ud2rrg: Transforming Universal Dependencies into RRG Trees

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TreeGraSP Meeting #4

Outline

Introduction

The basic algorithm

Clause linkage

RRGbank results

ud2rrg for RRGparbank

RRGparbank results

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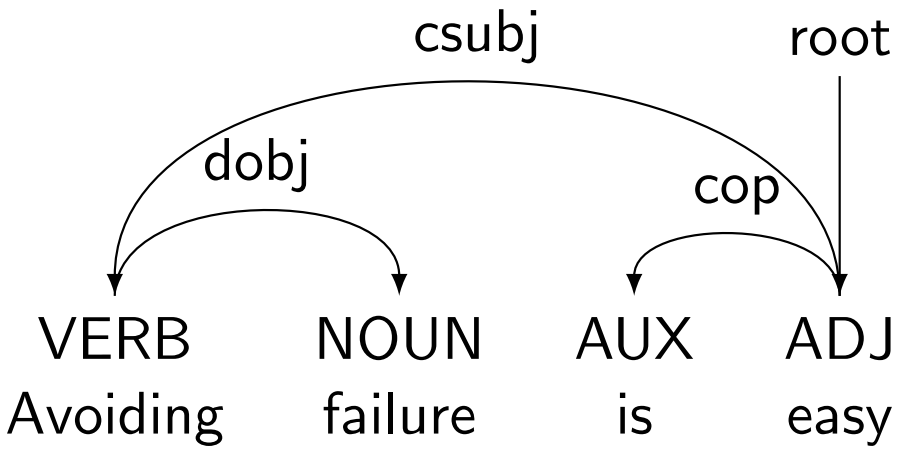
What are Universal Dependencies?

- framework for consistent annotation of parts of speech, syntactic dependencies across languages
- treebanks for 70+ languages

"Manning's law"

1. UD needs to be satisfactory on linguistic analysis grounds for individual languages.
2. UD needs to be good for linguistic typology, i.e., providing a suitable basis for bringing out cross-linguistic parallelism across languages and language families.
3. UD must be suitable for rapid, consistent annotation by a human annotator.
4. UD must be suitable for computer parsing with high accuracy.
5. UD must be easily comprehended and used by a non-linguist, whether a language learner or an engineer with prosaic needs for language processing. We refer to this as seeking a habitable design, and it leads us to favor traditional grammar notions and terminology.
6. UD must support well downstream language understanding tasks (relation extraction, reading comprehension, machine translation, ...).

UD: example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Why convert UD to RRG?

- a single algorithm for a large number of languages, treebanks
- similar in philosophy to RRG
- minimal theoretical assumptions, good starting point

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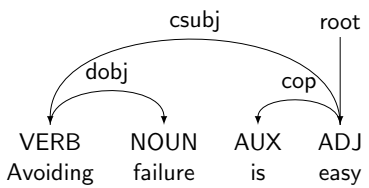
