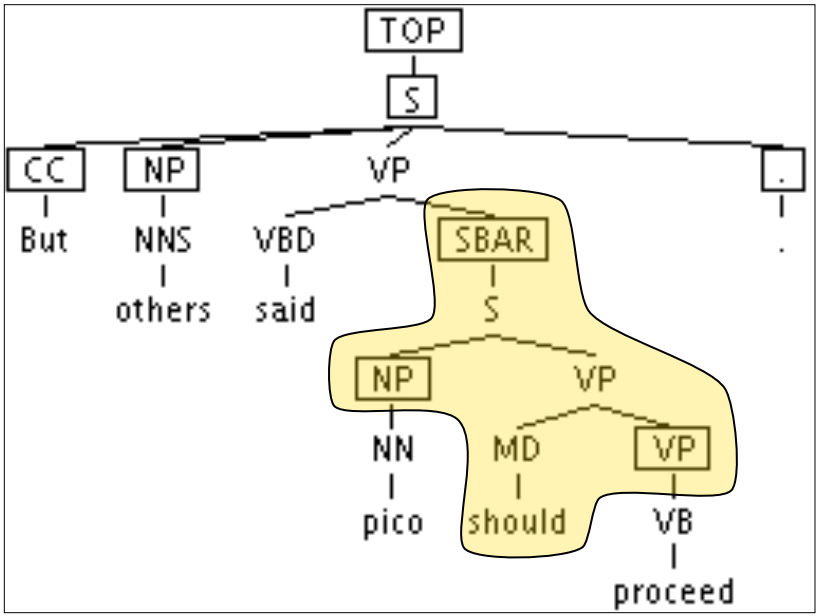


TSG

Nonterminals rewrite as sequence of child fragments of arbitrary size



Motivation

- Language modeling is hard, and syntax isn't as easy a solution as one might hope:
  - parser scores aren't very helpful (Och et al., 2004)
  - but can be improved with task-specific training (Cherry & Quirk, 2008)

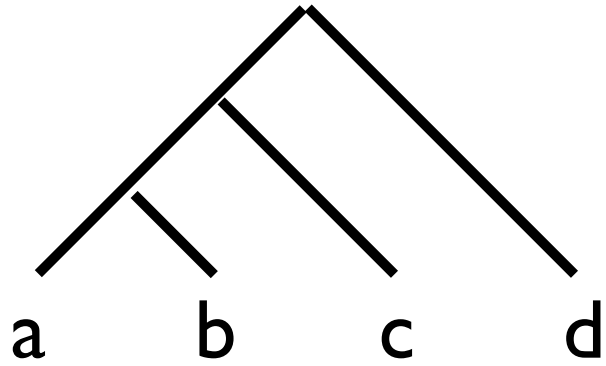
Motivation

- TSGs are an interesting formalism, but haven't been that helpful in parsing (though see Bansal & Klein, 2010)
- Tree features are helpful in related tasks, like parse reranking (Charniak & Johnson, 2005)
- Perhaps they can improve language modeling

Grammatical?

a b c d

Grammatical?



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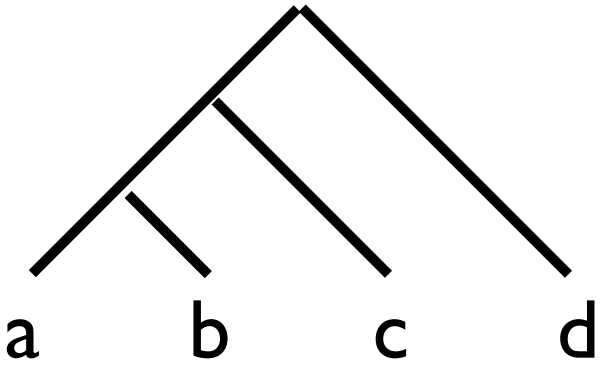

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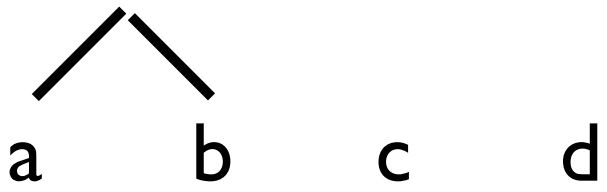

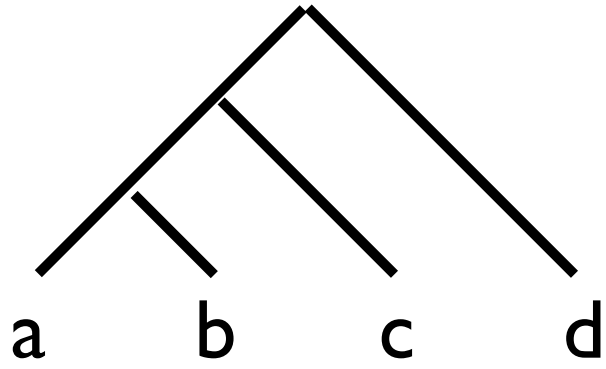

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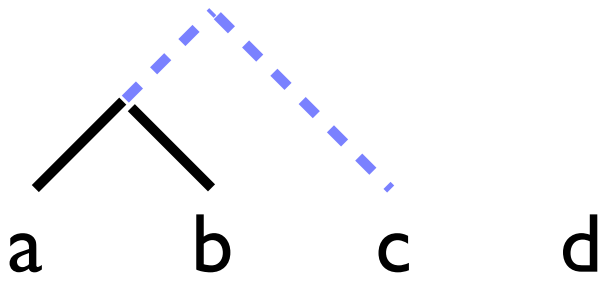

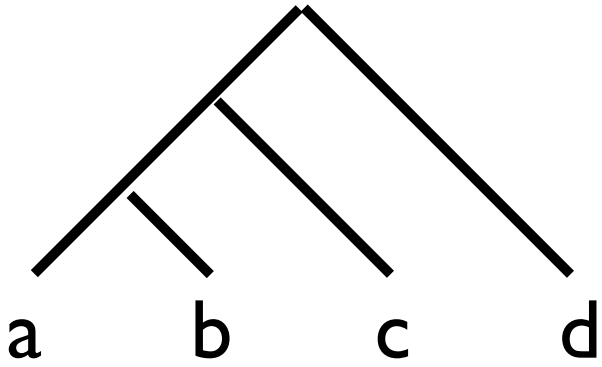

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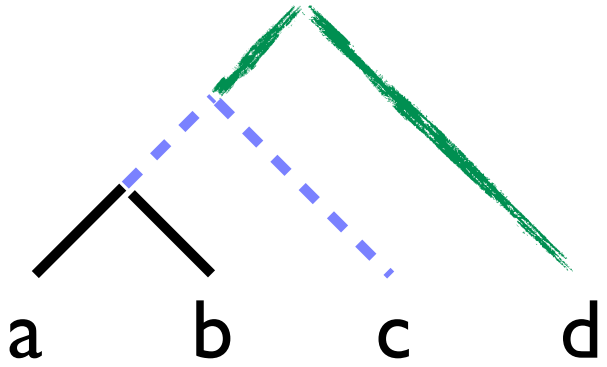
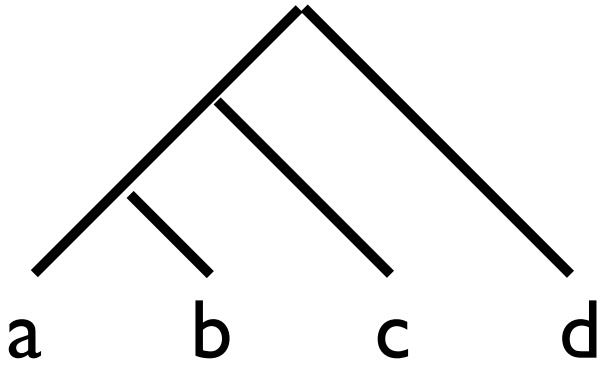
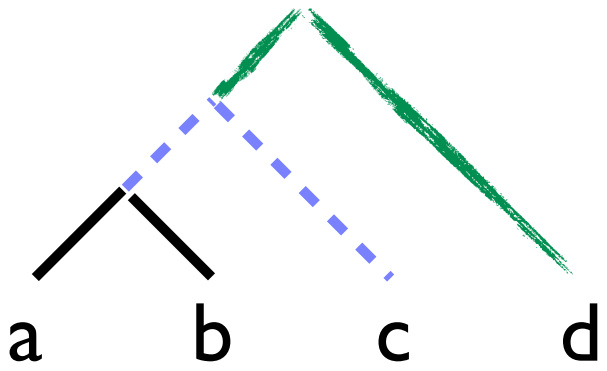




