Ling 566
Oct 19, 2023

Catch-up, Review

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Overview

- Homework tips
- Common mistakes
- RQs
- Terminology
- Analogies to other systems you might know
- DELPH-IN demos (if time)

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Homework tips/requests

- Type whenever possible (no photos of whiteboards)
- Answer each part of each question separately (but don't include the full text of the question)
- Be sure to answer each part of each question, and follow the directions!
- Look over the problems early and ask questions
- Check your work
- Monitor Canvas discussions
- WORK TOGETHER

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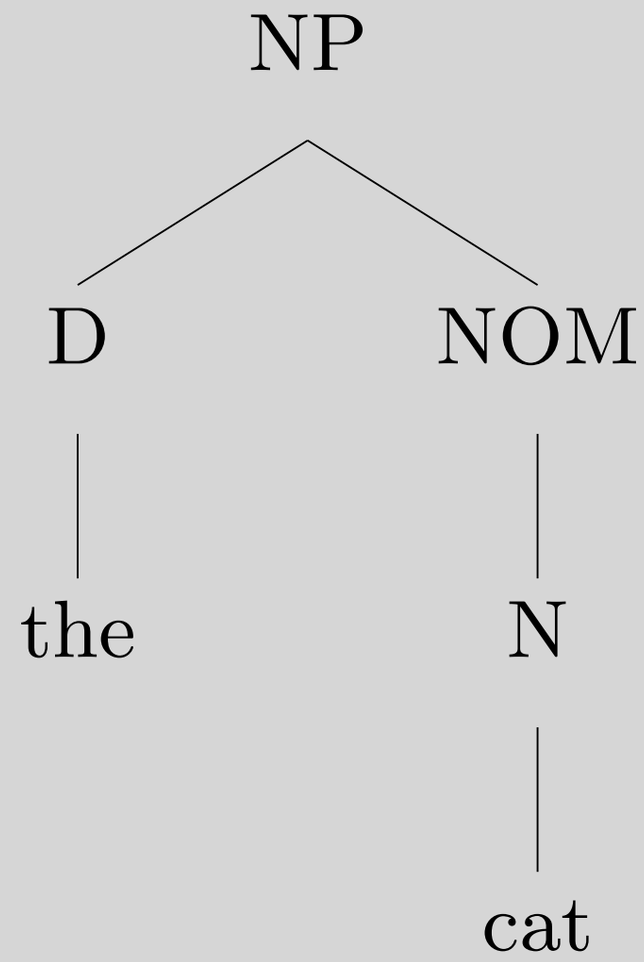
Which grammar does this tree go with?