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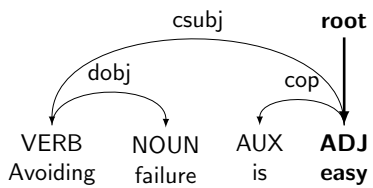
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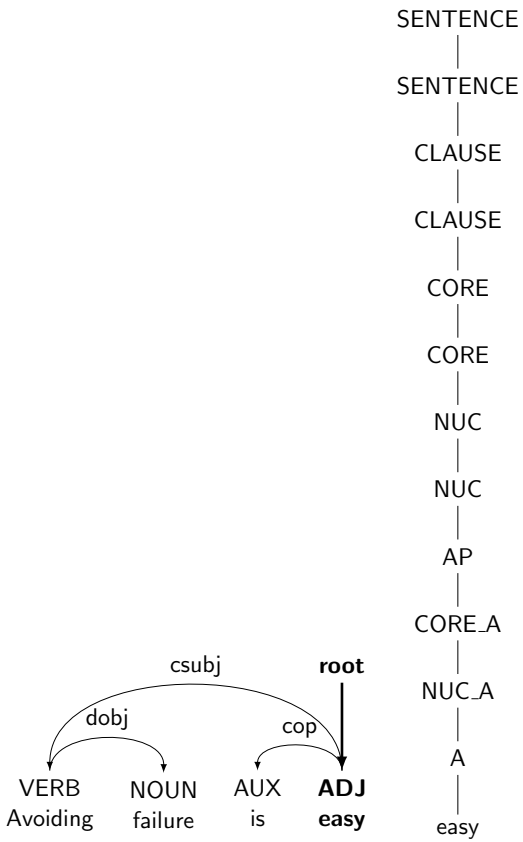
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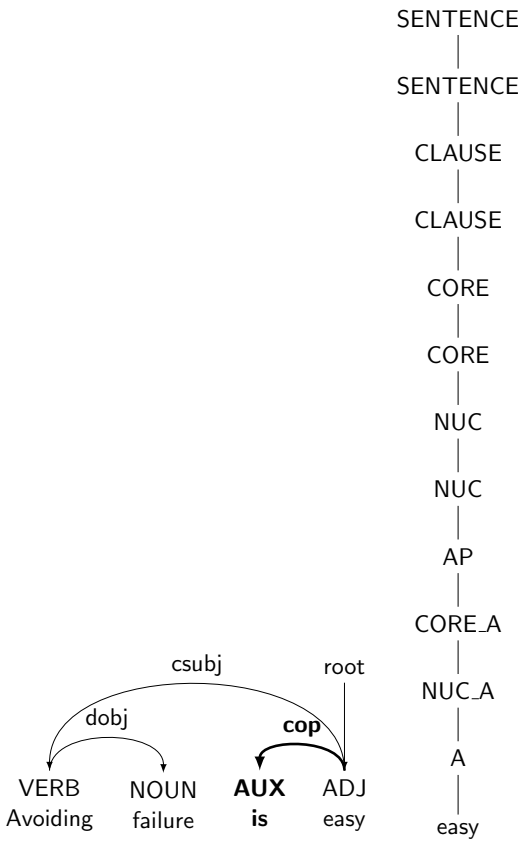
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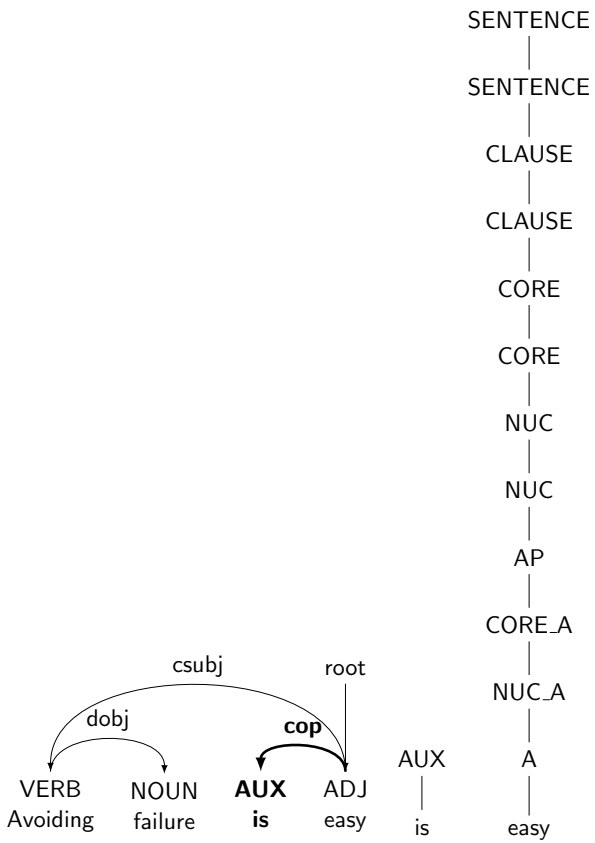
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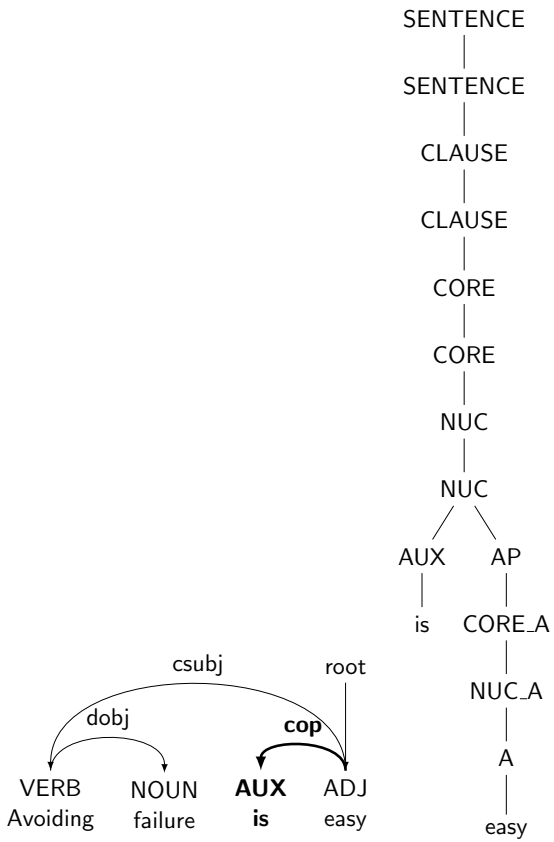
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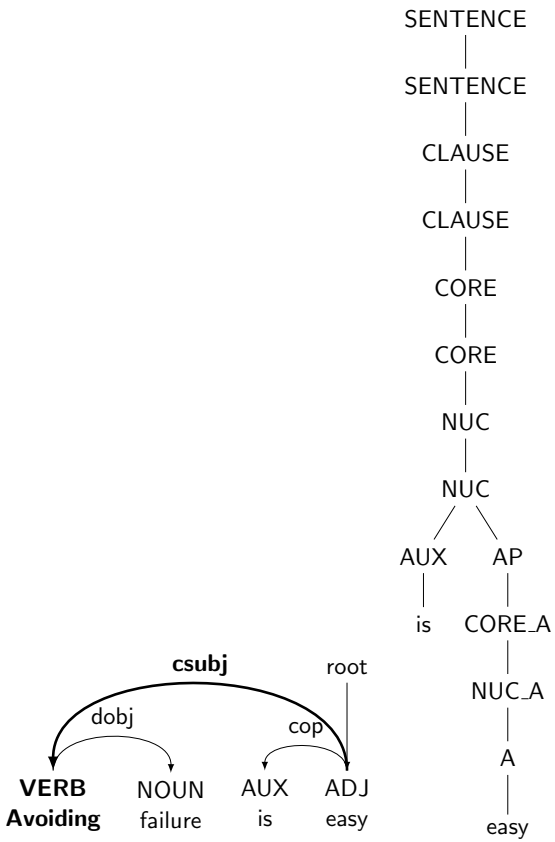
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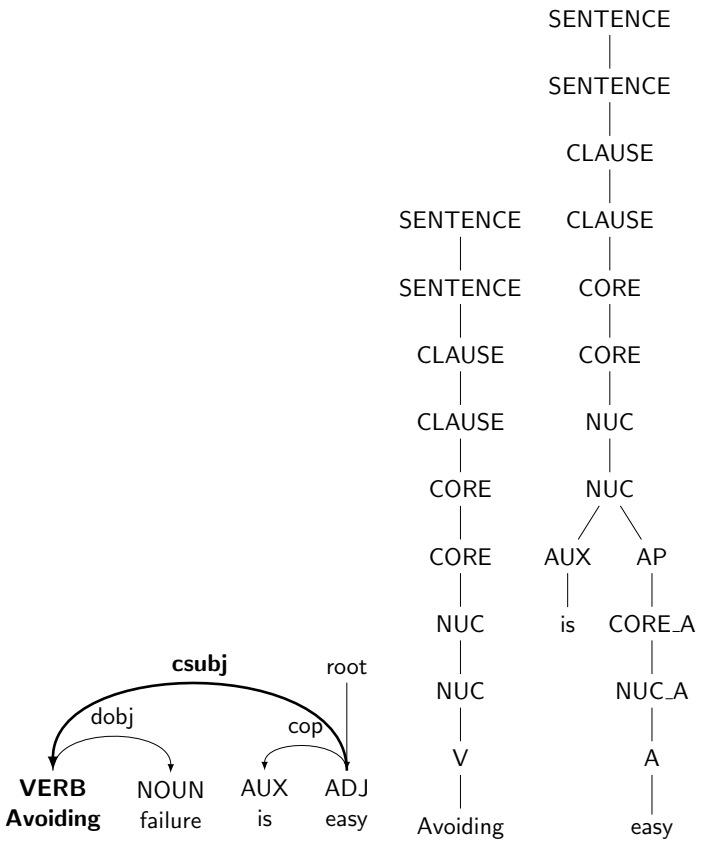
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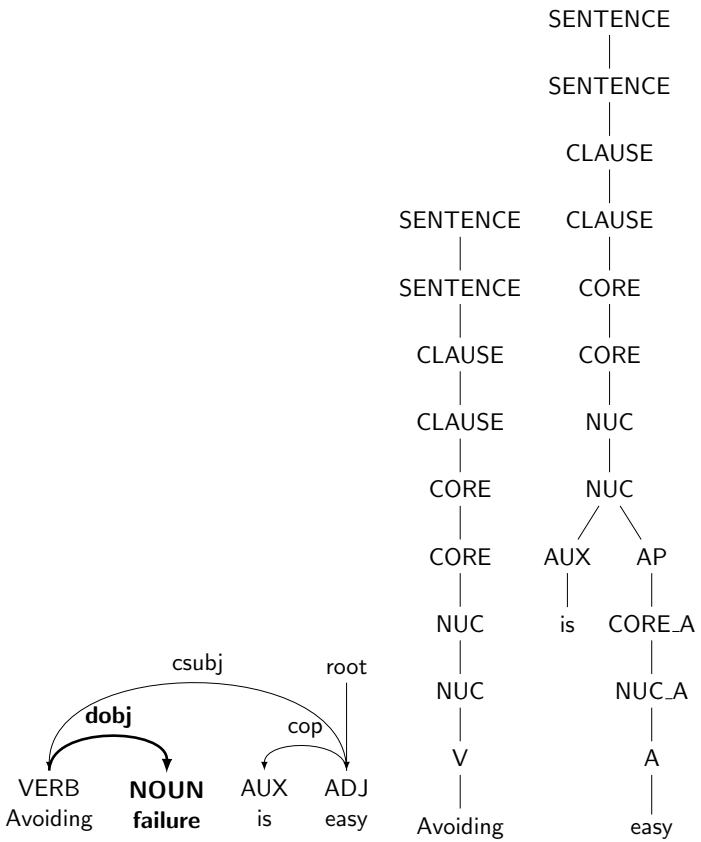
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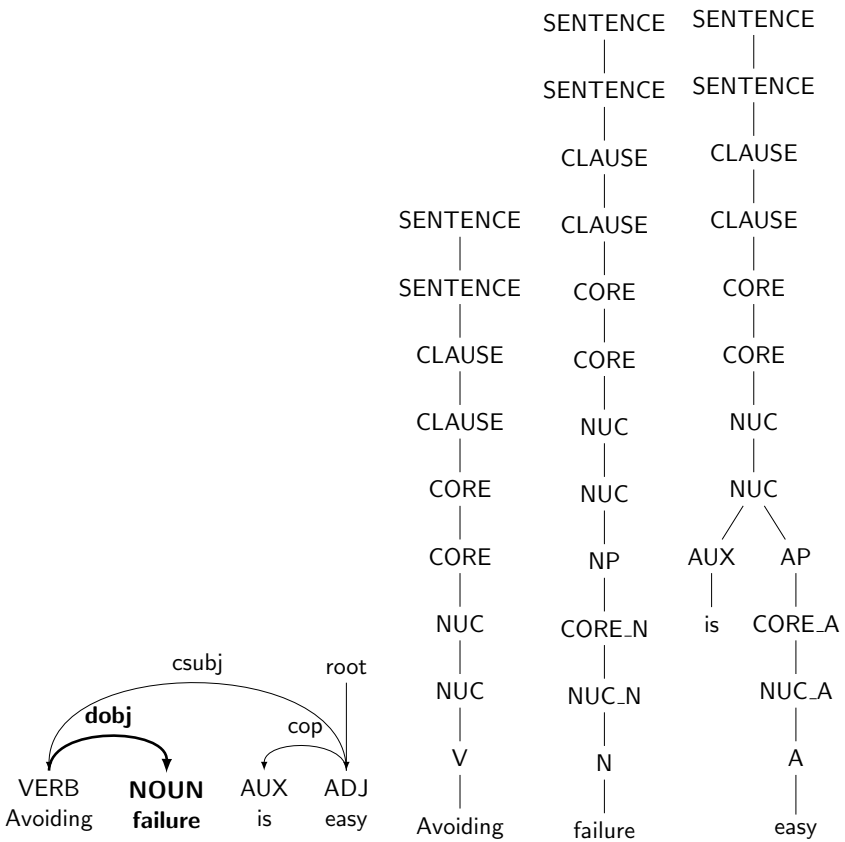
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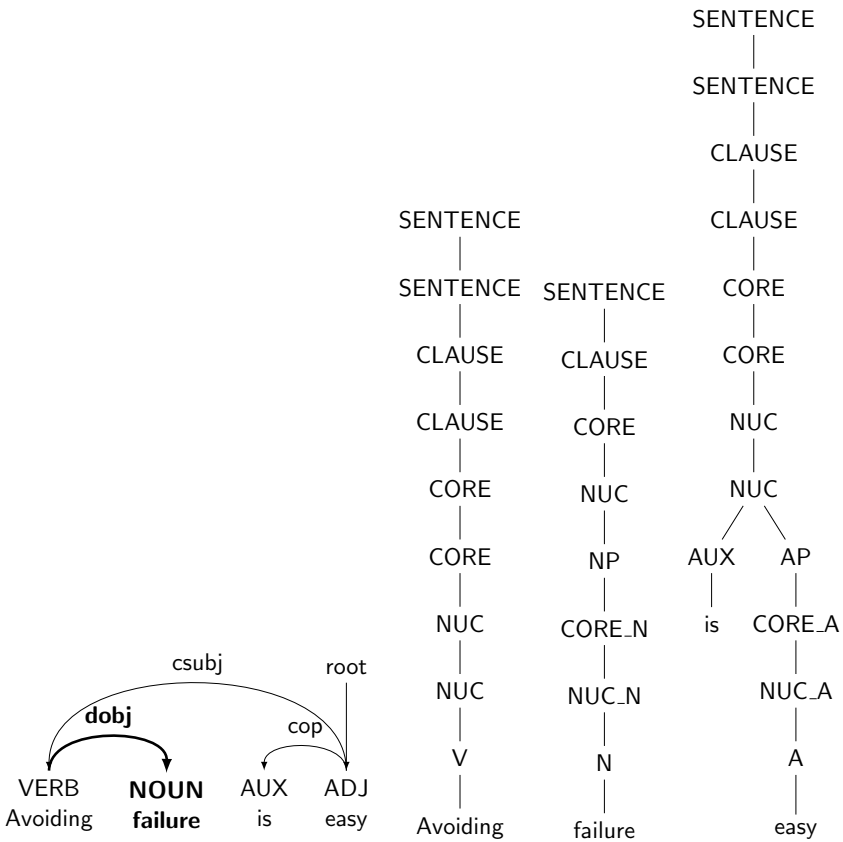
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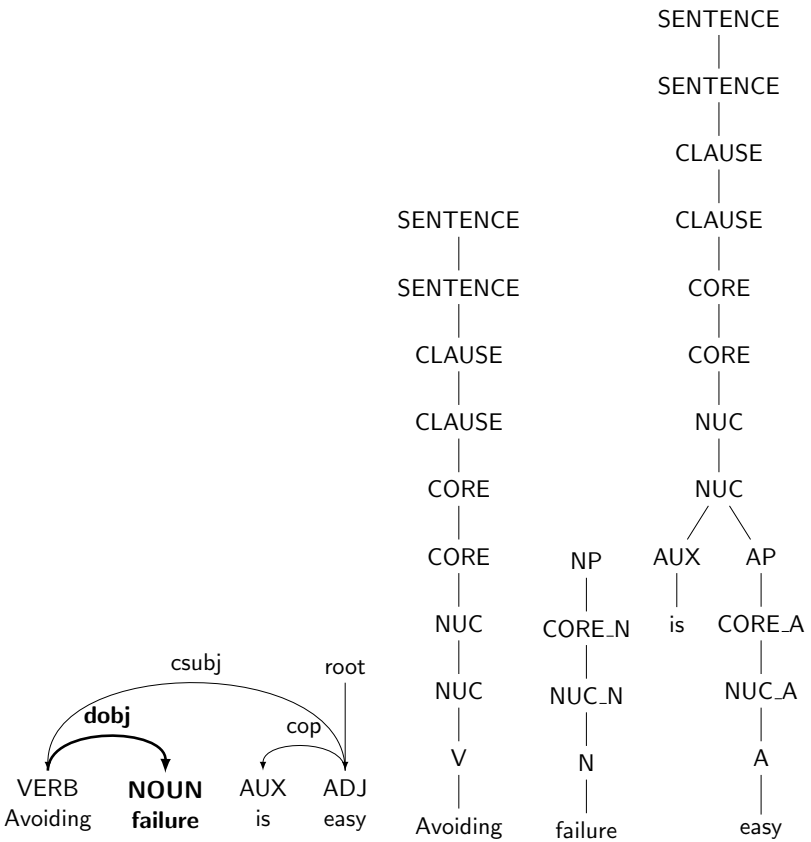
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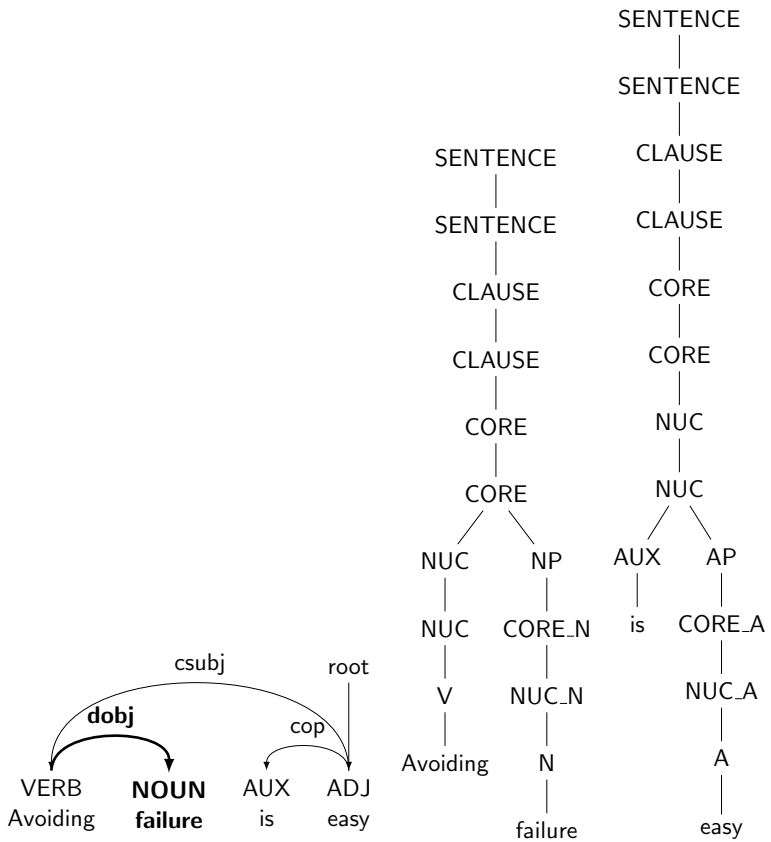
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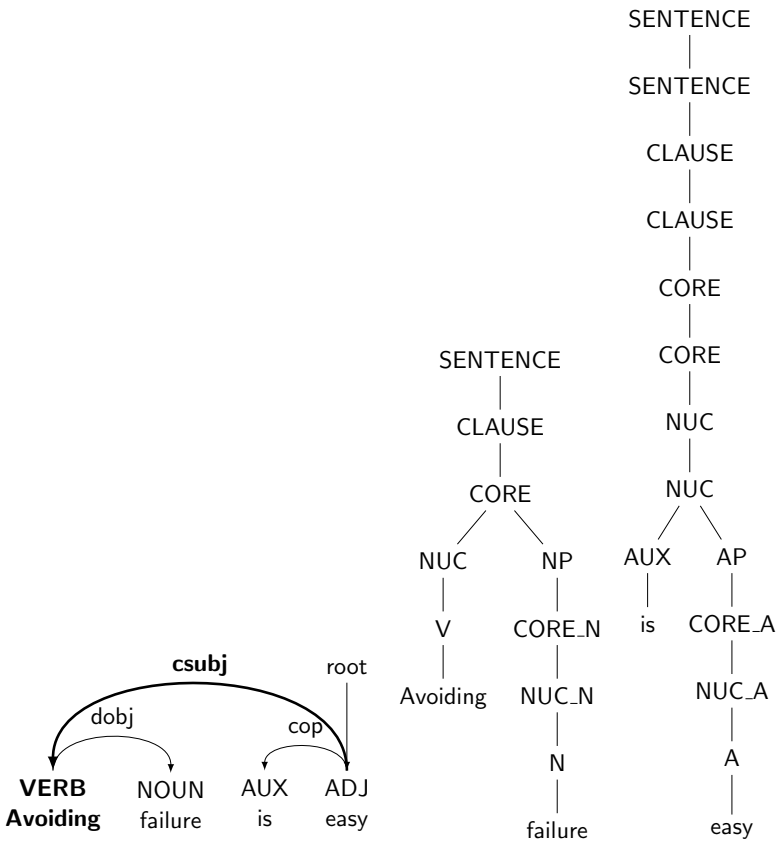
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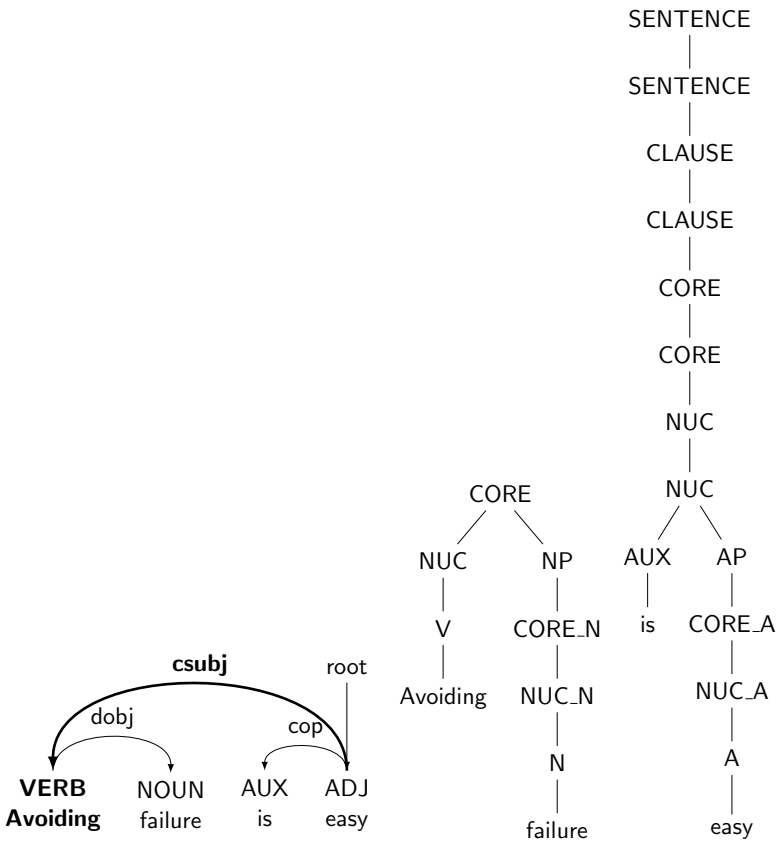
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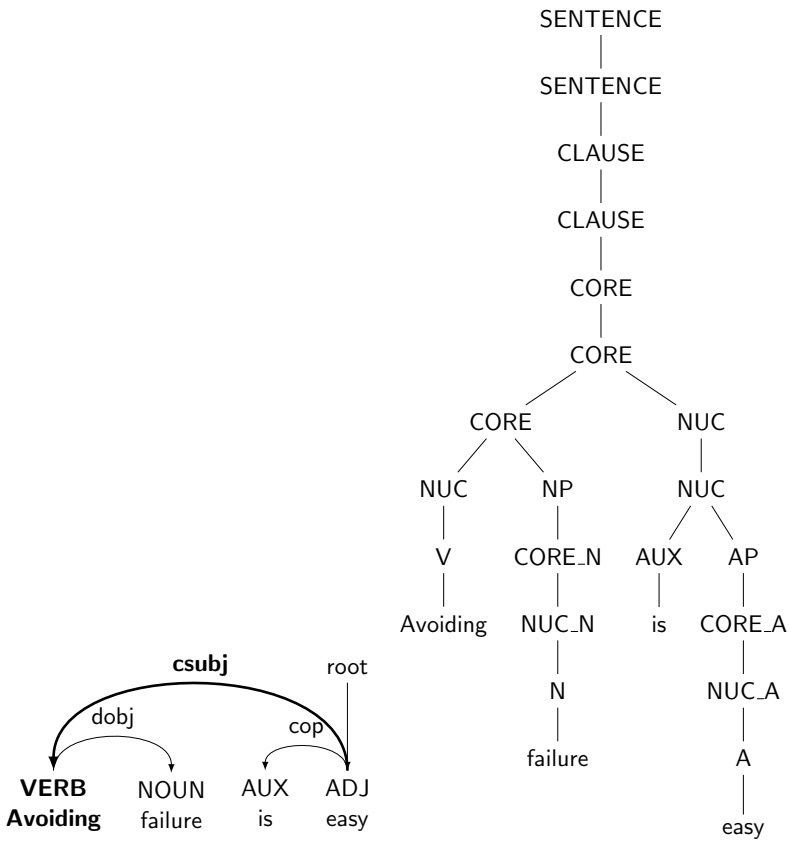
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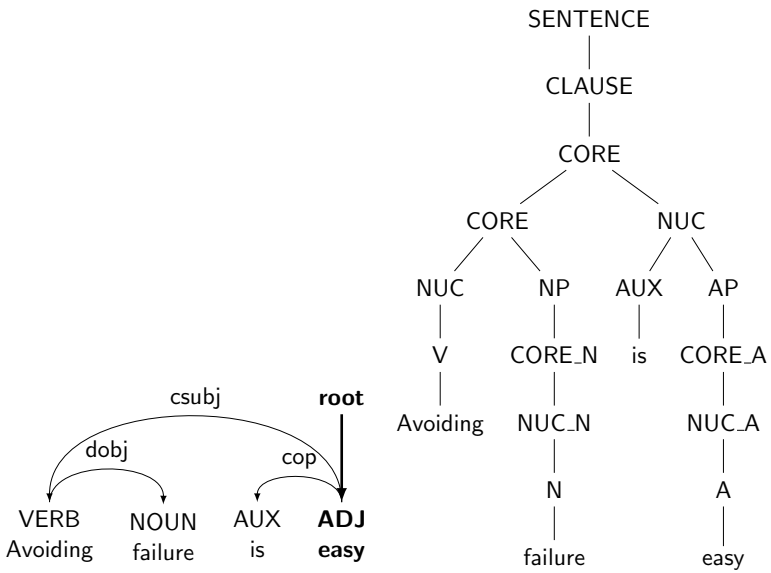
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The basic algorithm: overview