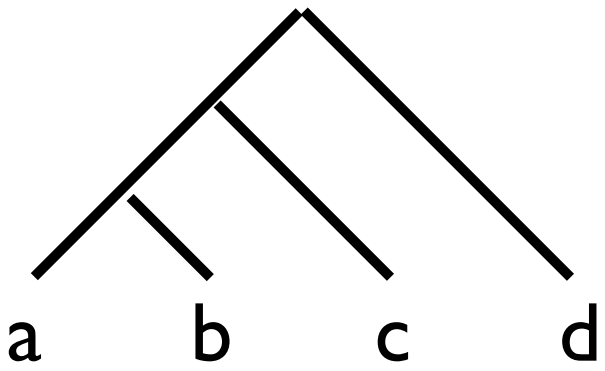
Grammatical?

increased likelihood of grammaticality →

many little fragments

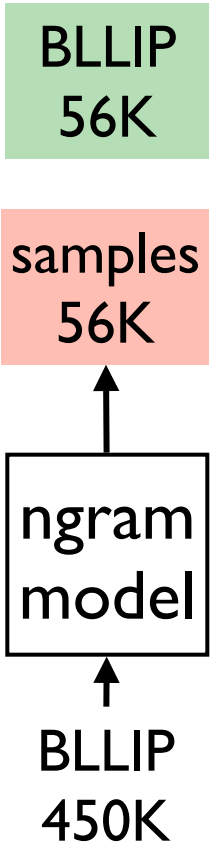


single large fragment



Experiments

Cherry & Quirk (2008)



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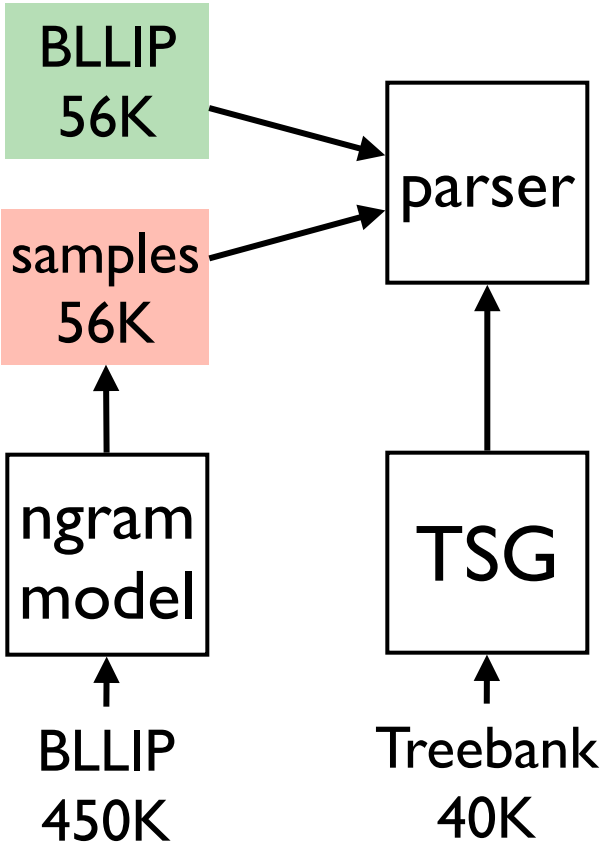

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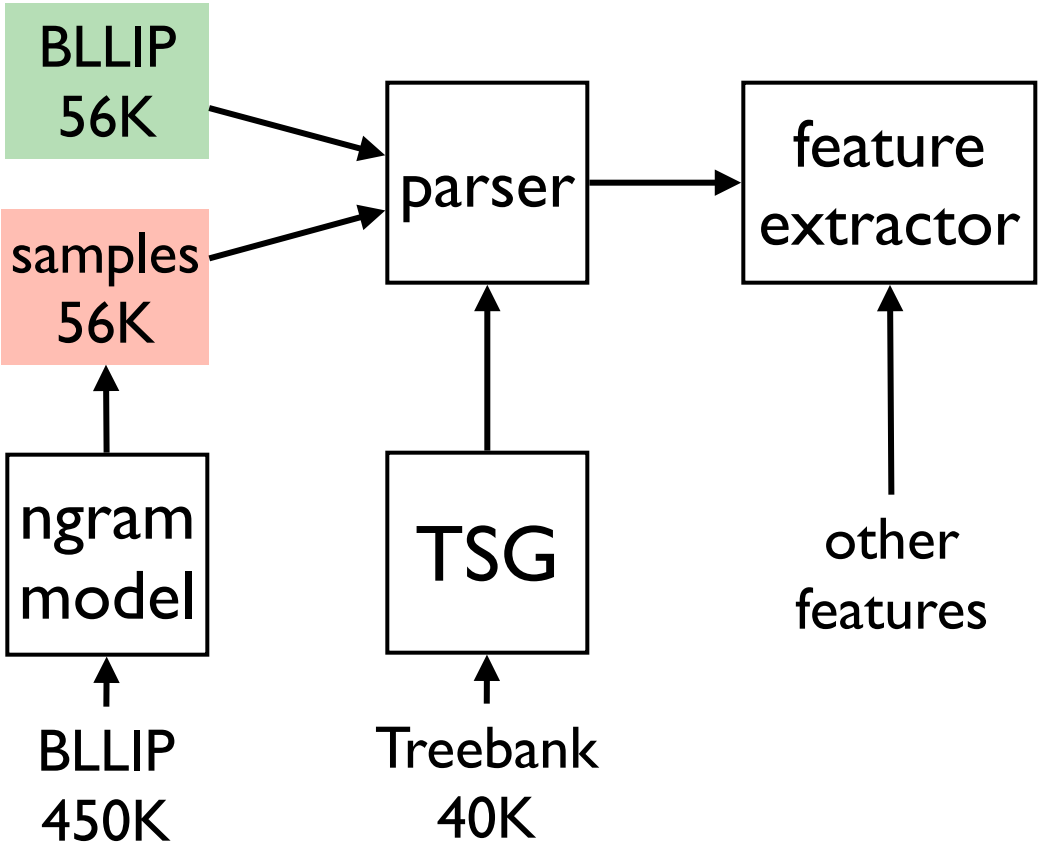