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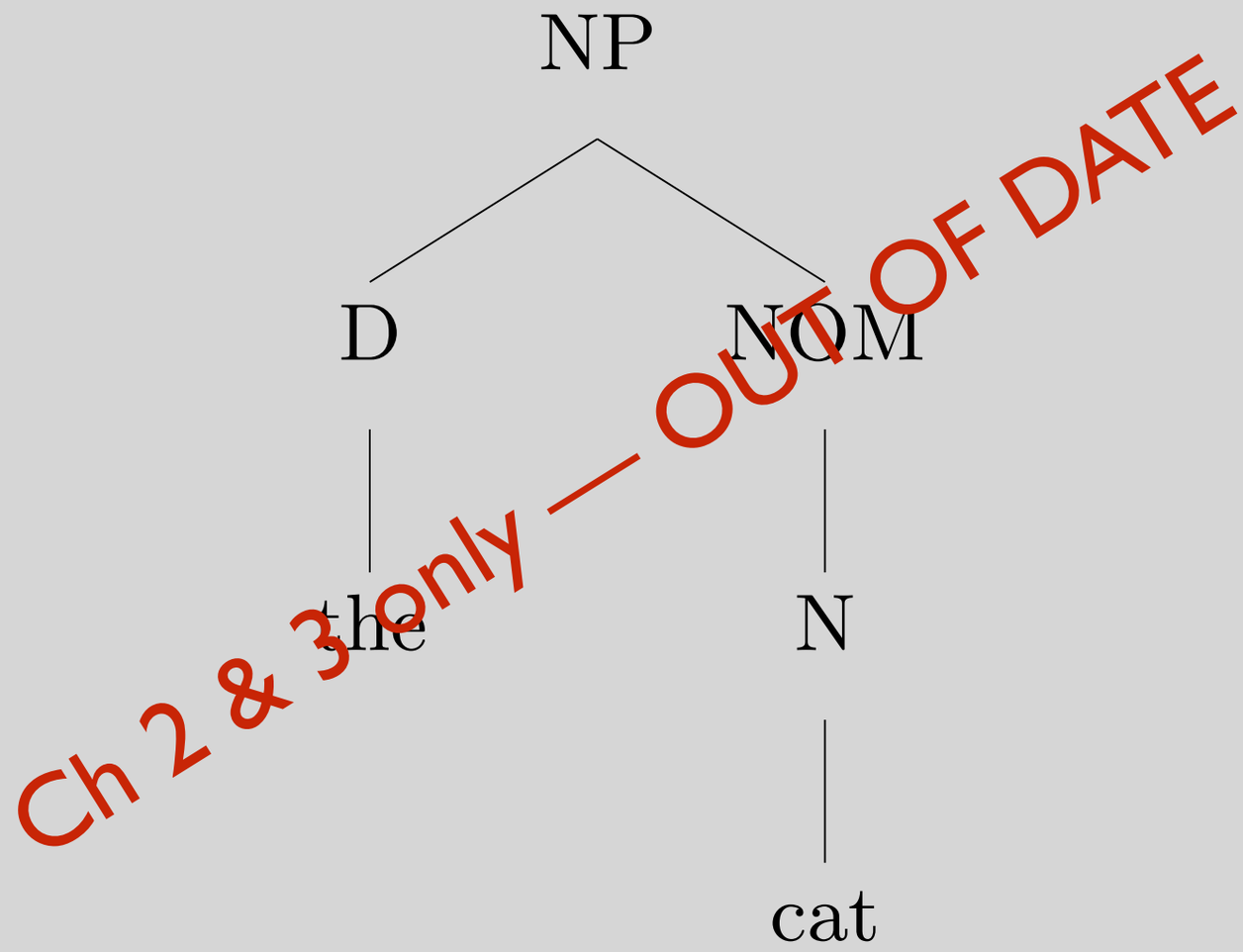
Which grammar does this tree go with?



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What's wrong with this?

$$\left\langle \text{out}, \left[\begin{array}{ll} \textit{word} & \\ \text{HEAD} & \textit{prep} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \text{VP}\ \rangle \\ \text{COMPS} & \langle\ (\text{PP} \mid \text{NP})\ \rangle \end{array}\right] \end{array}\right] \right\rangle$$

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What's wrong with this?

$$\left\langle \text{out}, \left[\begin{array}{ll} \textit{word} & \\ \text{HEAD} & \textit{prep} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ (\text{NP})\ (\text{PP})\ \rangle \end{array} \right] \end{array} \right] \right\rangle$$

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What's wrong with this?

$$\left\langle \text{out}, \left[\begin{array}{ll} \textit{word} & \\ \text{HEAD} & \textit{prep} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & (\ \text{NP} \mid \text{PP}\ ) \end{array}\right] \end{array}\right] \right\rangle$$

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What's wrong with this?

$$\left\langle \text{grew}, \begin{bmatrix} word \\ \text{HEAD} & \begin{bmatrix} verb \\ \text{AGR} & 3sing \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\ \text{NP}\ \rangle \\ \text{COMPS} & \langle\ \text{AP}\ \rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

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What's wrong with this?

$$\left\langle \text{out}, \left[\begin{array}{ll} \textit{word} & \\ \text{HEAD} & \textit{preposition} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ (\ \text{NP} \mid \text{PP}\ )\ \rangle \end{array}\right] \end{array}\right] \right\rangle$$

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What's wrong with this?

$$\left\langle \text{there}, \begin{bmatrix} \textit{phrase} & \\ \text{HEAD} & \textit{prep} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

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Tags & lists

- What's the difference between these two?

$$\begin{bmatrix} \text{SPR} & \boxed{1}\langle\ \text{NP}\ \rangle \end{bmatrix}$$

$$\begin{bmatrix} \text{SPR} & \langle\ \boxed{1}\text{NP}\ \rangle \end{bmatrix}$$

- When does it matter?