To convert a UD (sub)tree to RRG,

1. based on part of speech and lemma of root, choose an RRG *fragment*
2. for each child,
   - 2.1 convert it recursively,
   - 2.2 based on dependency relation, link the result into the current tree:
     - for `csubj`, `nsubj`, `dobj`, ...: simple attachment (trim to appropriate layer and attach at appropriate node),
     - for `xcomp`, `ccomp`, ...: clause linkage ({clause,core,nuclear} {cosubordination,subordination}),
3. conflate redundant nodes.

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Clause linkage rules so far

- for `xcomp` dependencies:
  - phase verb (*begin*, *keep*, *stop*...) heading participle → nuclear cosubordination
  - otherwise → core cosubordination
- for `ccomp` dependencies:
  - discourse verb (*say*, *think*, *wonder*...) → clause subordination
  - otherwise → core subordination
- implemented for English by Naima Grebe using VerbNet

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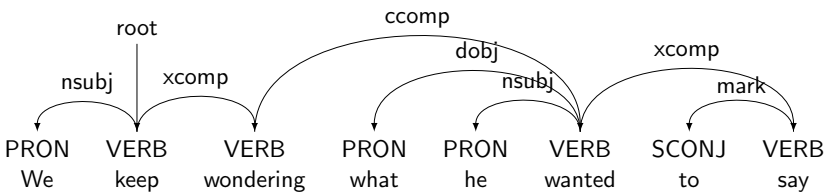
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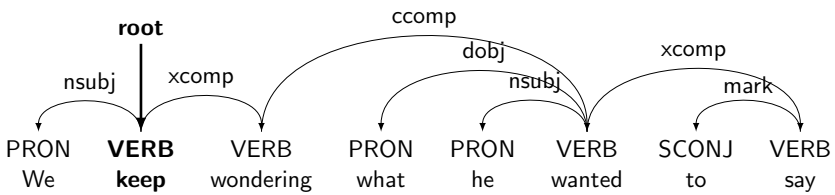
Example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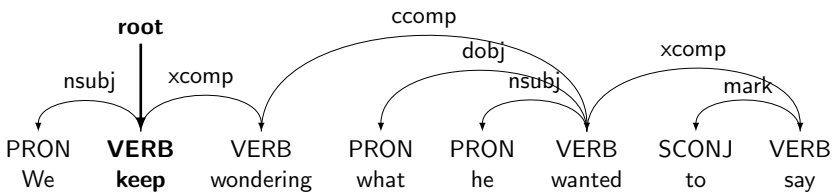
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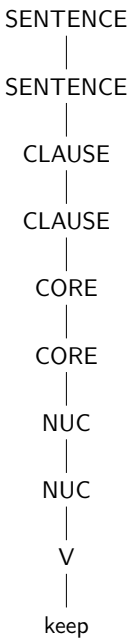
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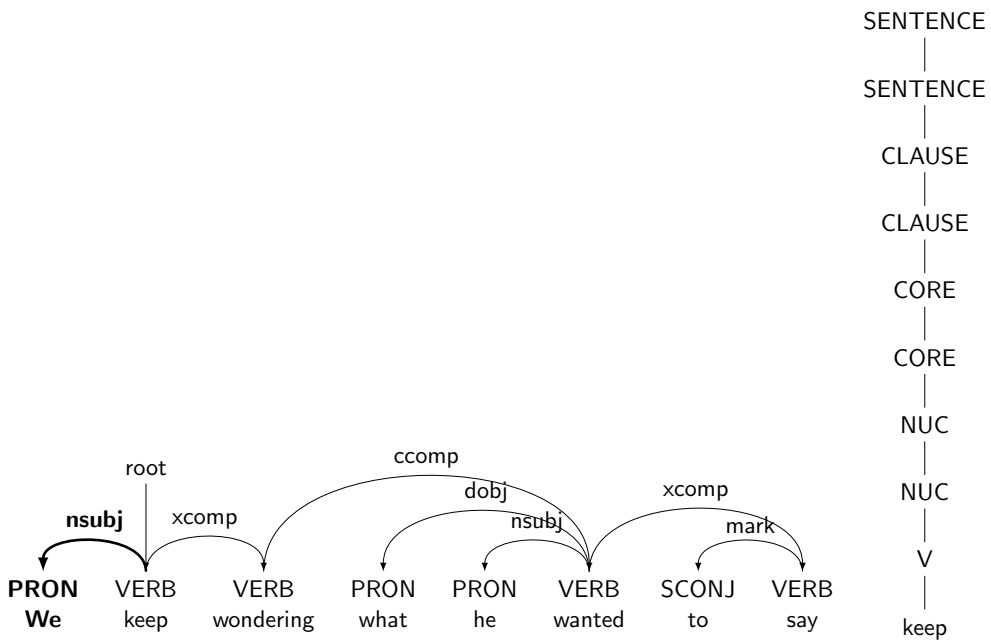
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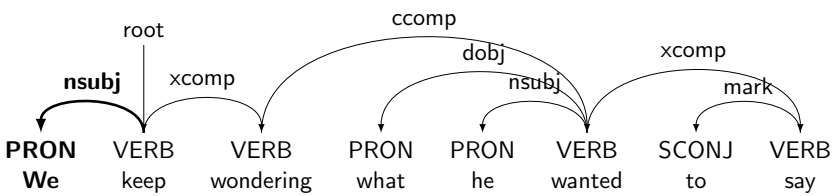
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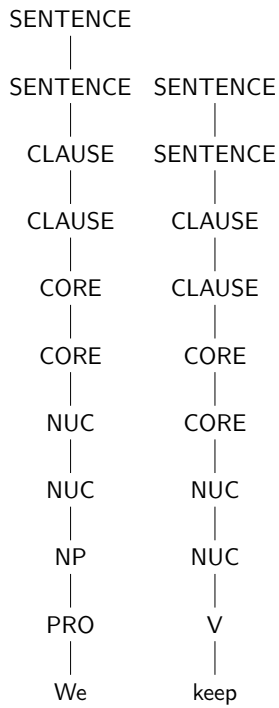
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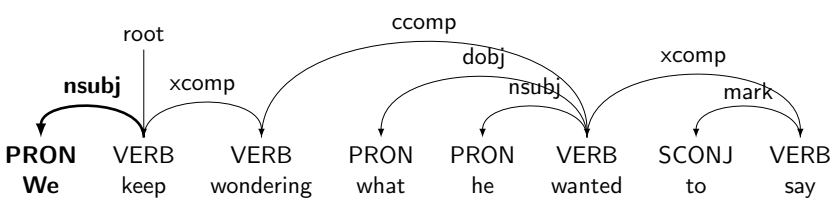
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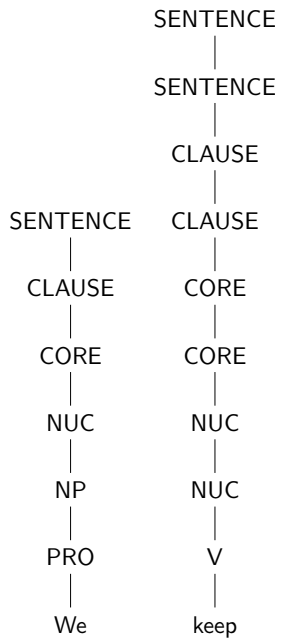
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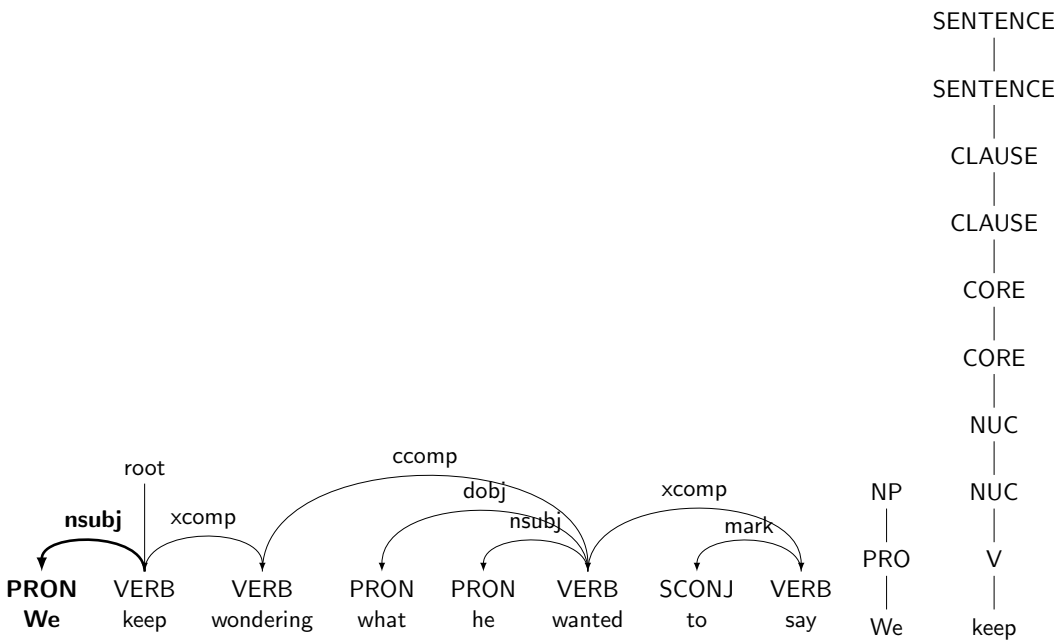
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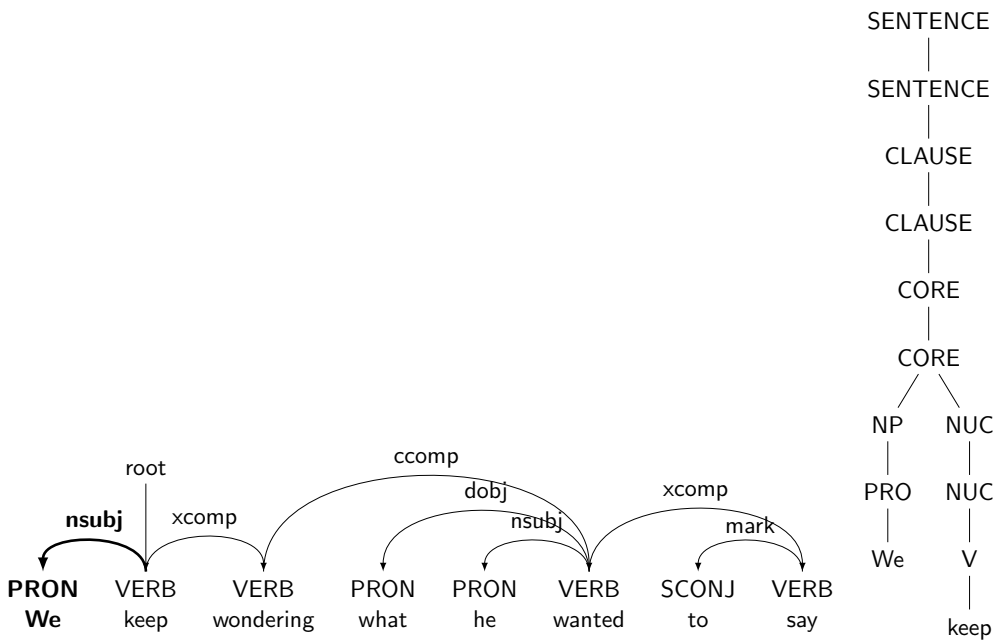
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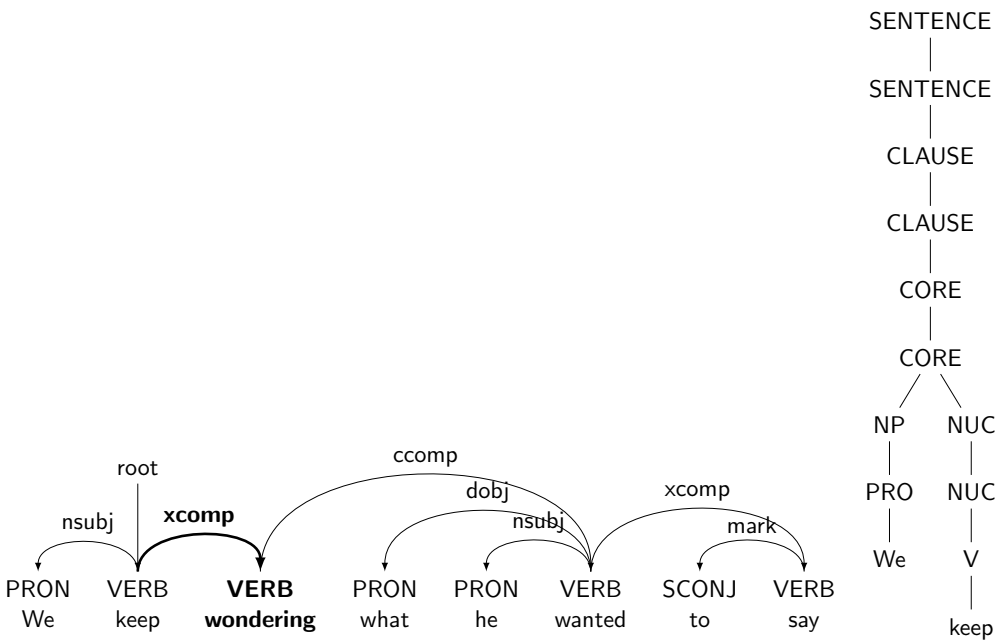
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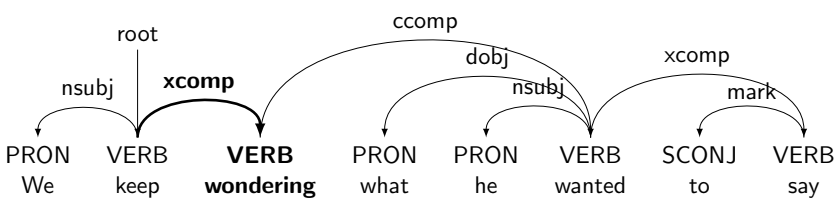
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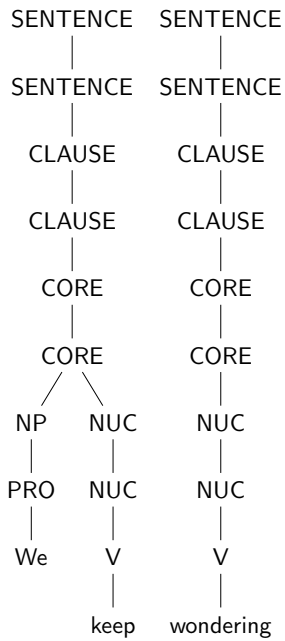
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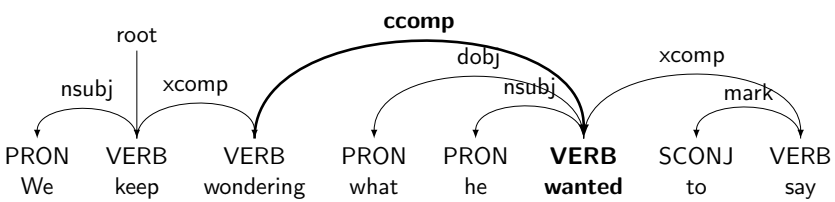
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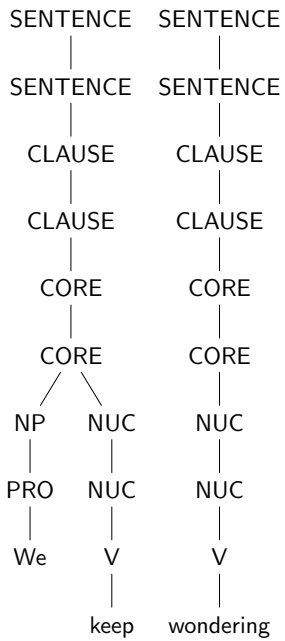
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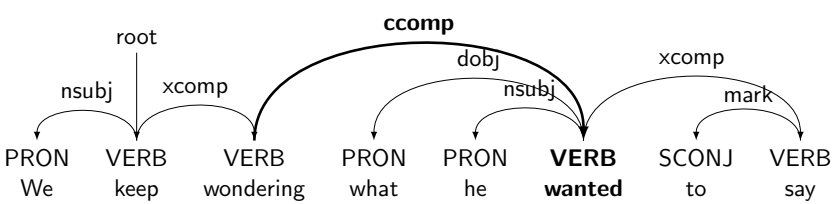