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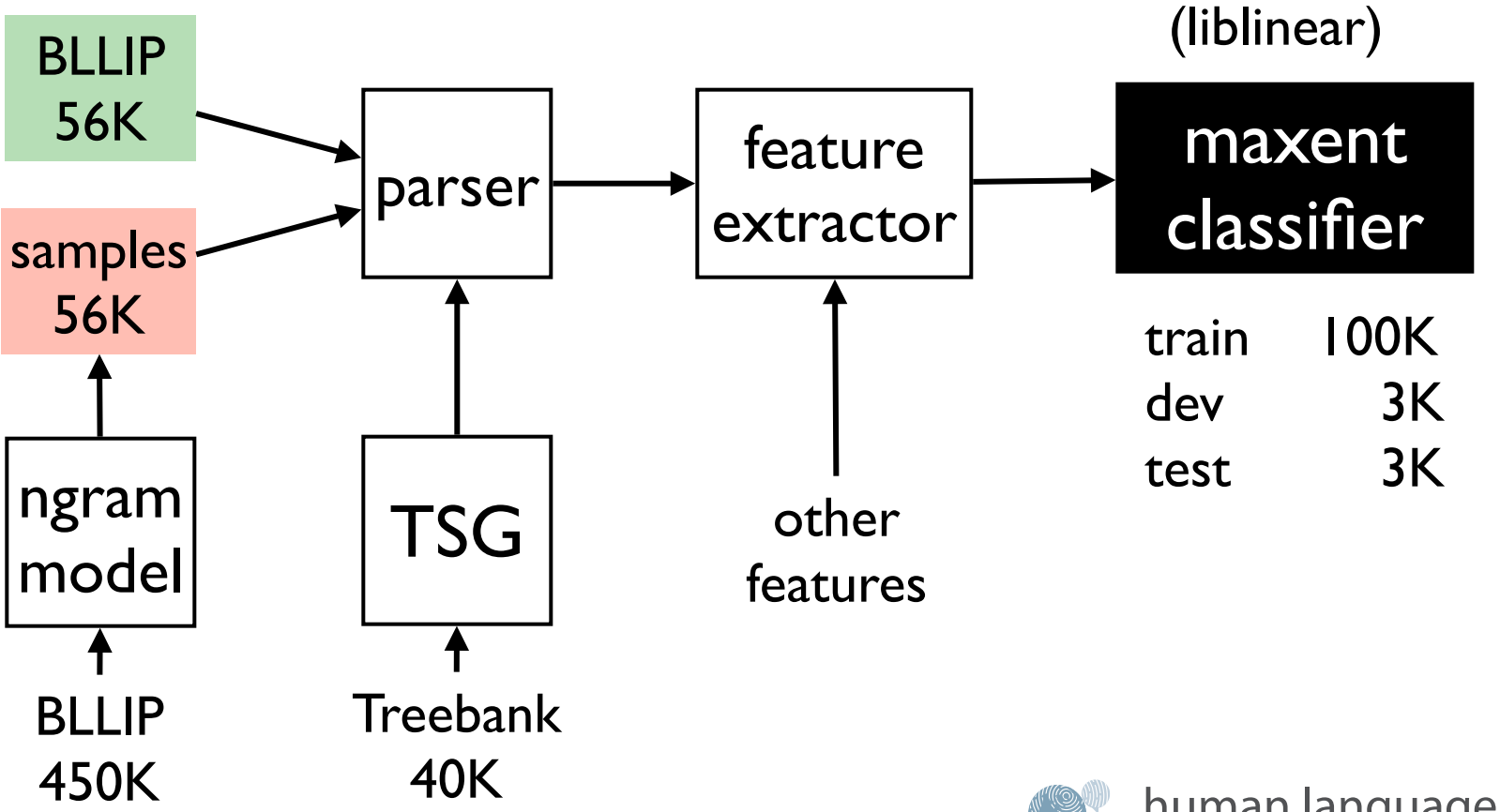

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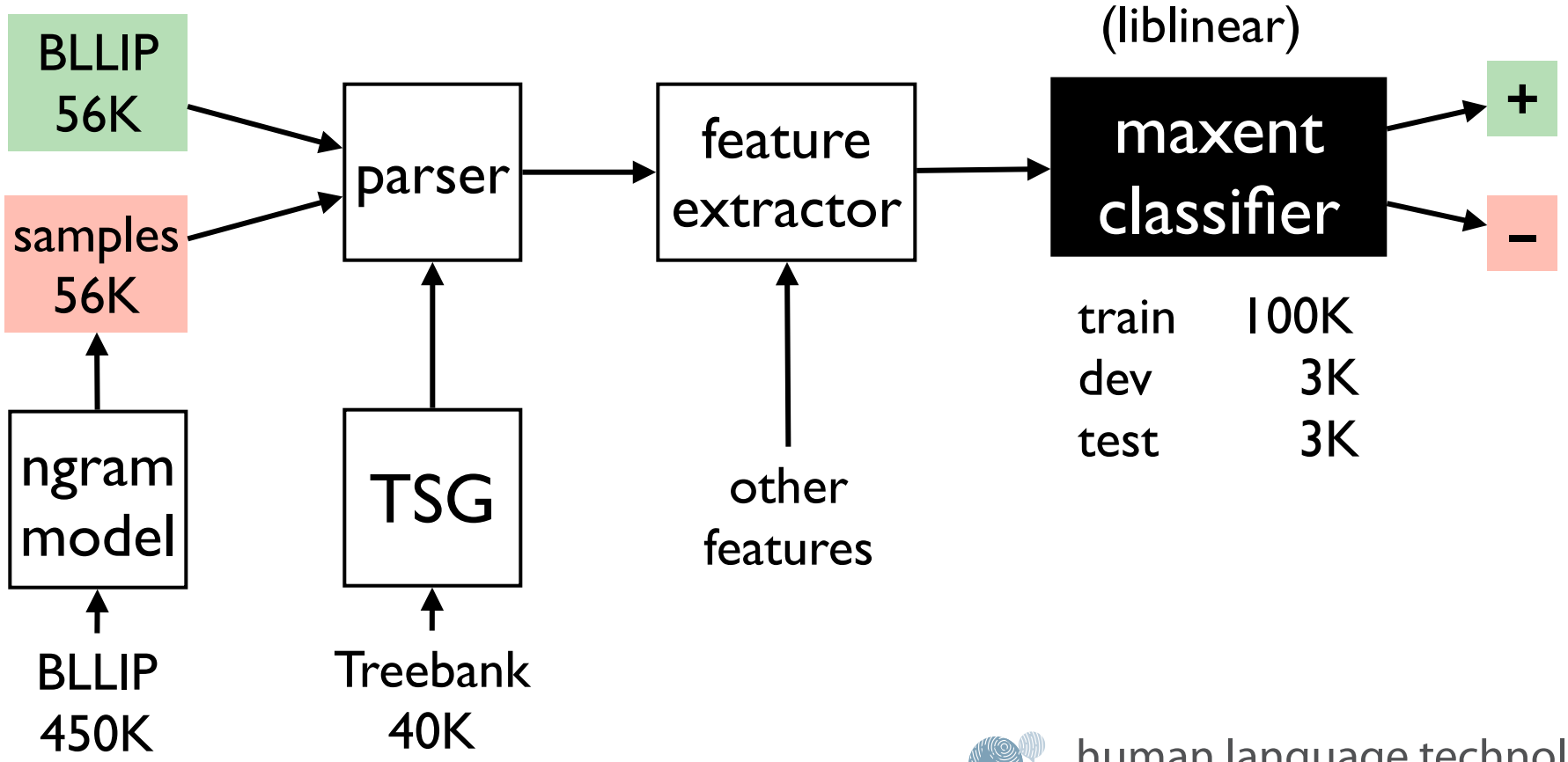