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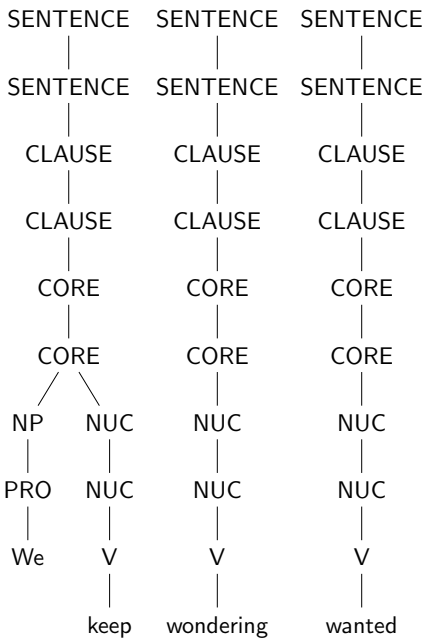
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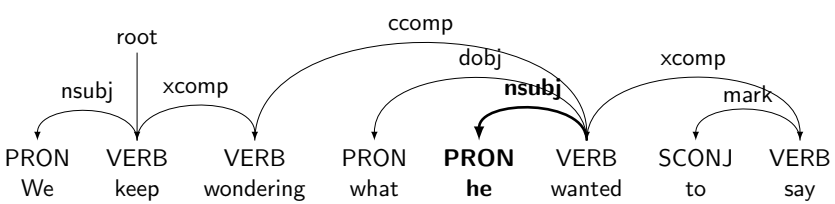
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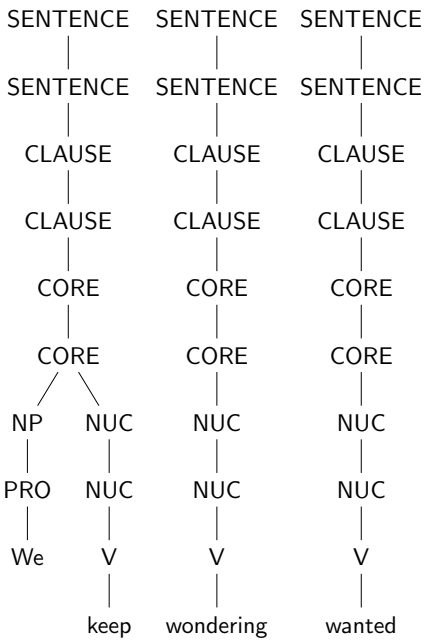
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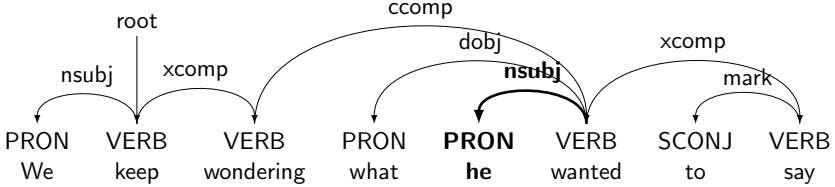
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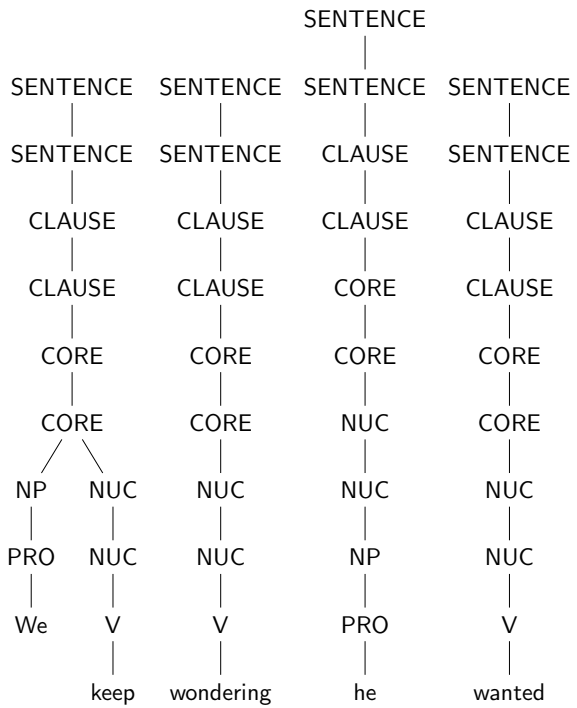
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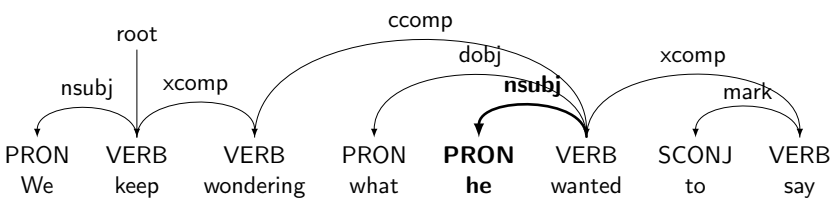
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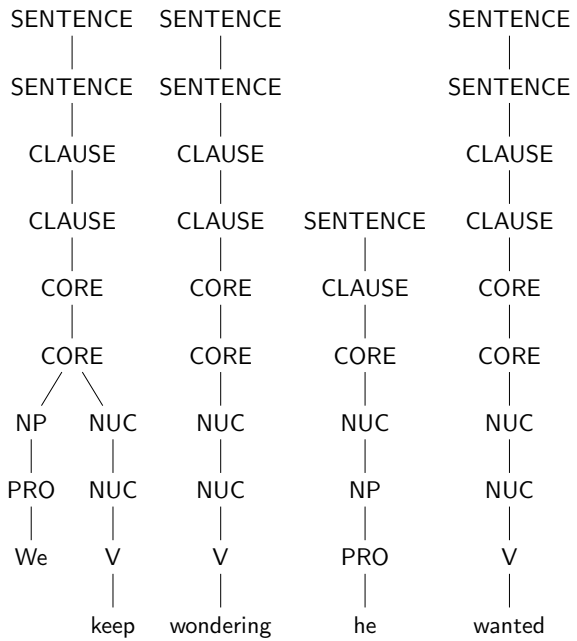
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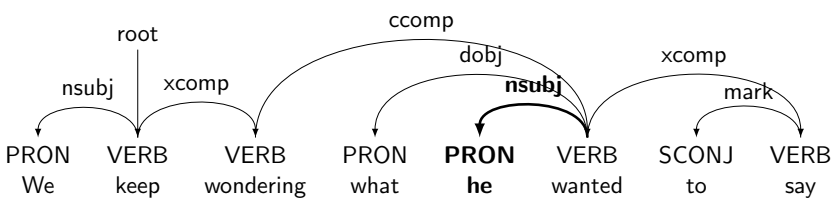
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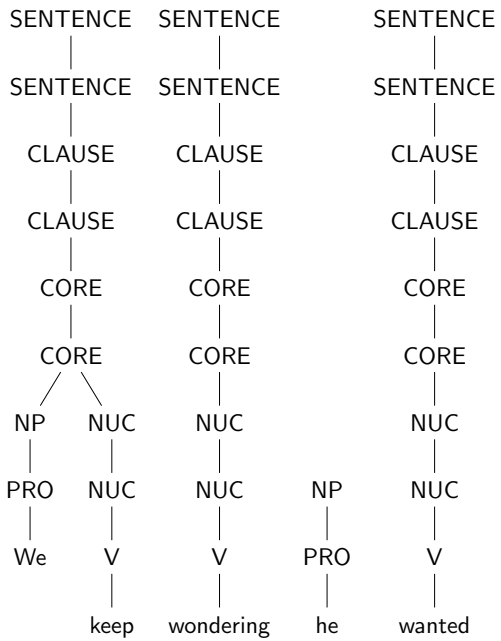
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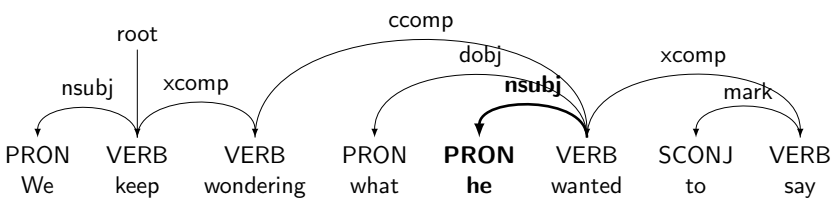
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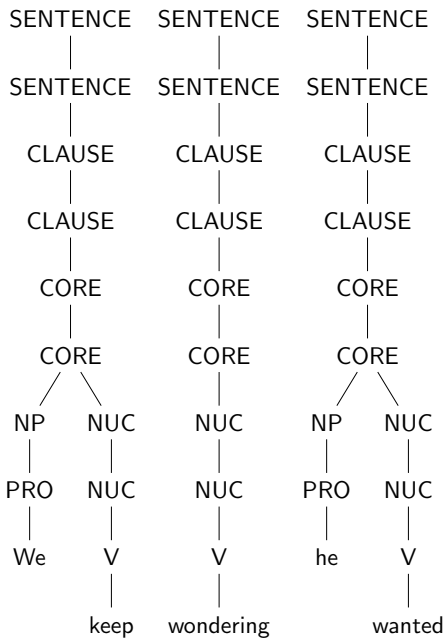
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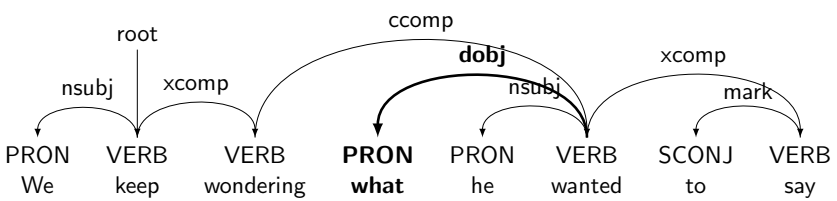
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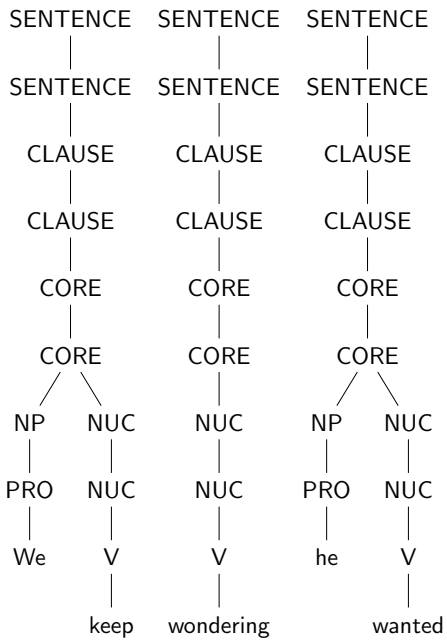
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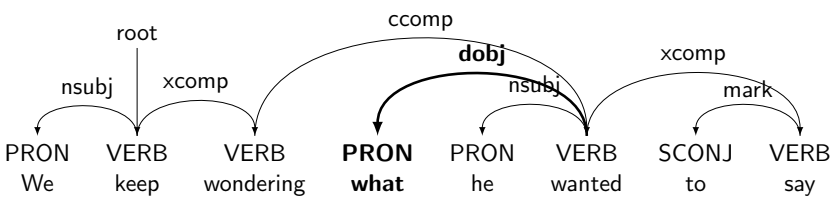
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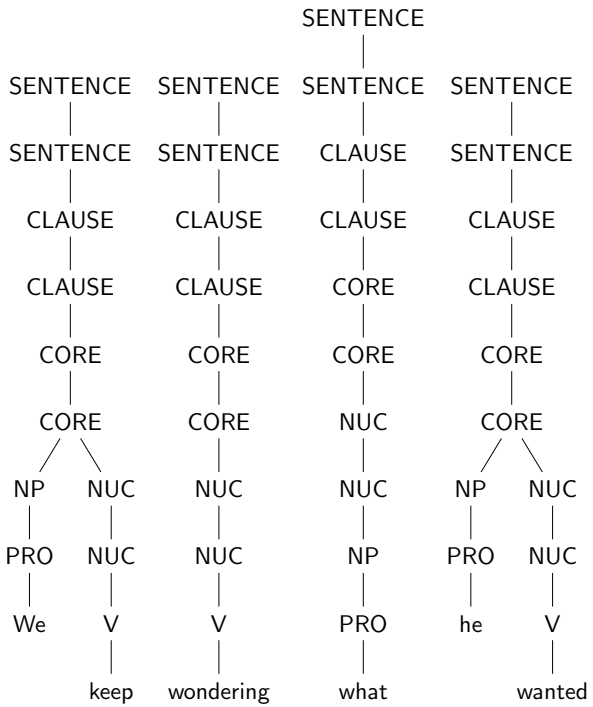
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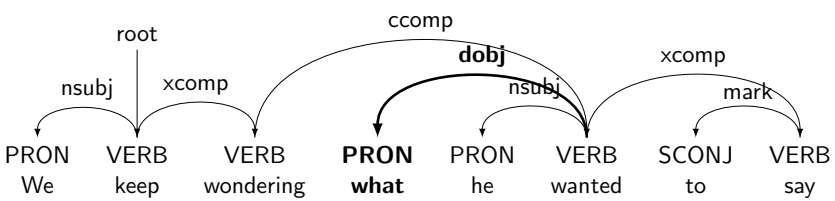
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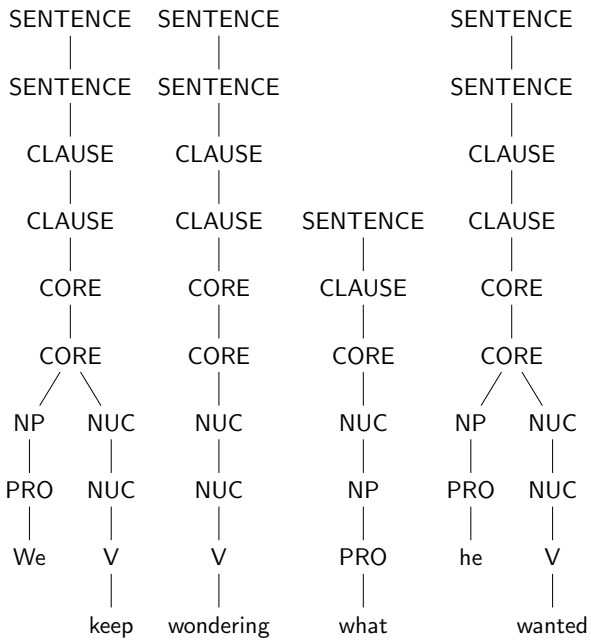
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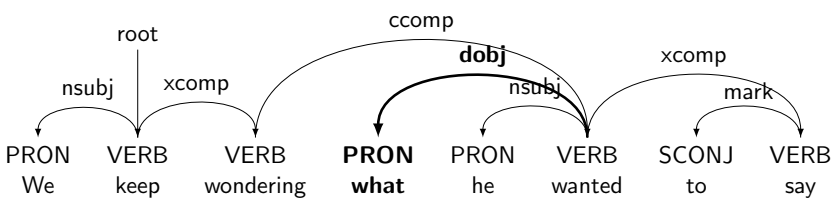
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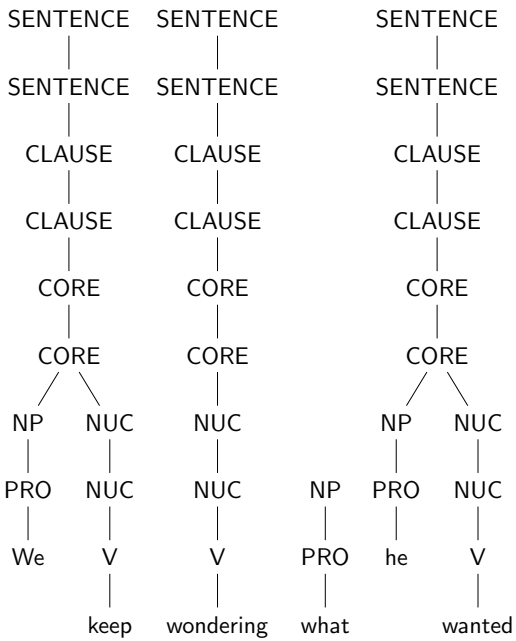
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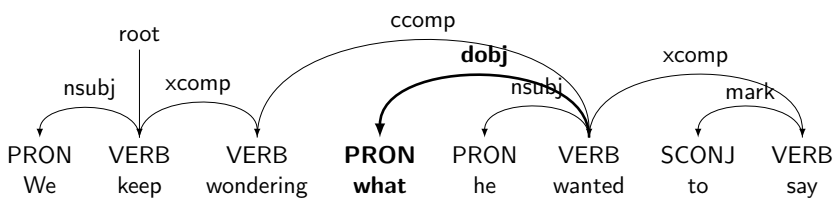
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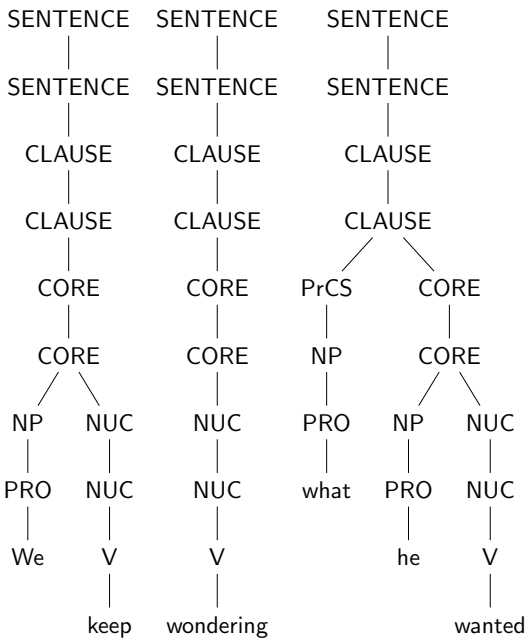
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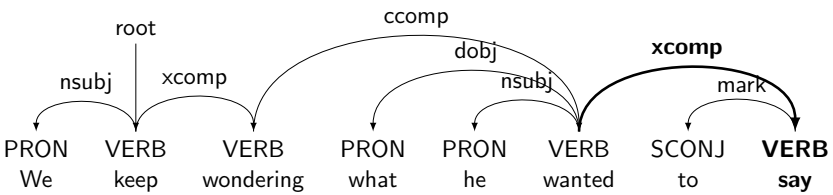
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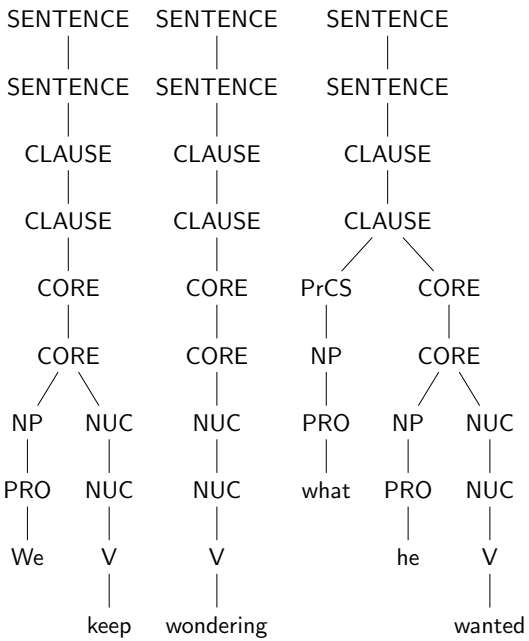
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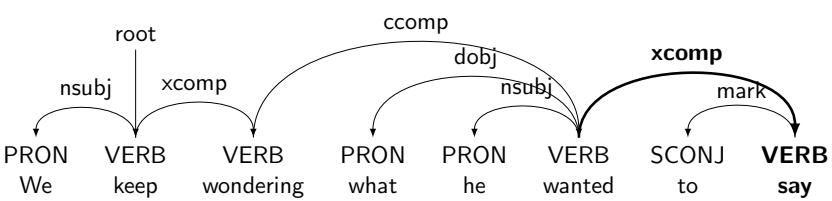
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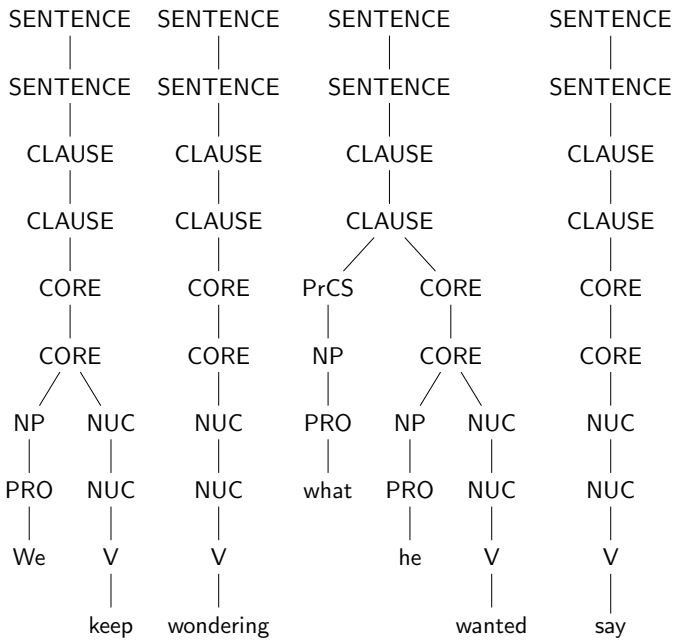
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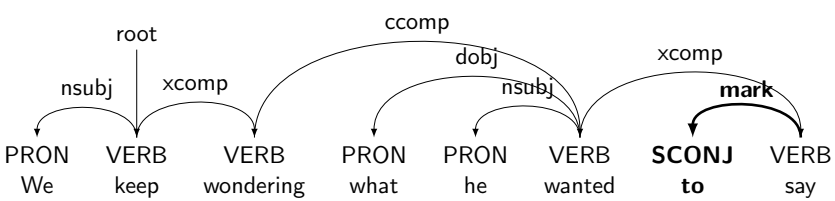
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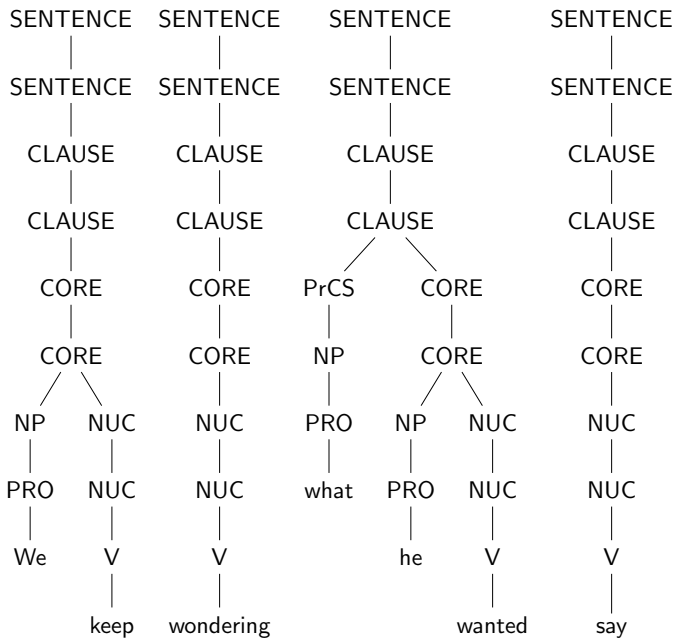
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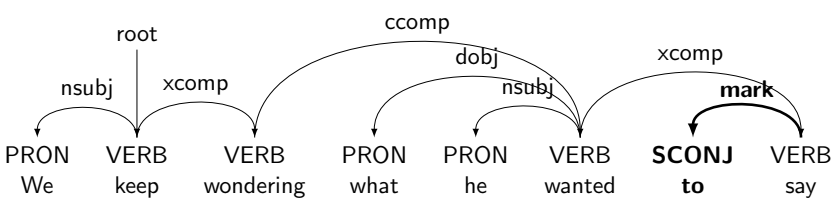
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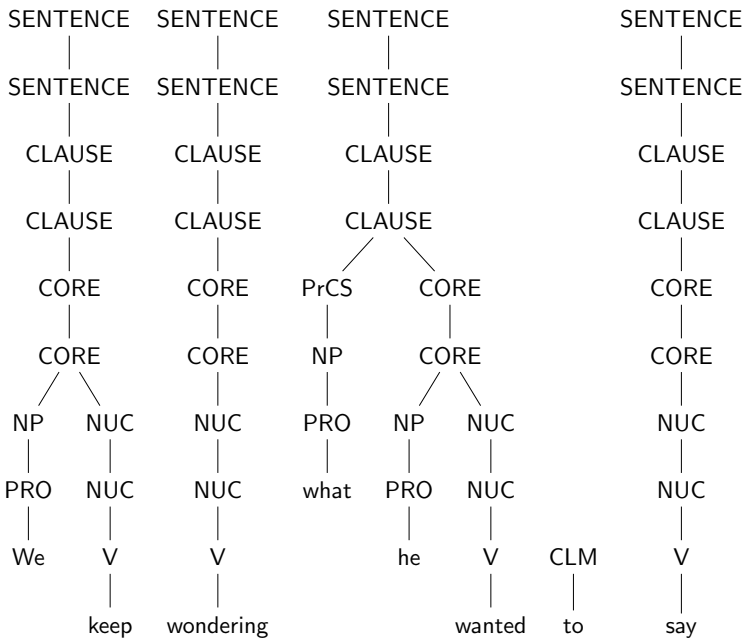
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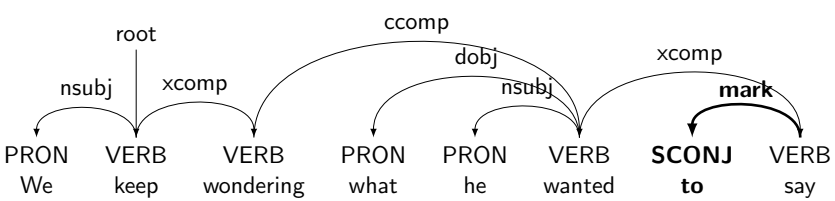
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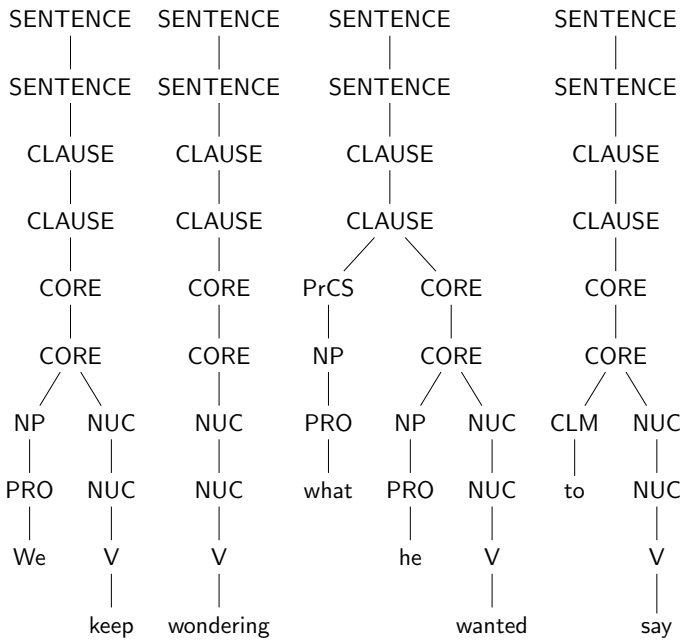
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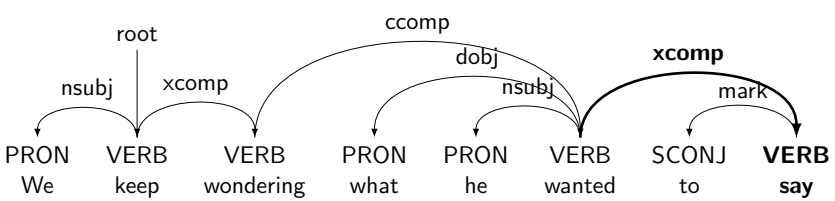
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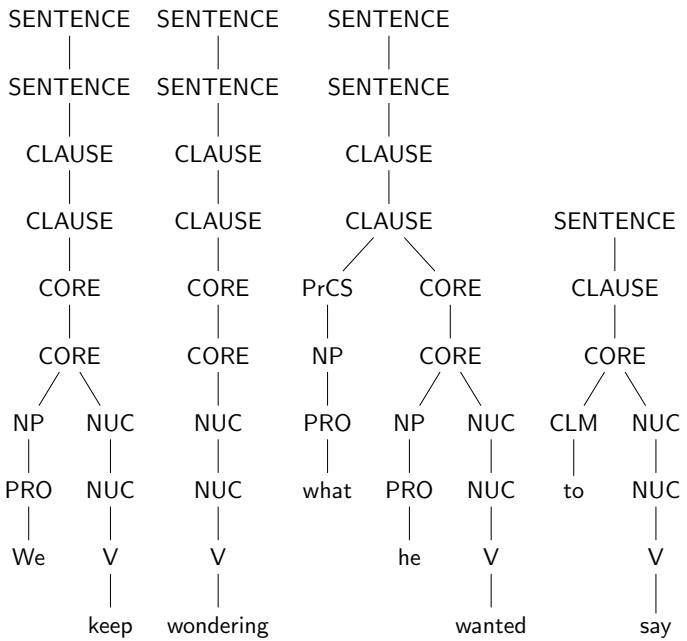
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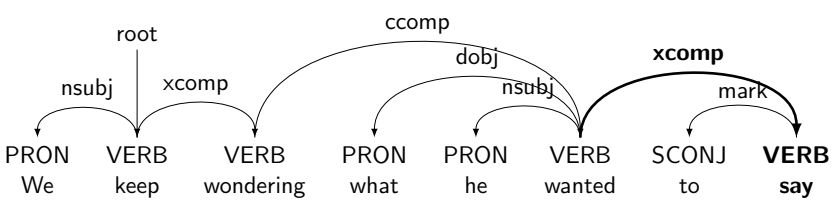
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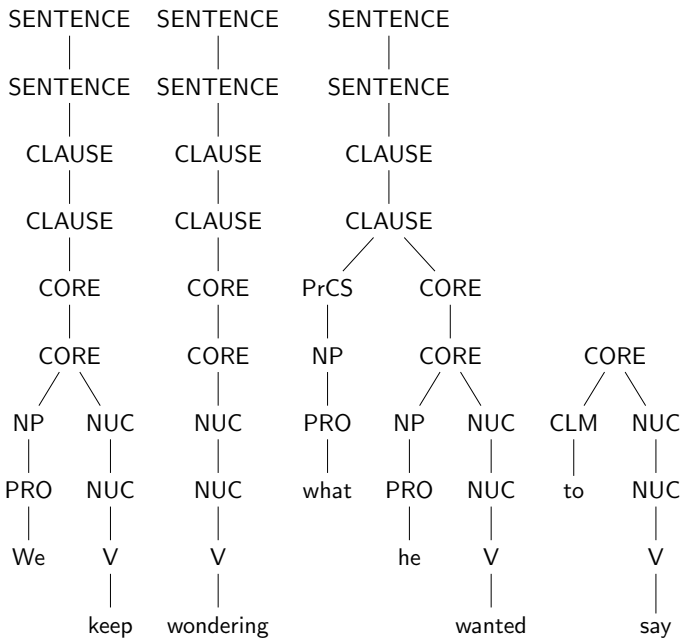
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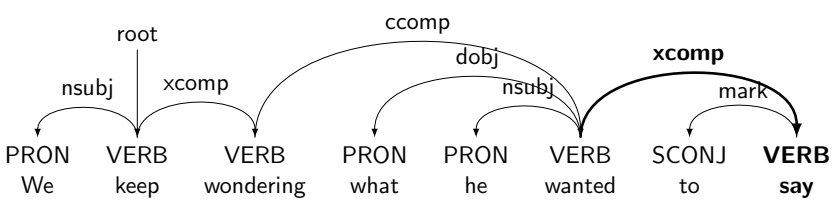
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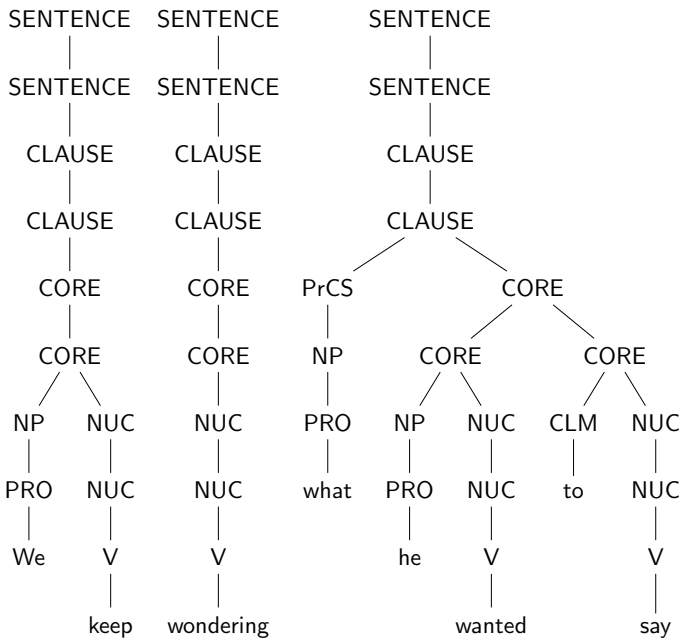
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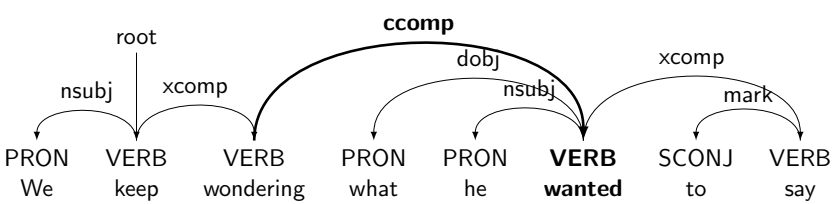
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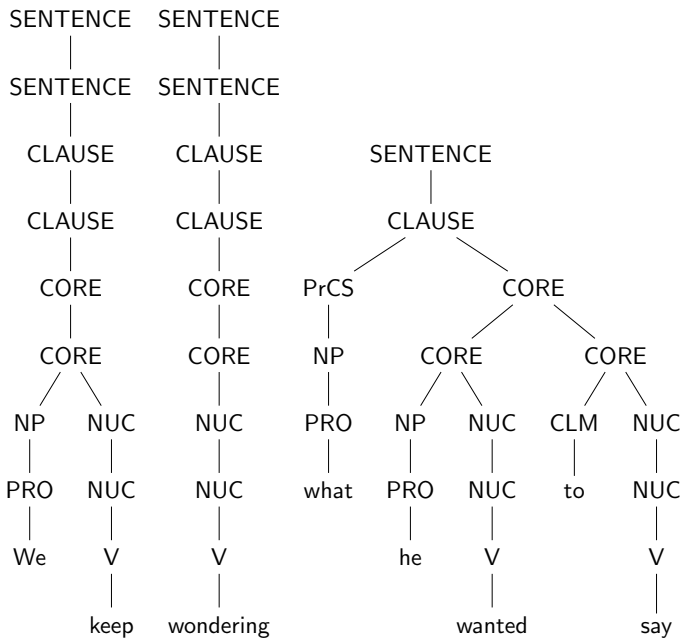
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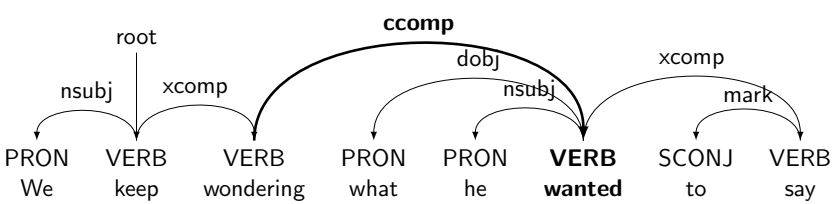
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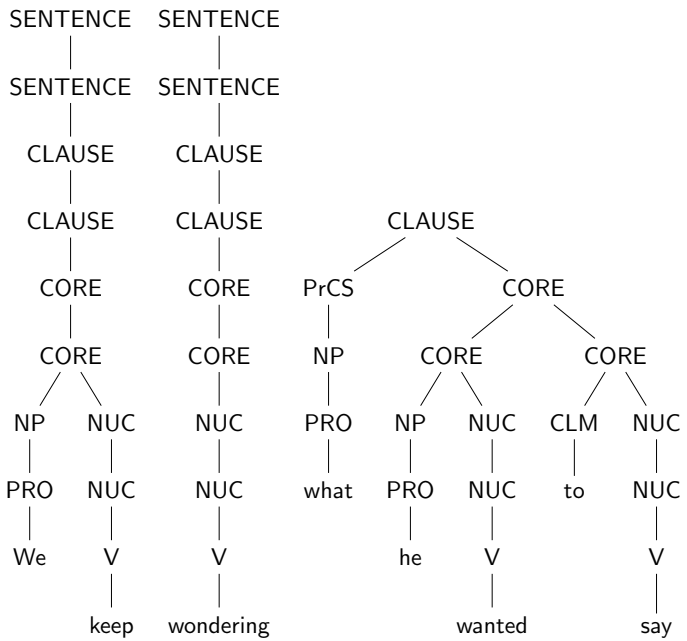
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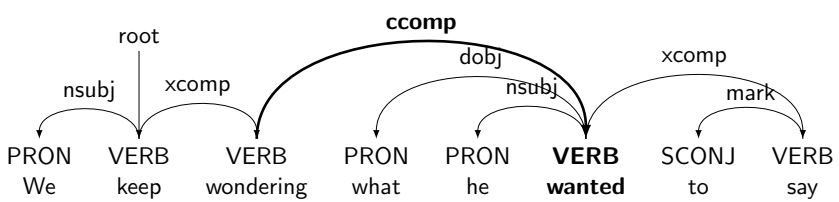
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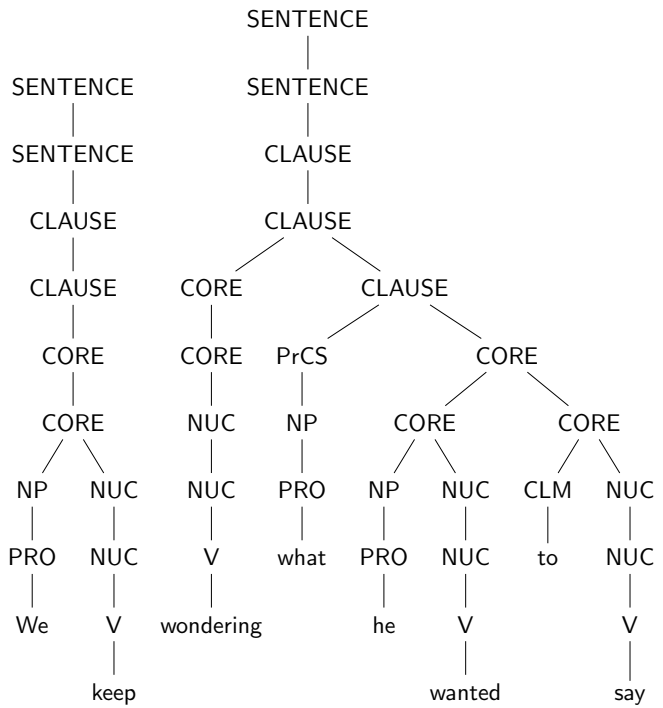
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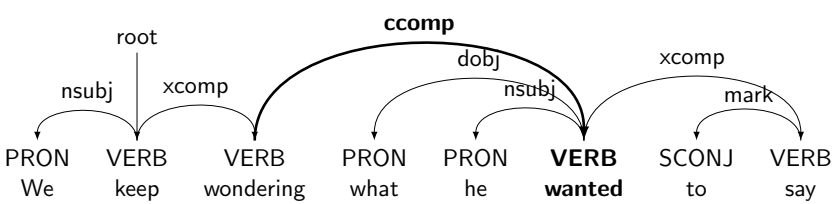
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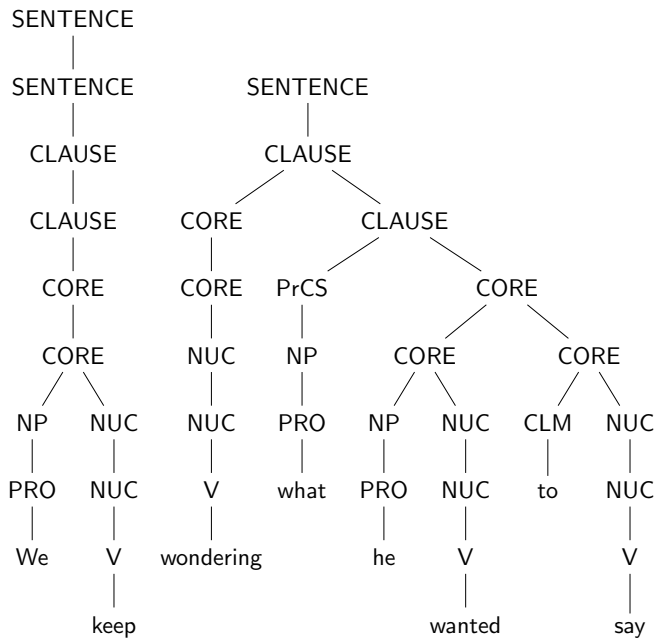
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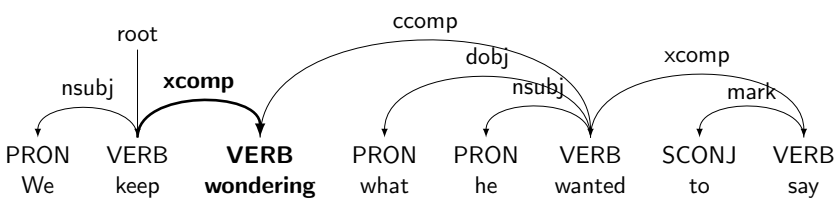
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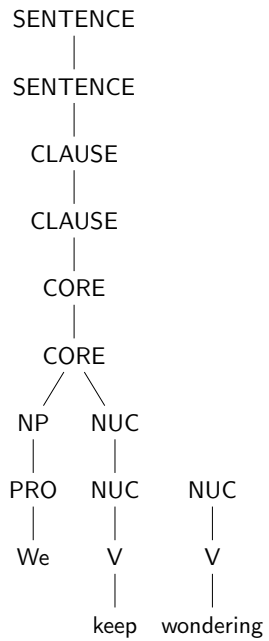
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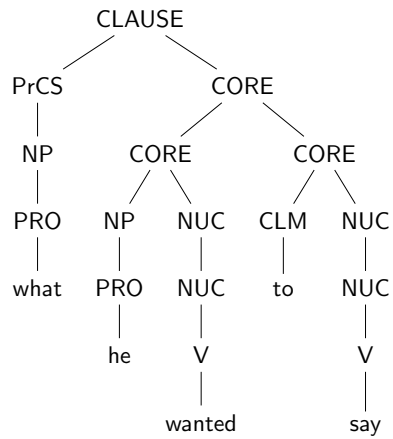
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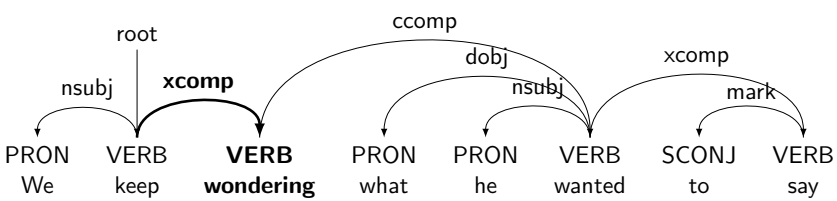
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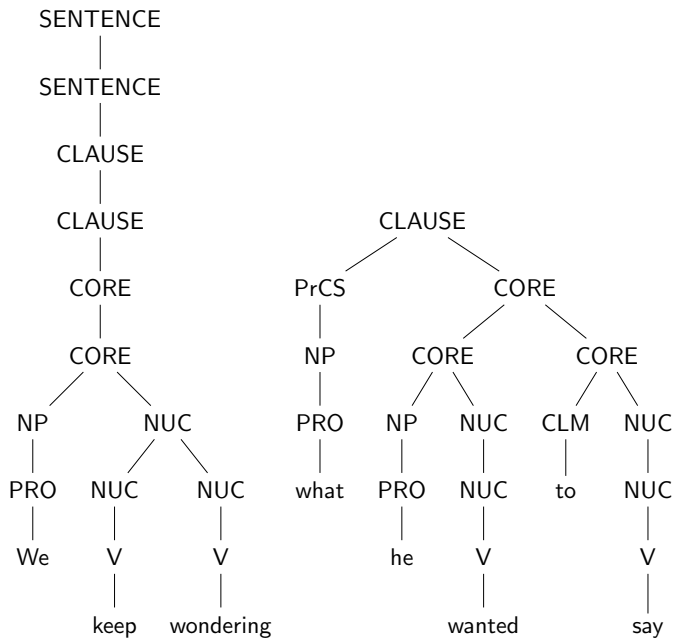
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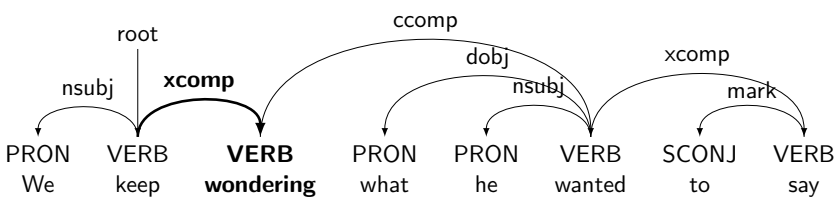
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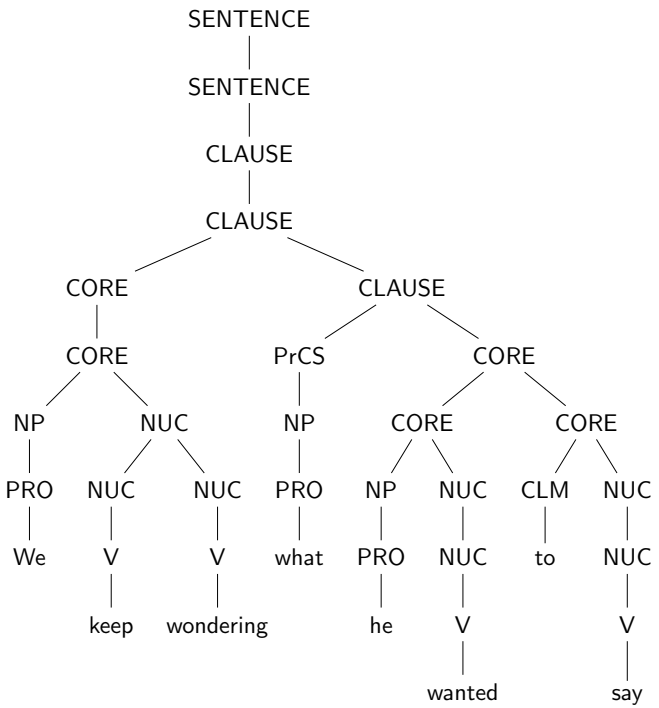
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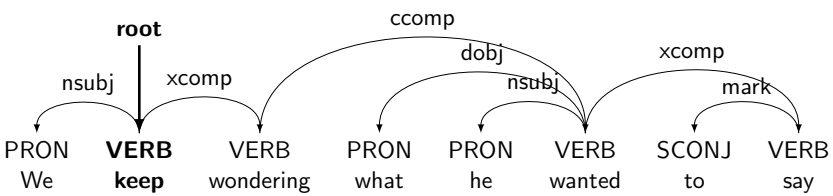
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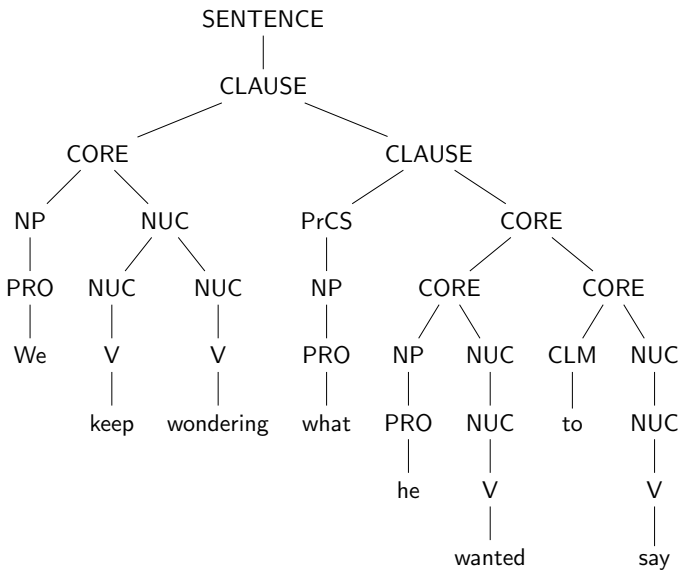
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Outline