Feature sets

feature set	example
length	*l* 7

Feature sets

feature set	example
length	*17*
3-grams	*"he further praised"*

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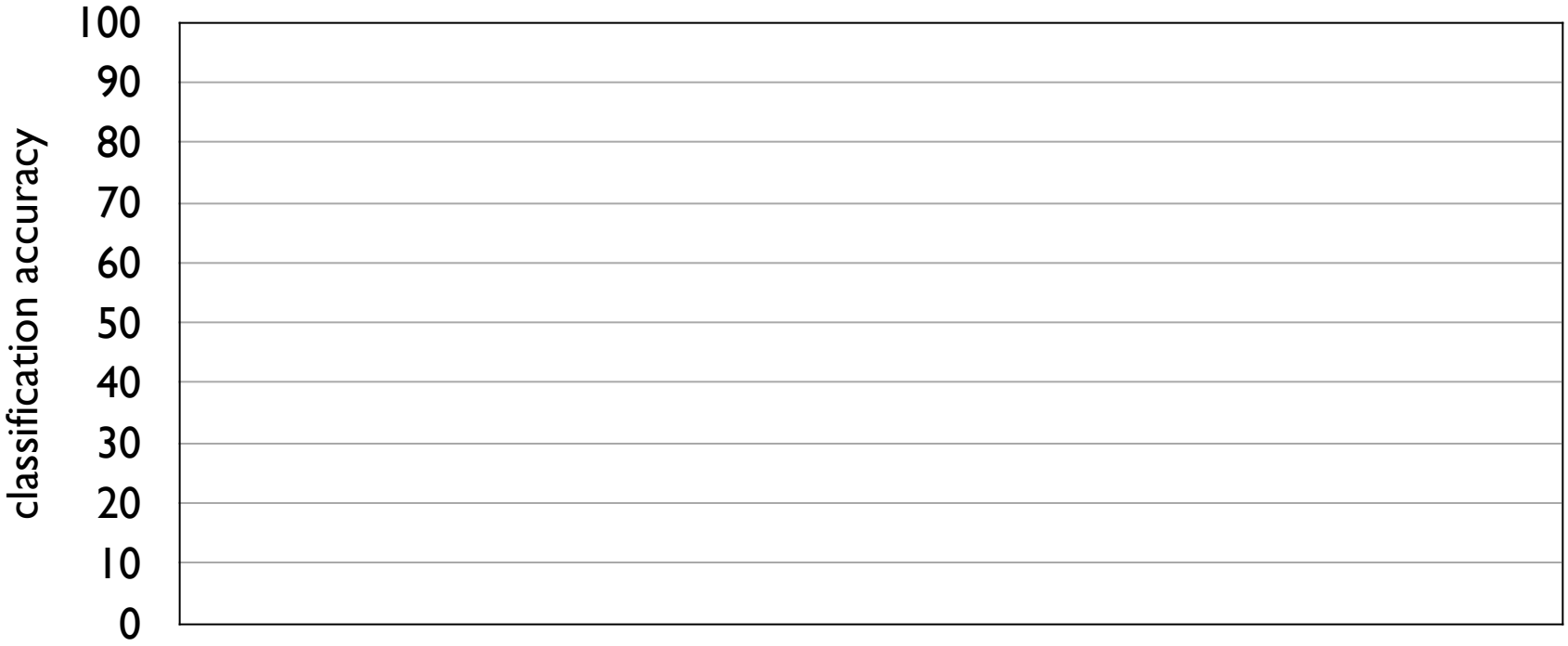
TSG fragments	(TOP (S NP (VP VBD said) NP SBAR) .)

Classification results



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Classification results

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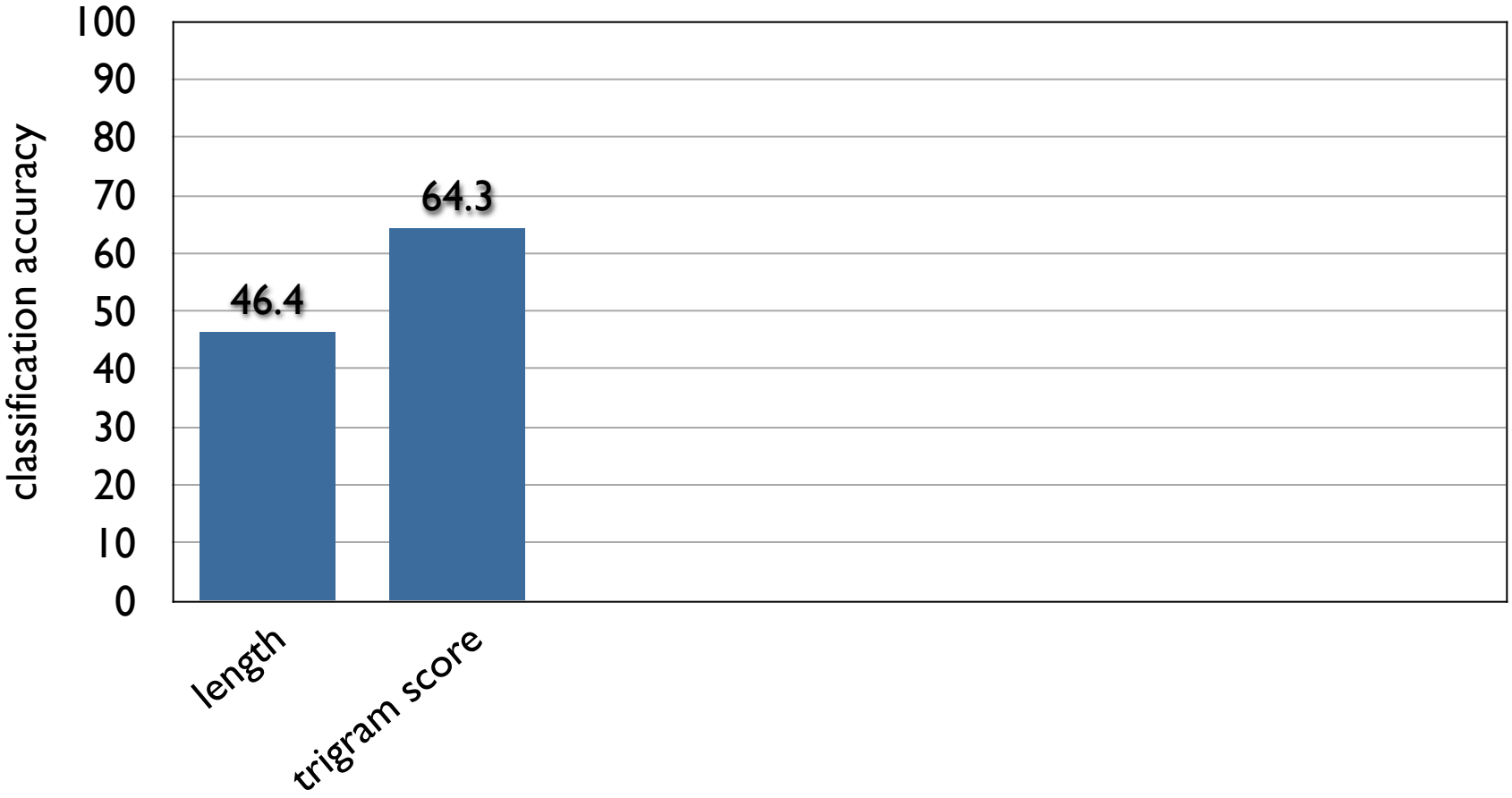