Introduction

The basic algorithm

Clause linkage

RRGbank results

ud2rrg for RRGparbank

RRGparbank results

Current results

RRGbank development data

language	English
source	Penn Treebank WSJ
sentences	2097
avg. sentence length	8.98

ptb2rrg vs. ud2rrg

	`ptb2rrg.py`	`ud2rrg.py`
coverage	100%	96.28%+
EVALB f-score	92.74	85.99%

Outline

Introduction

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ud2rrg for RRGparbank

RRGparbank results

ud2rrg for RRGparbank

- RRGparbank: annotate multilingual data
- Multext-East "1984" Corpus: English + translations into languages of eastern Europe
- Gold tokens + POS tags + features + alignments
- No gold constituency trees + language specific transformation rules → ptb2rrg hard to adapt
- Adapt ud2rrg for different kinds of UD inputs

New challenges

- Targeted languages: English, German, Hungarian, Russian, Persian
- Input: dependencies generated with udpipe
- Sometimes only raw text (Russian)
- Output of udpipe: specific POS tags, more/less precise dependency labels
- Unequal quality of parses

English data

- Similar to the input of ud2rrg for rrgbank
- No gold constituency parse $\rightarrow$ less information (marked as argument, PTB POS tags, etc)

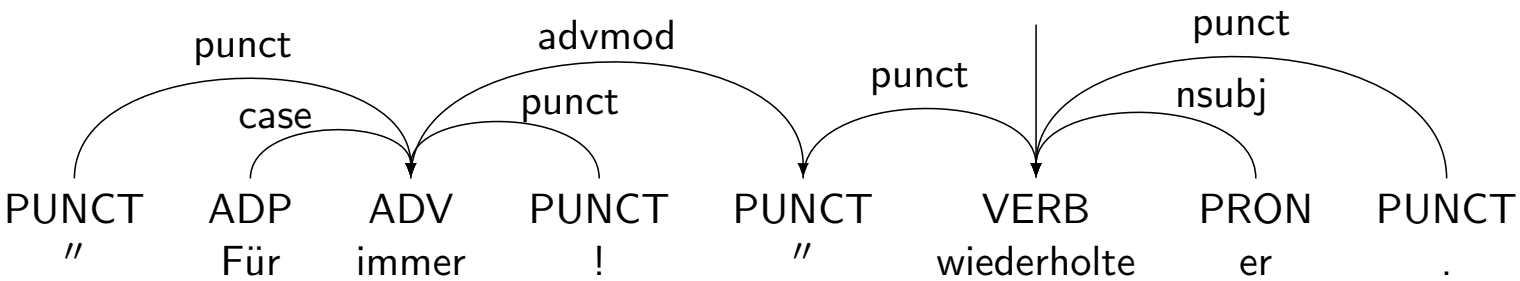
Russian data

- no gold tokens / POS tags: use raw data

German data

- Problems: more resource related than language related
- Low quality of dependency parsing
- Improve udpipe parsing: use subset of features
- Improve ud2rrg robustness: reassign dependents / update root

Reassigning dependents: example



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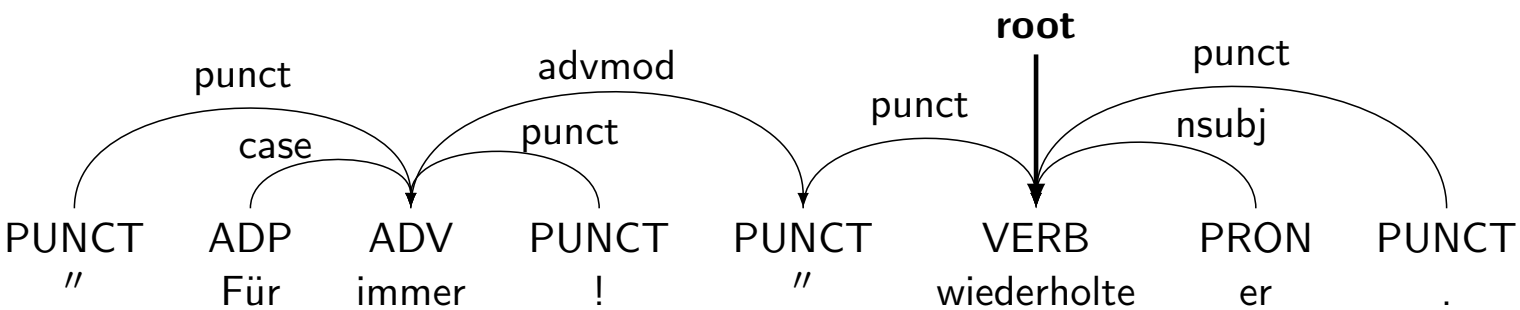

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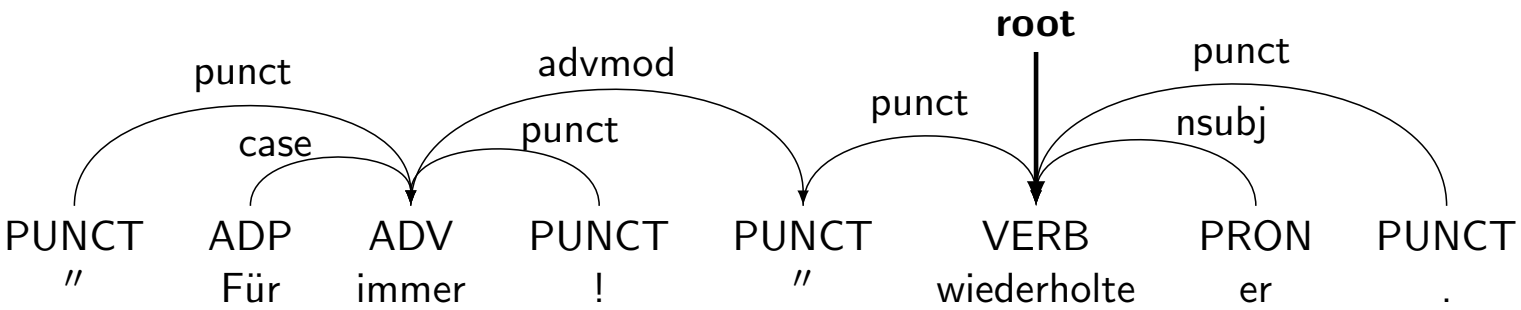

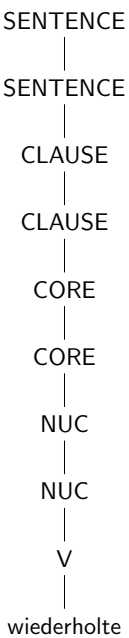

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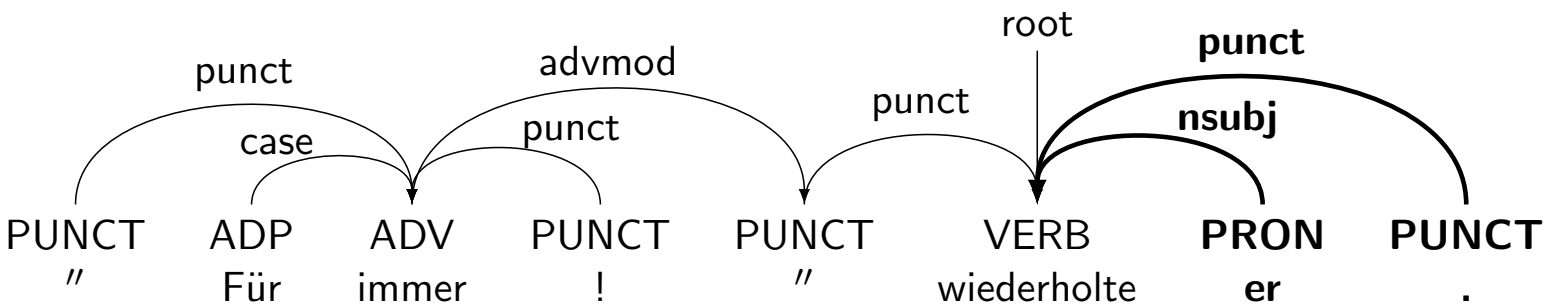