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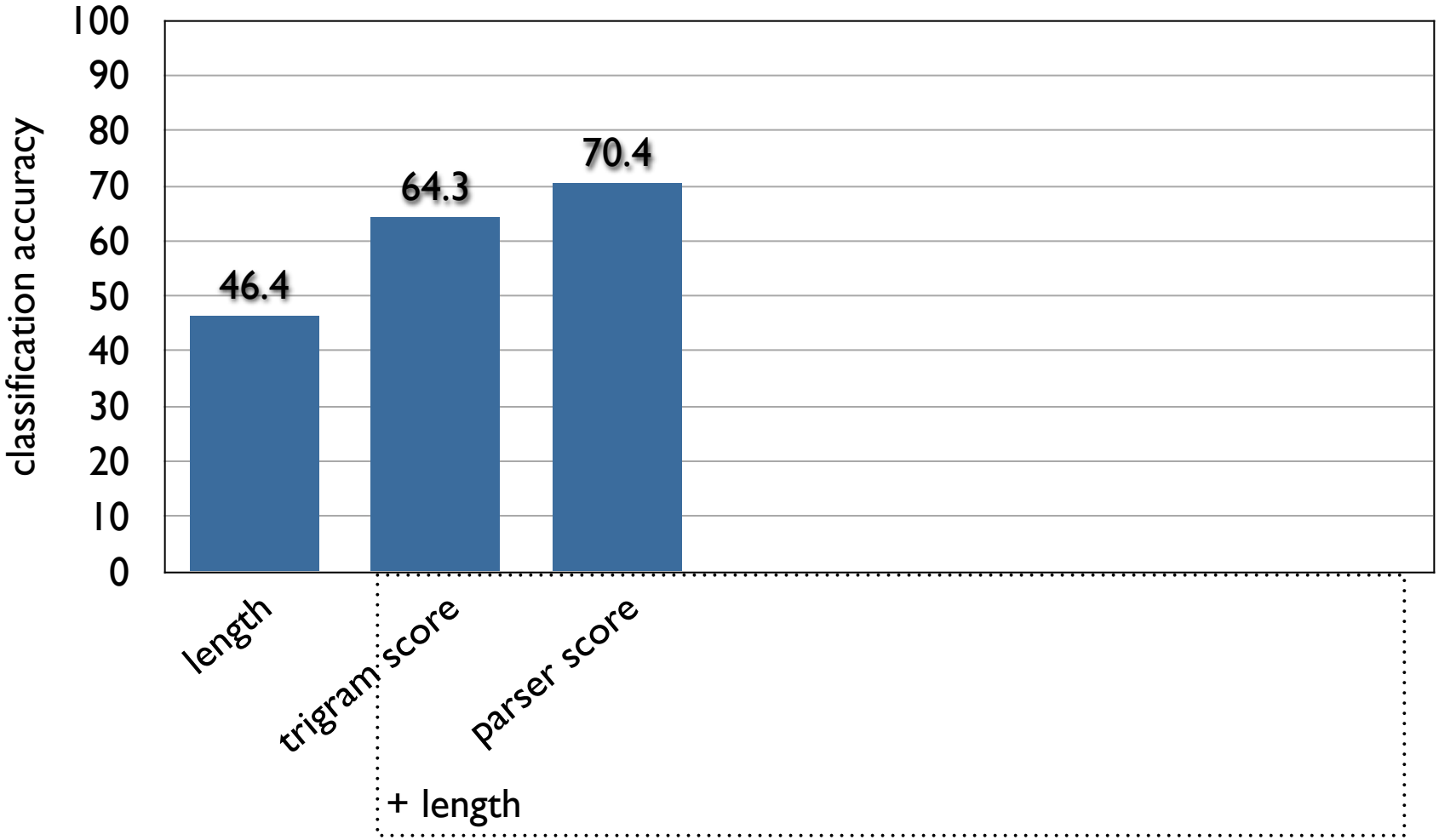

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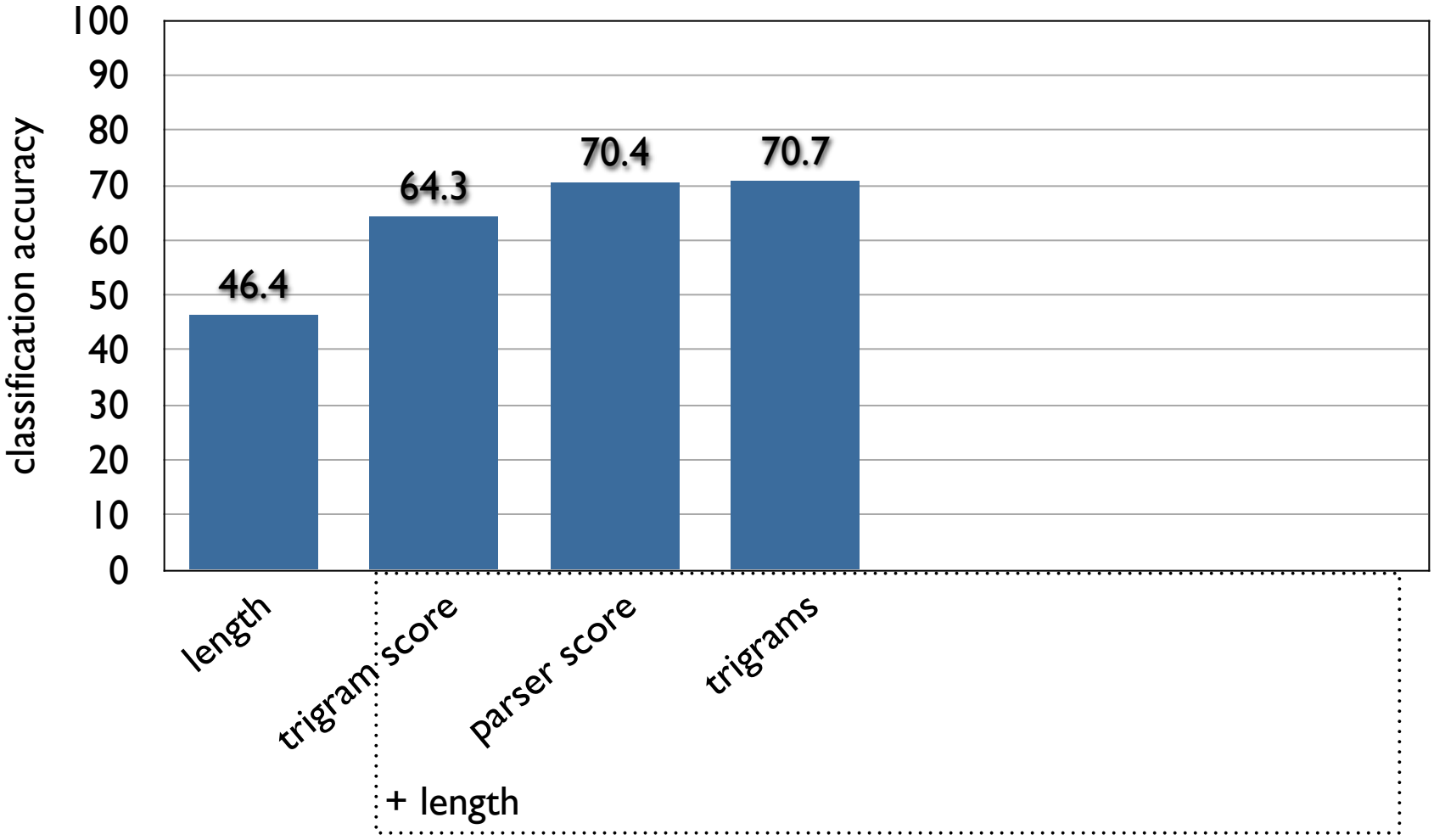

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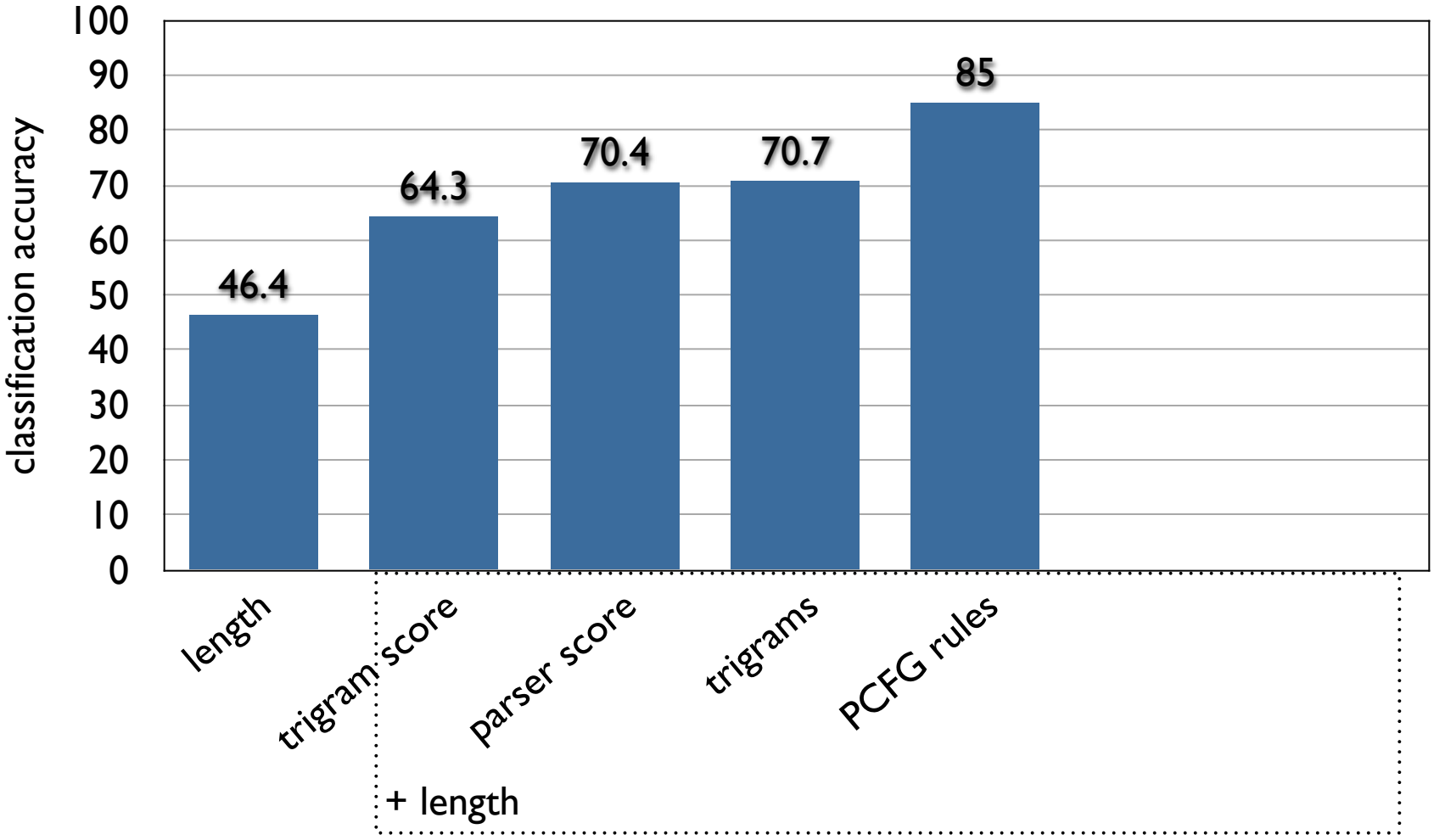

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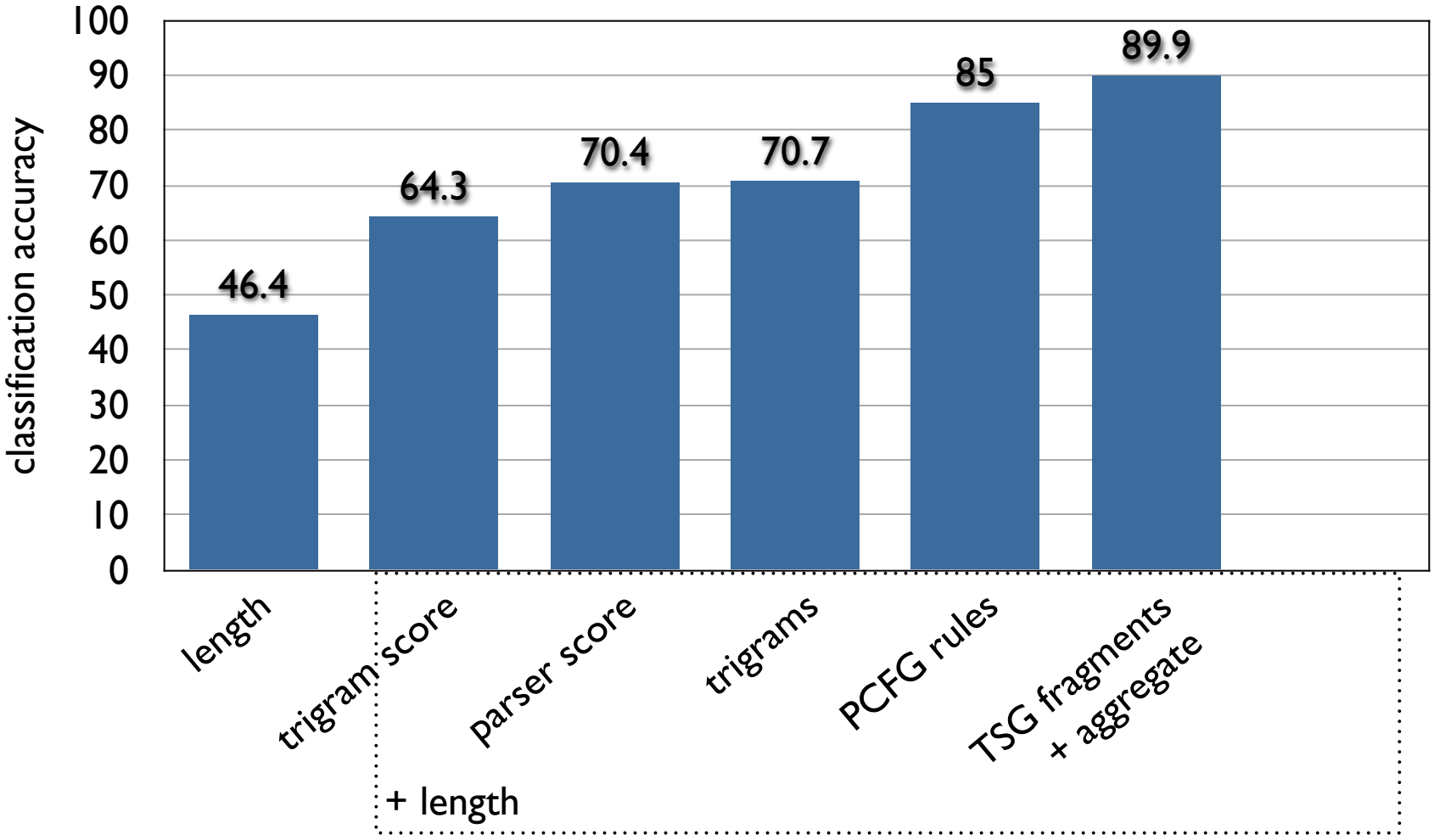

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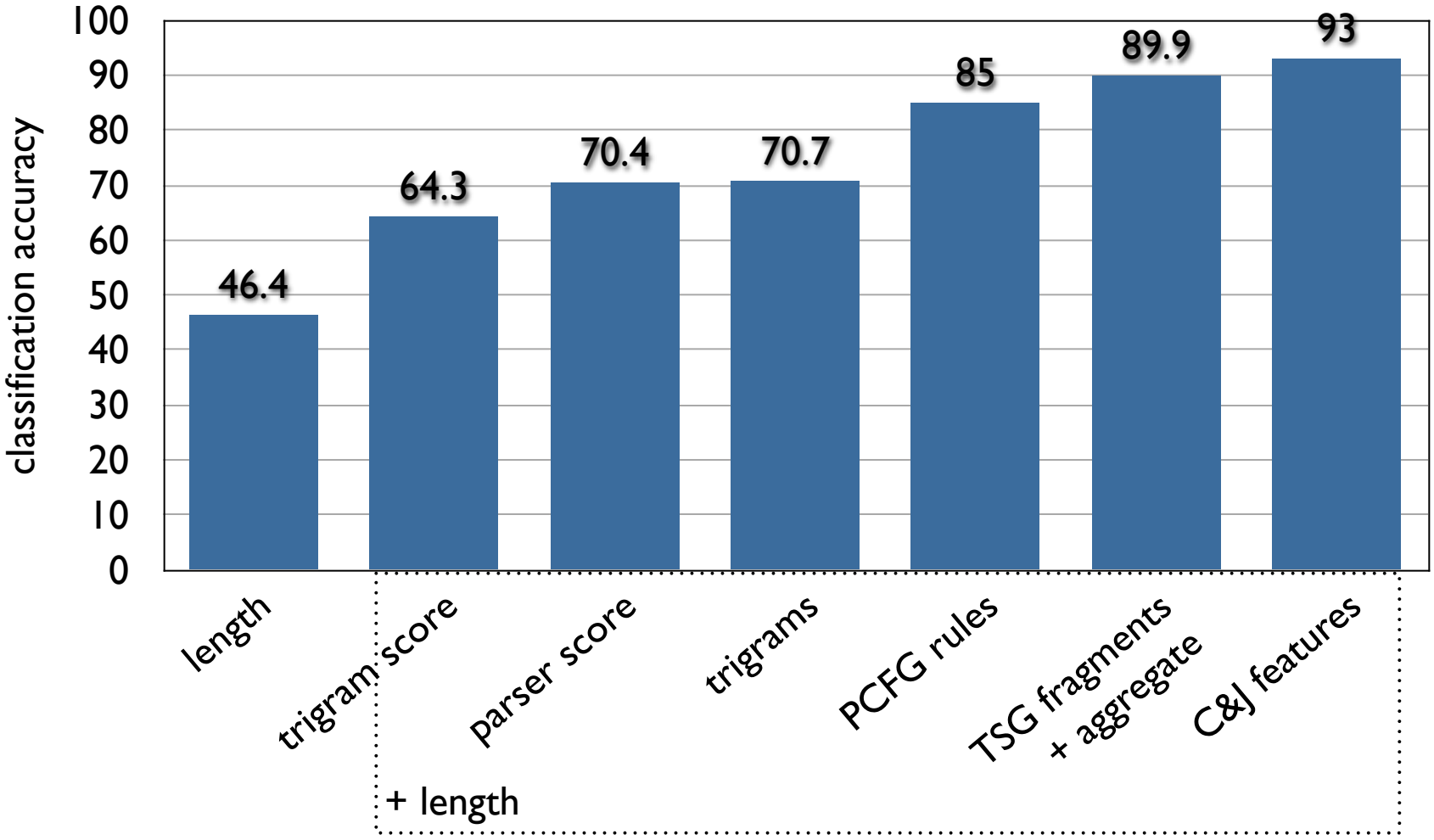