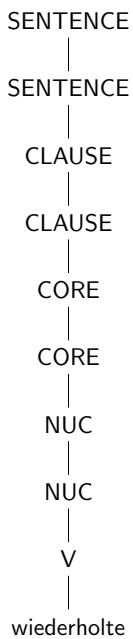

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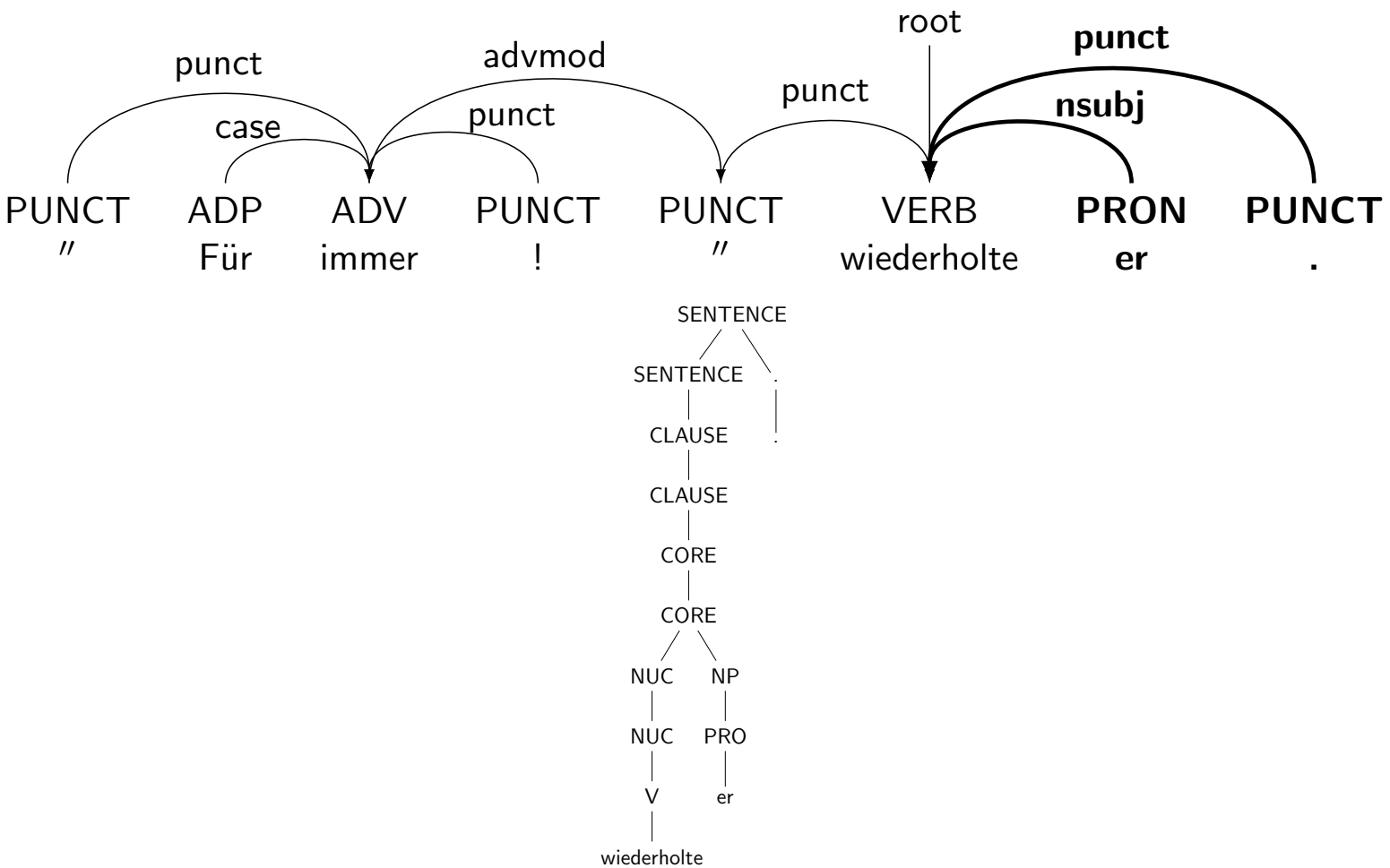

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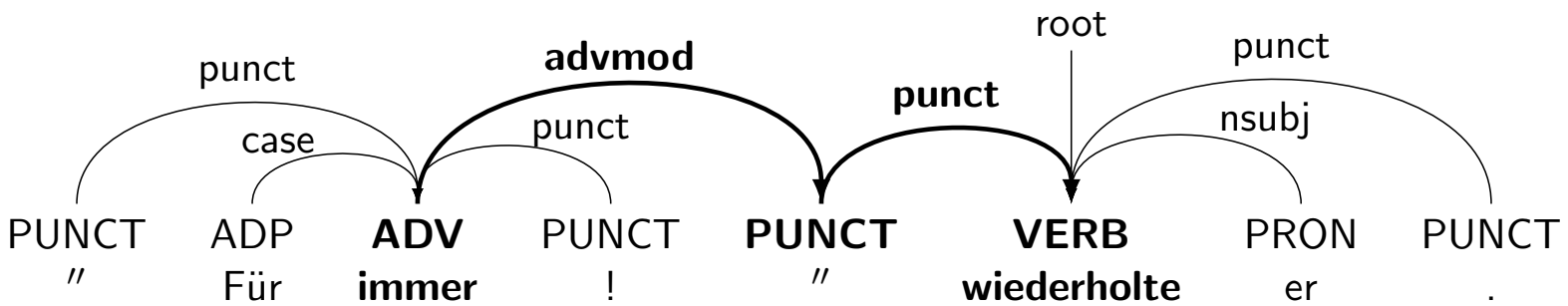

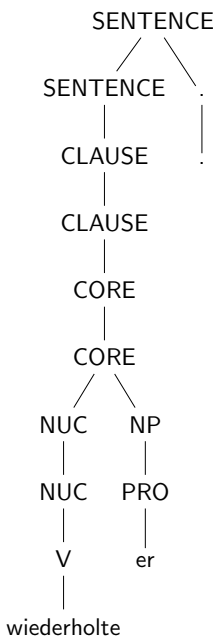

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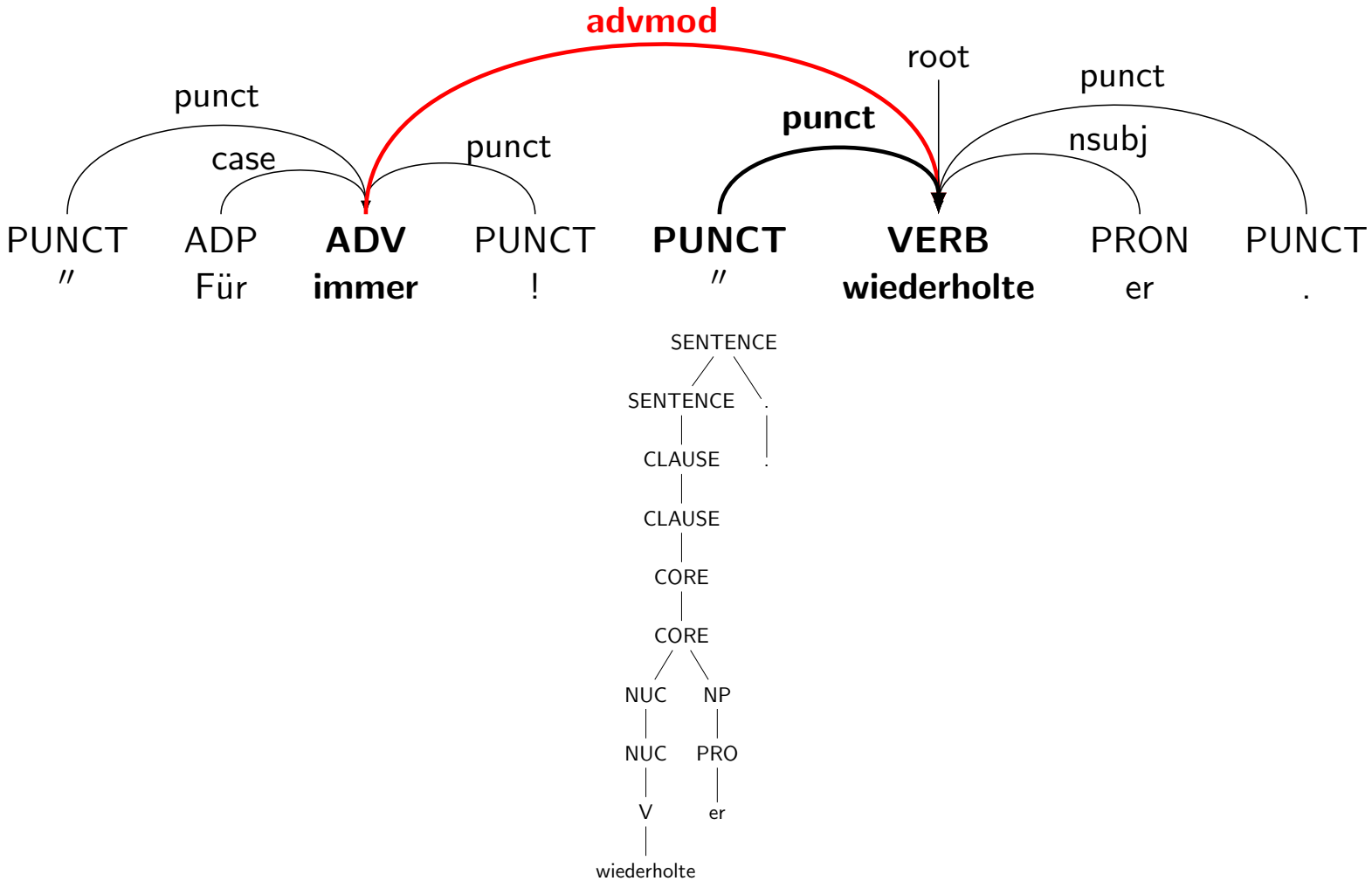

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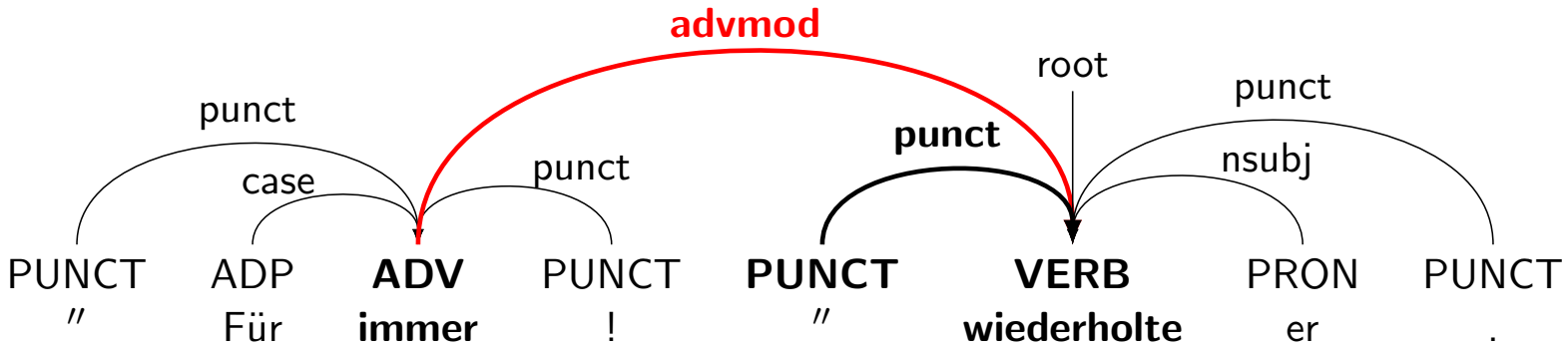

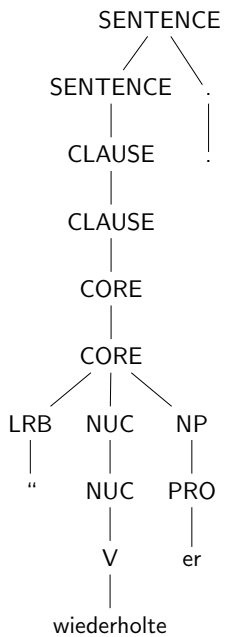

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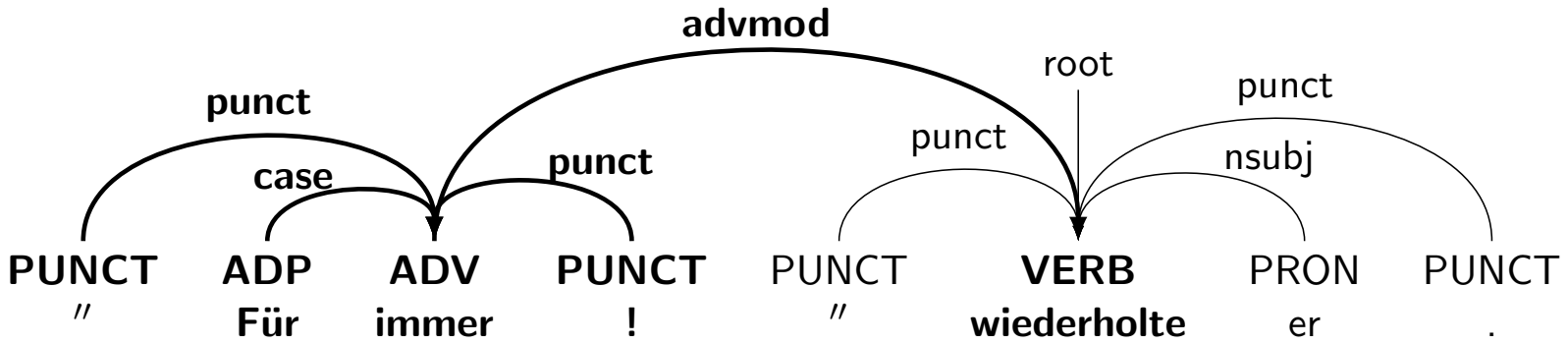

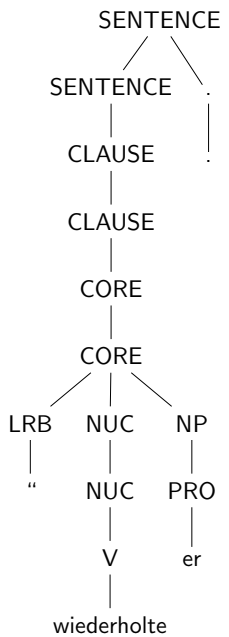

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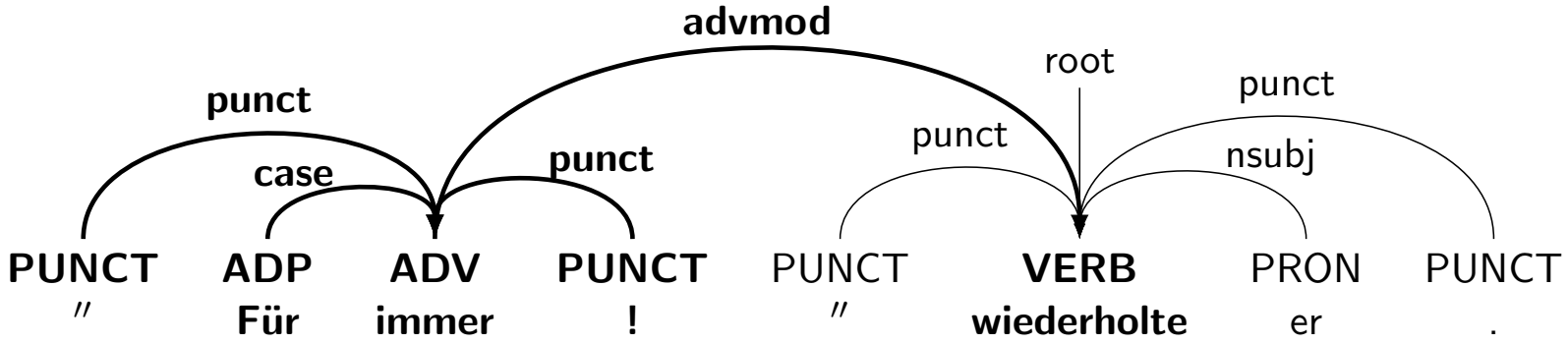