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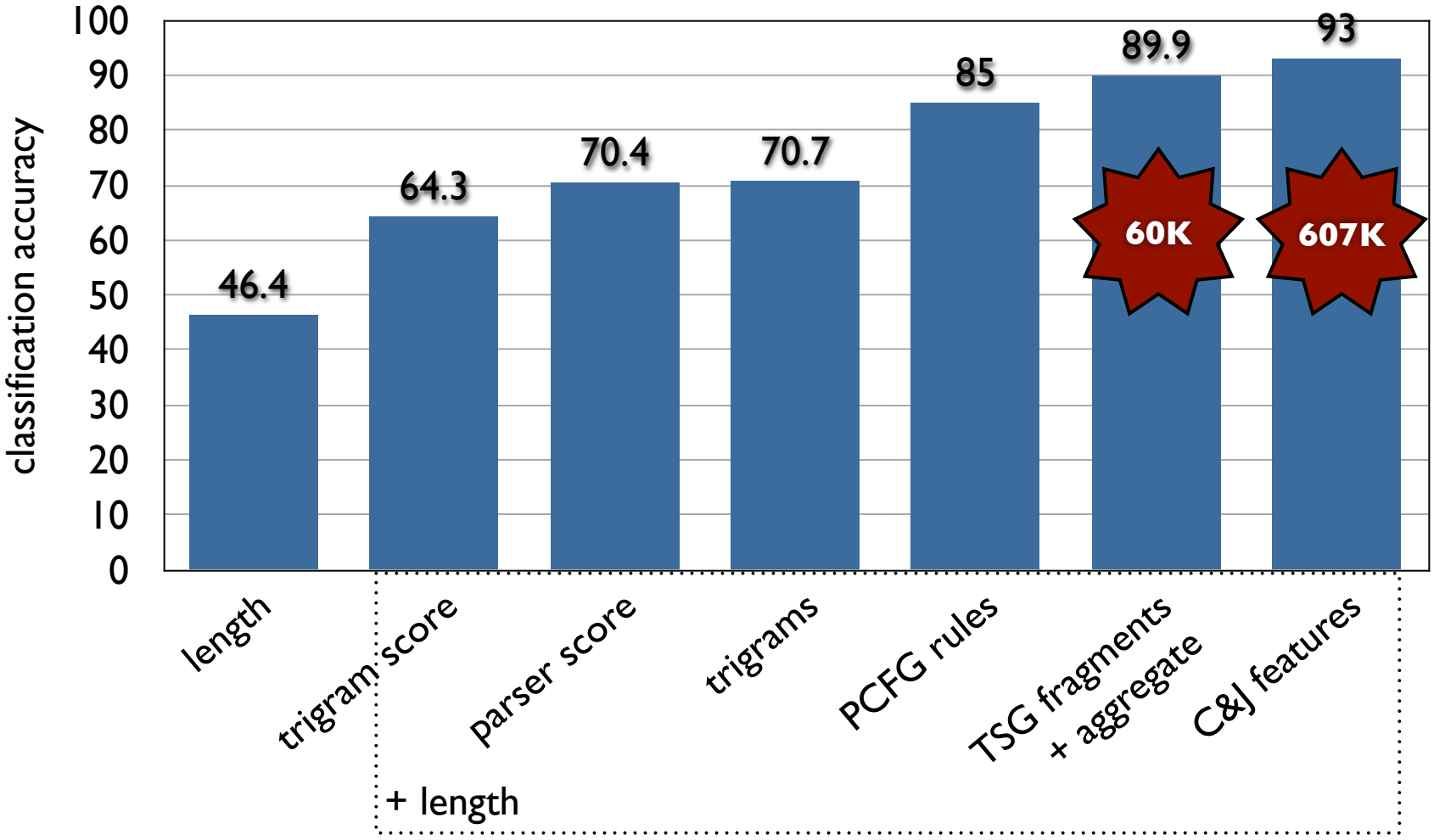
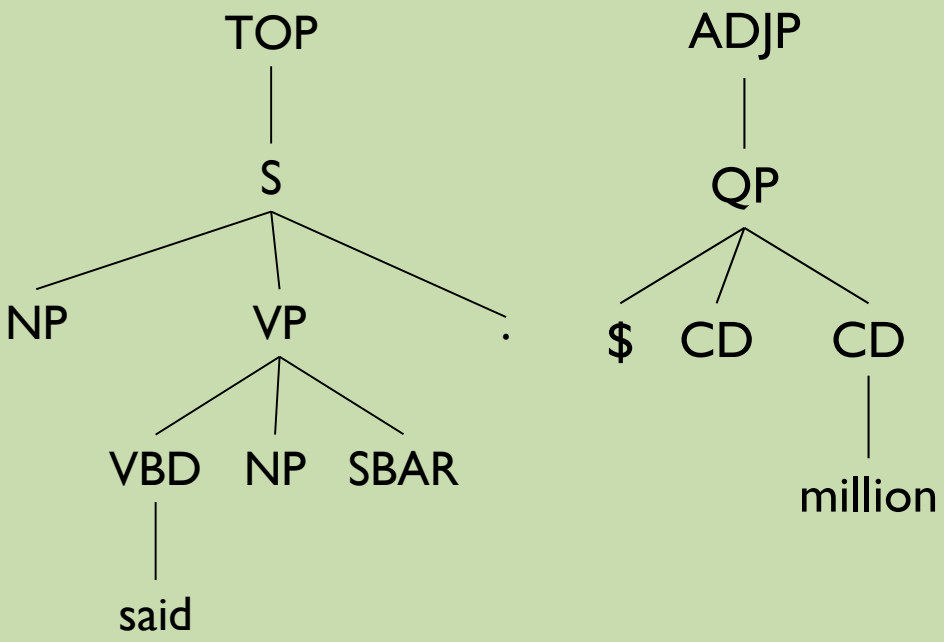
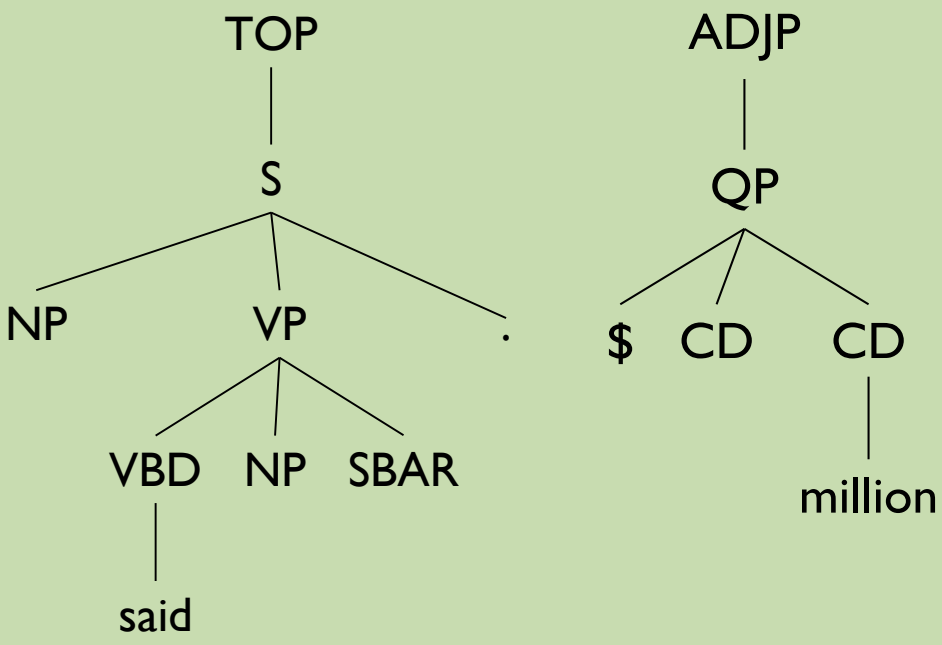