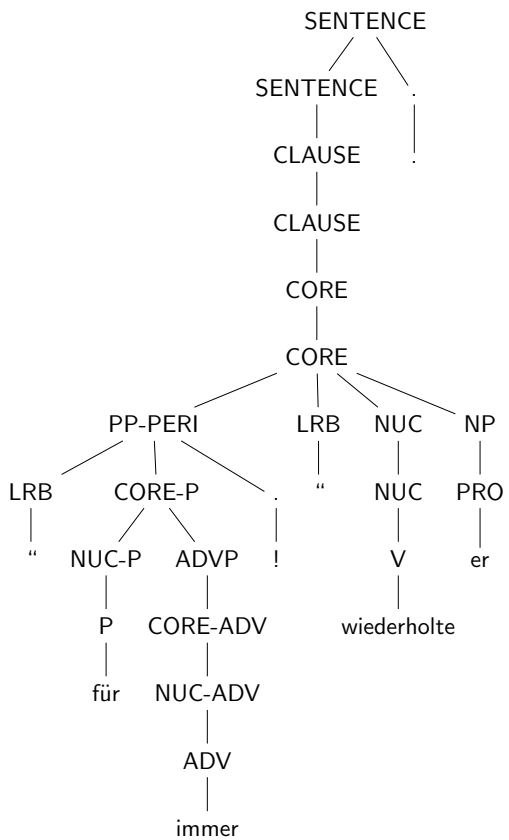

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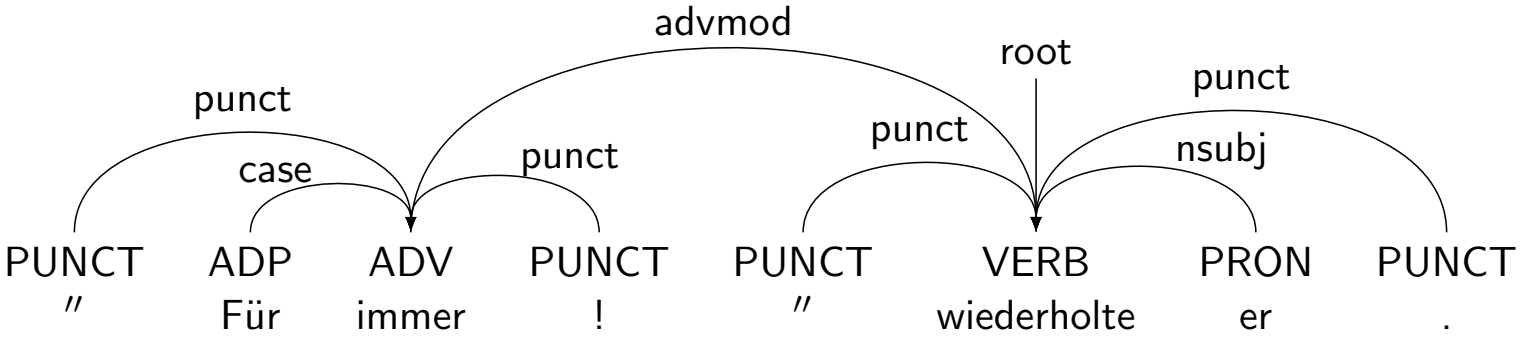
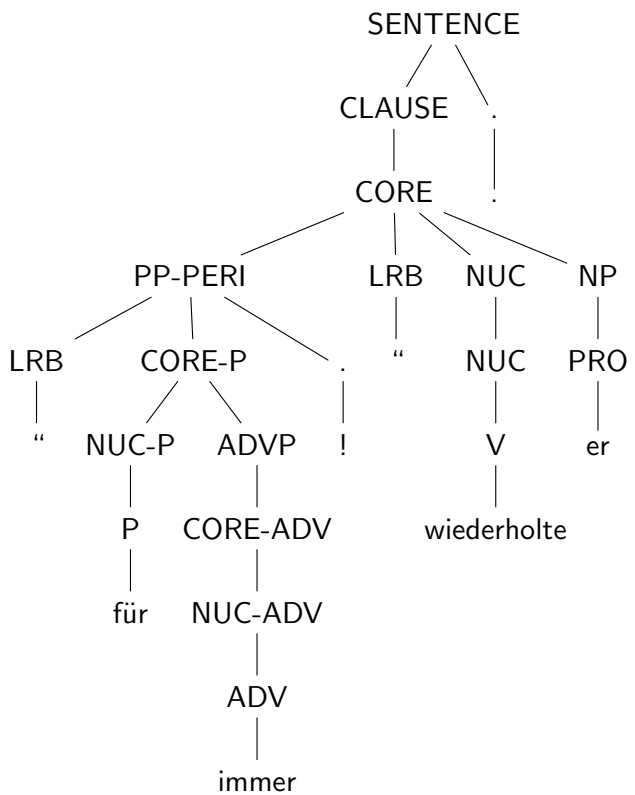
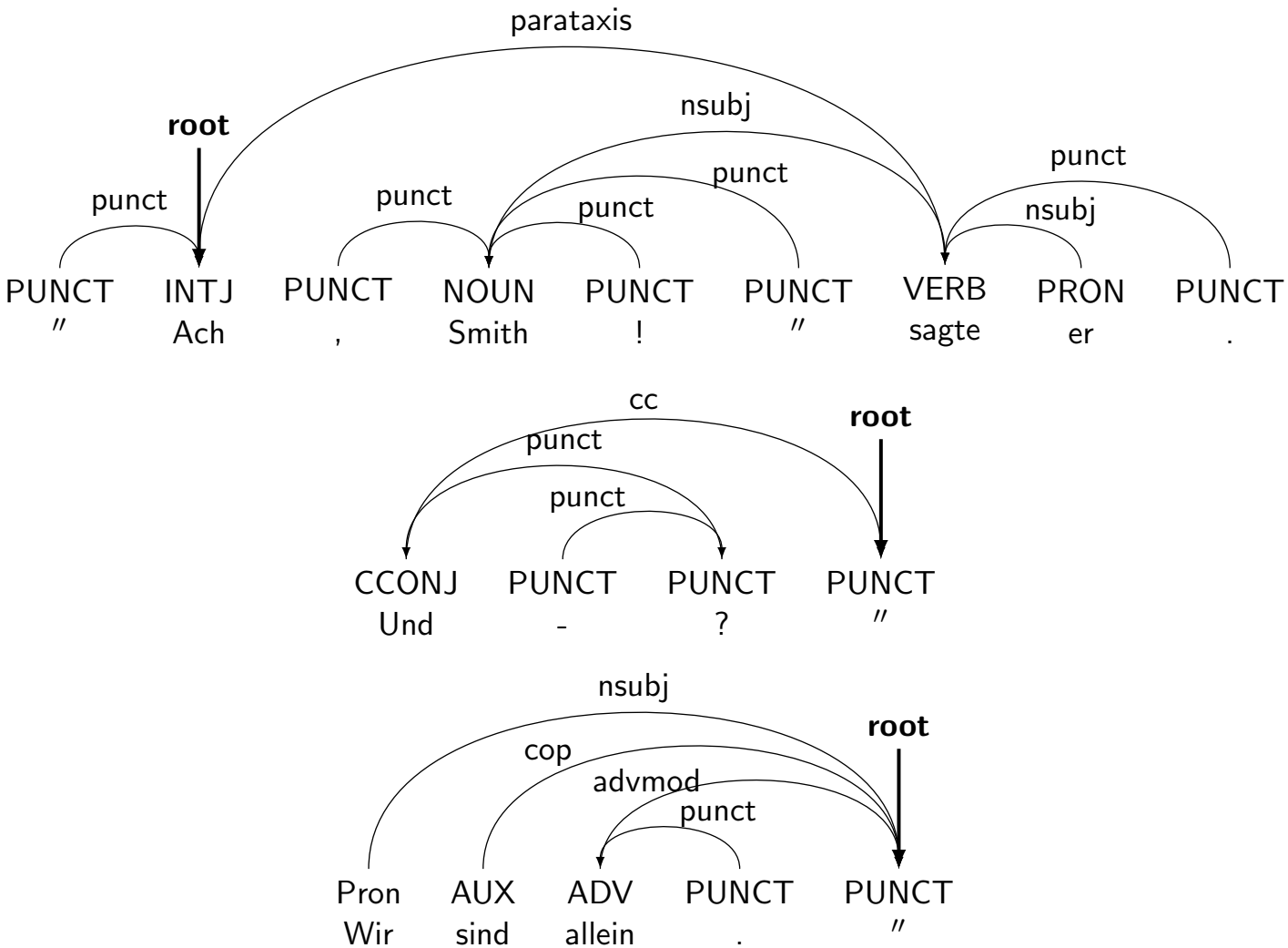
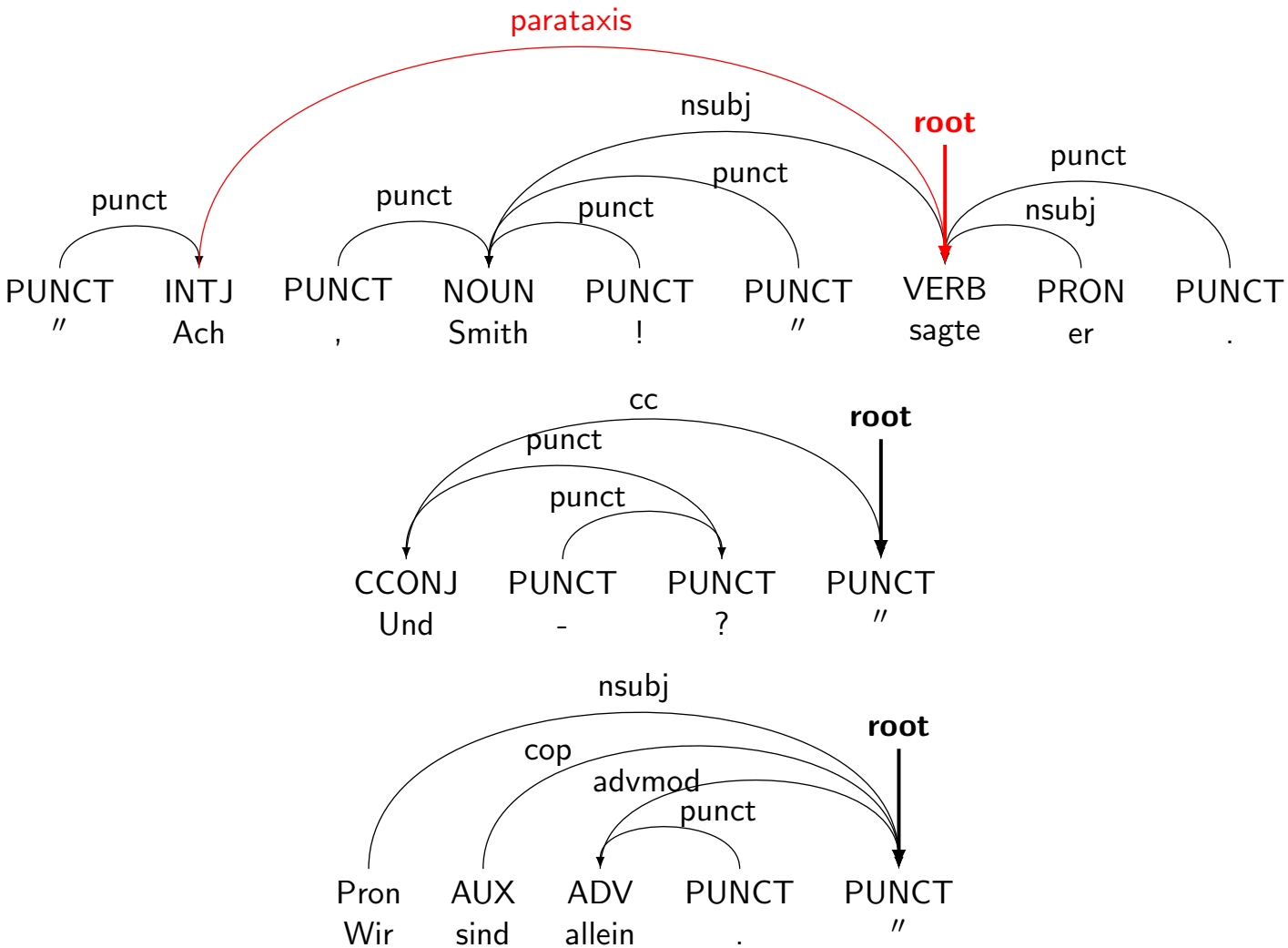




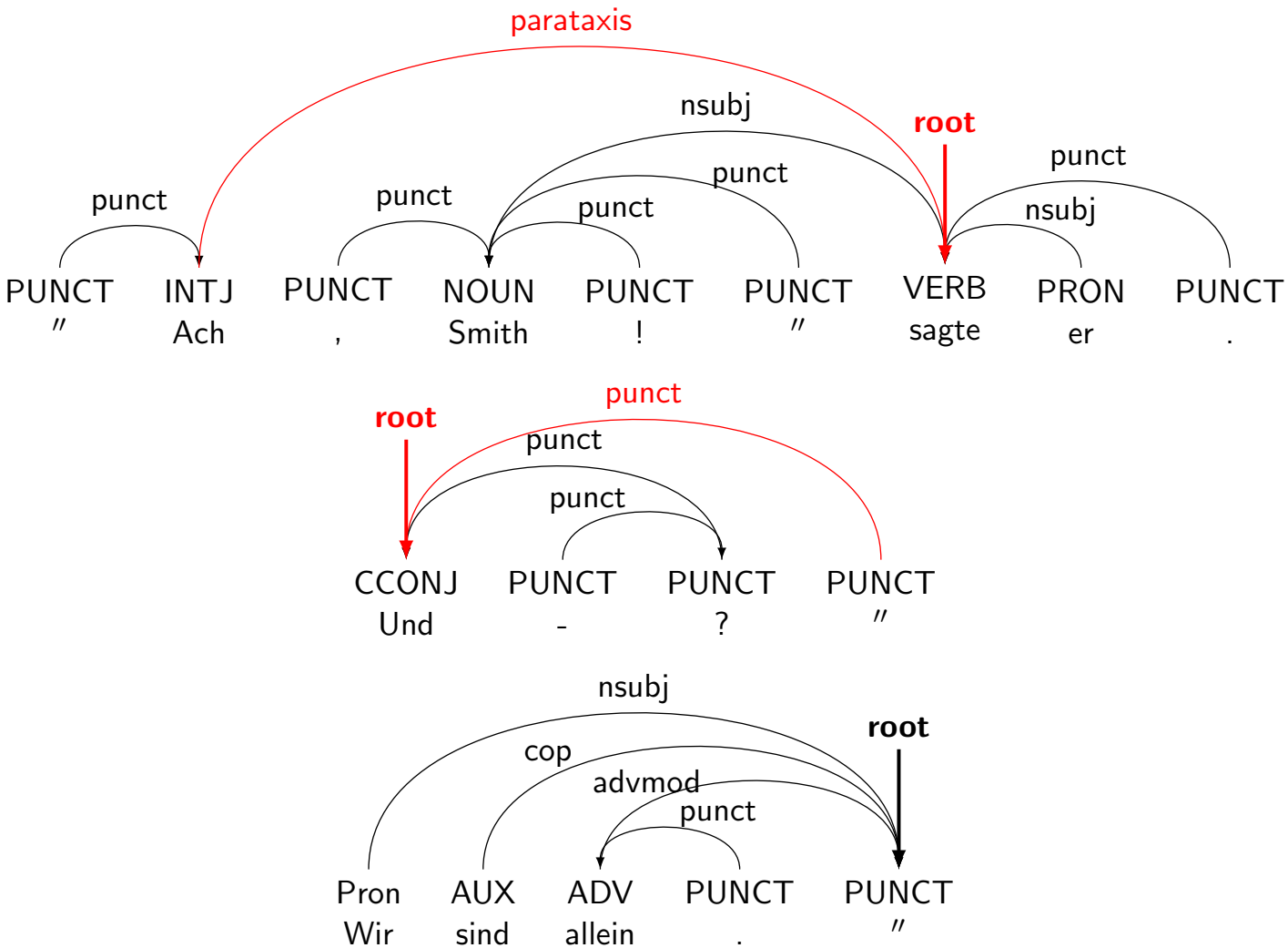
Reassigning roots: examples



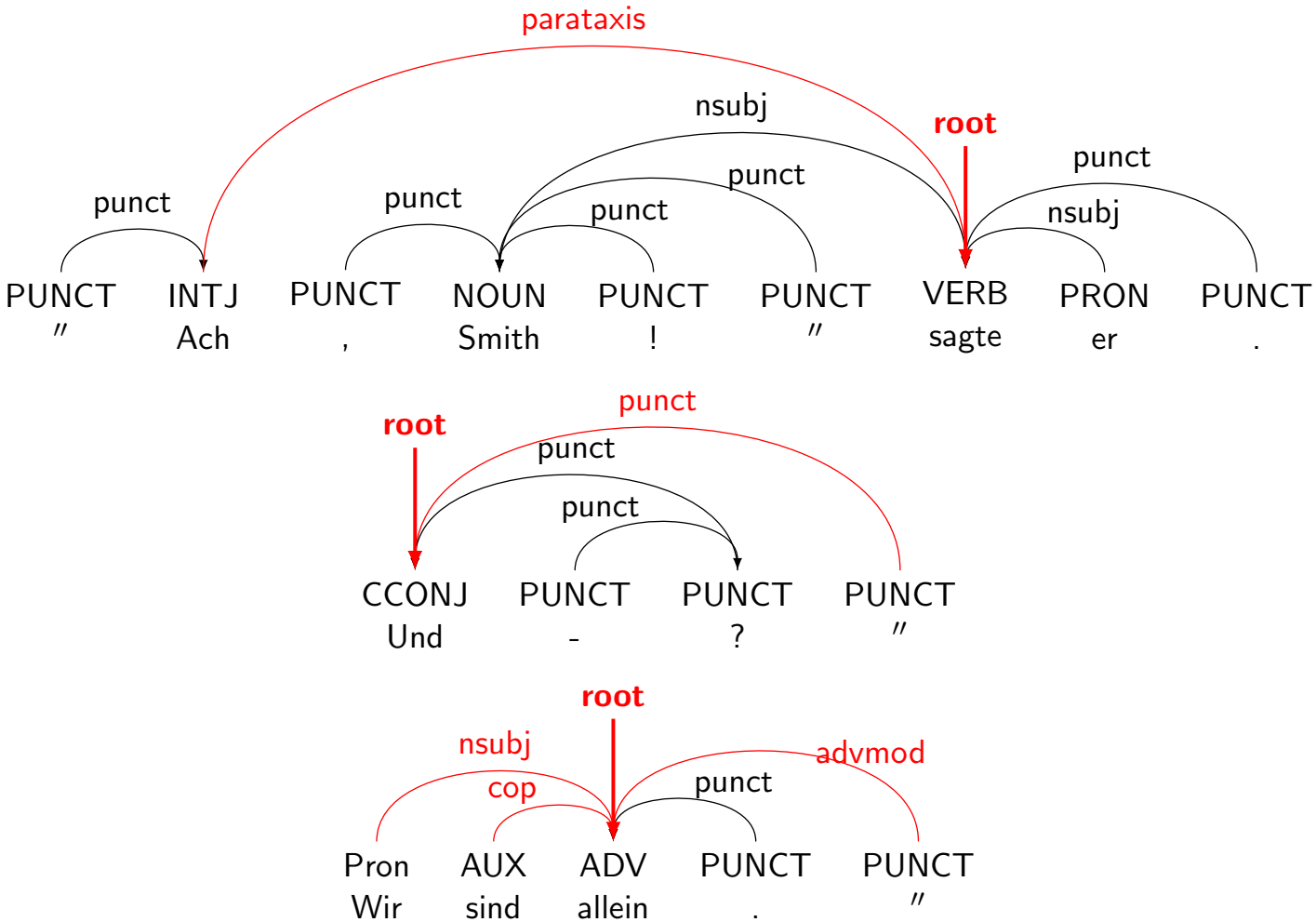
Reassigning roots: examples



Reassigning roots: examples



Reassigning roots: examples



Outline

Introduction

The basic algorithm

Clause linkage

RRGbank results

ud2rrg for RRGparbank

RRGparbank results

Current results

ud2rrg for 3 languages

	German (gold+silver)	English (silver)	Russian (gold+silver)
EVALB f-score	76.49%	70.62%	84.52%

Bibliography I