Features



- fragments with two words
- fragments with a rank of 8

Features



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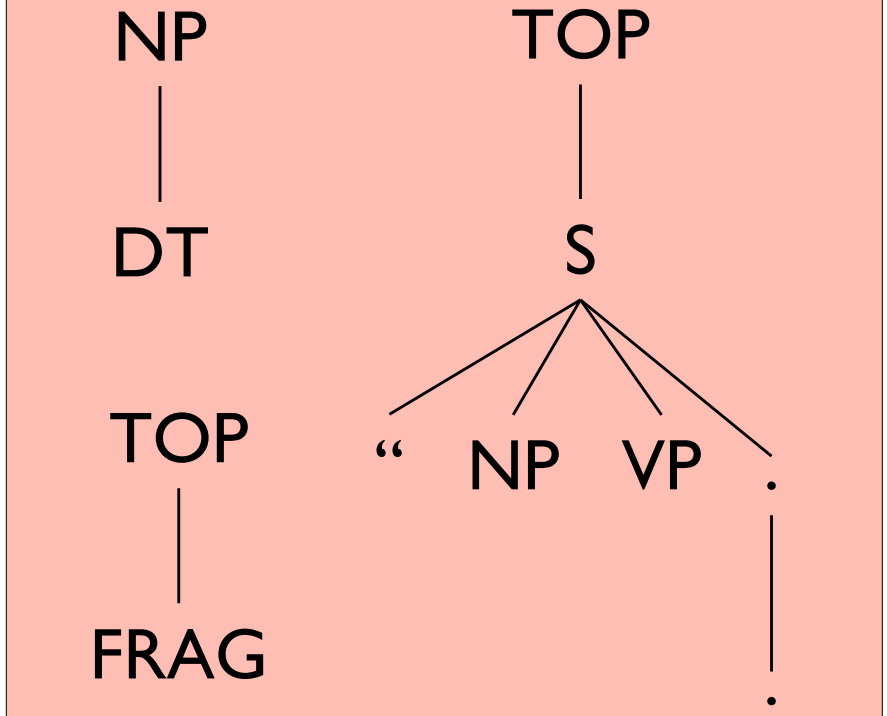


- unlexicalized fragments

Conclusions

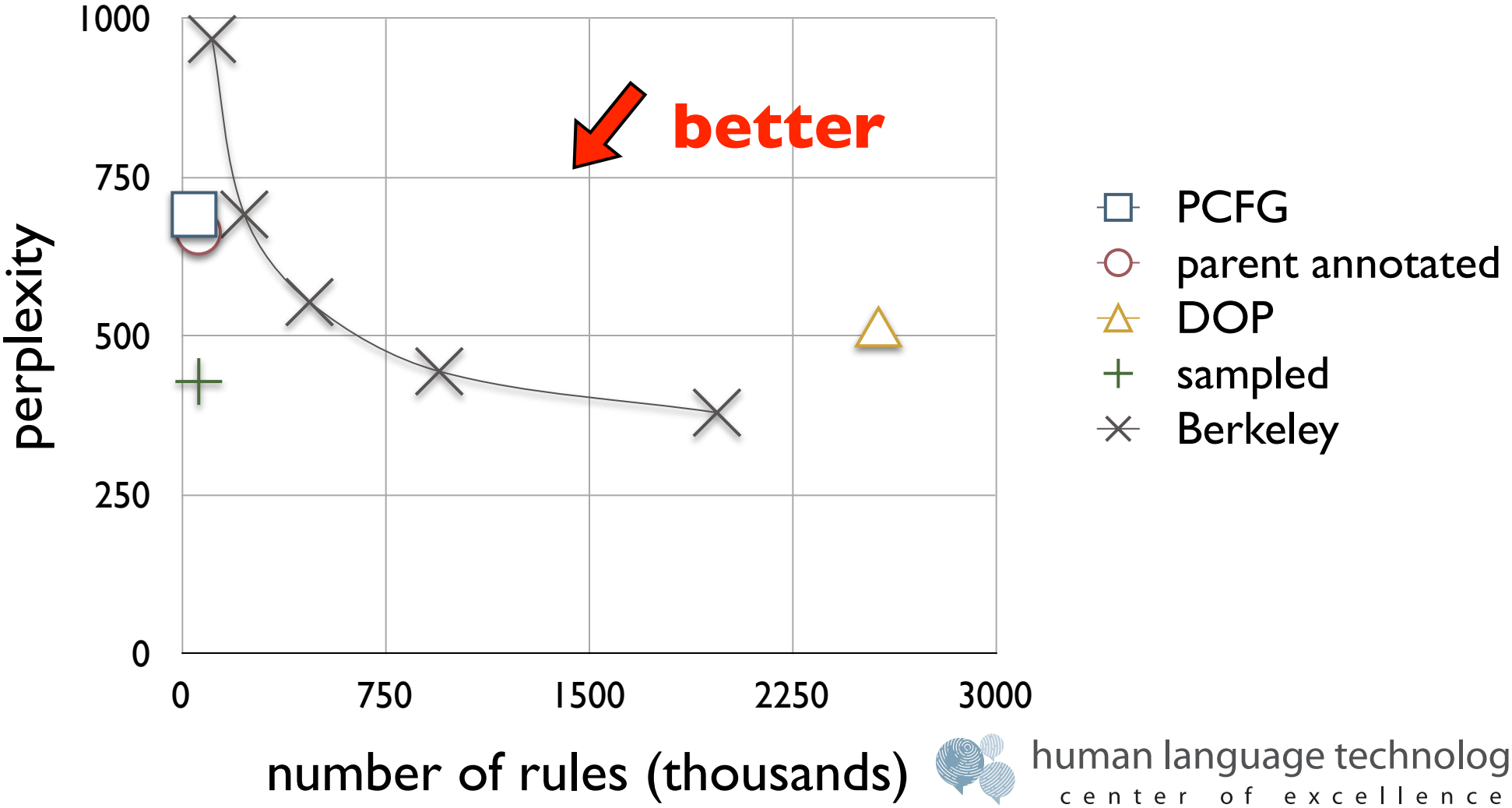
- TSGs performed well despite relatively poor parsing accuracy
- Shallow rules + coarse nonterminals => license for ungrammaticality
- Well below C&J features, but 1/10 the size, automatically discovered, and are a biproduct of the derivation

Future work

- Further baselines (implicit DOP representations, heuristic TSGs)
- Other discriminative tasks
  - more realistic negatives (Wagner et al., 2009; Tetreault et al., 2010)
  - MT classification and reranking
- Base measure changes

Thanks

Latent-variable TSGs



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