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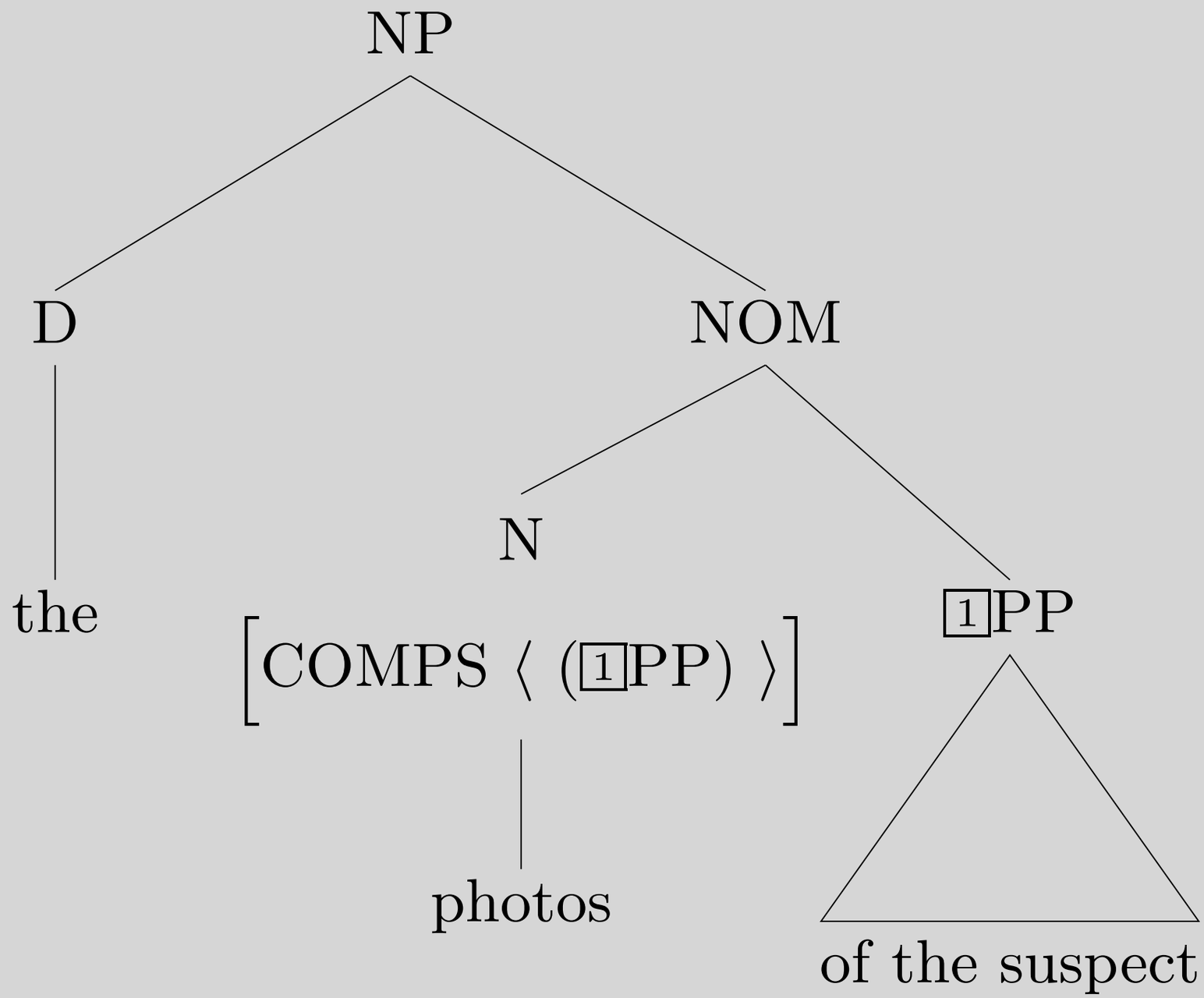
What's wrong with this tree?



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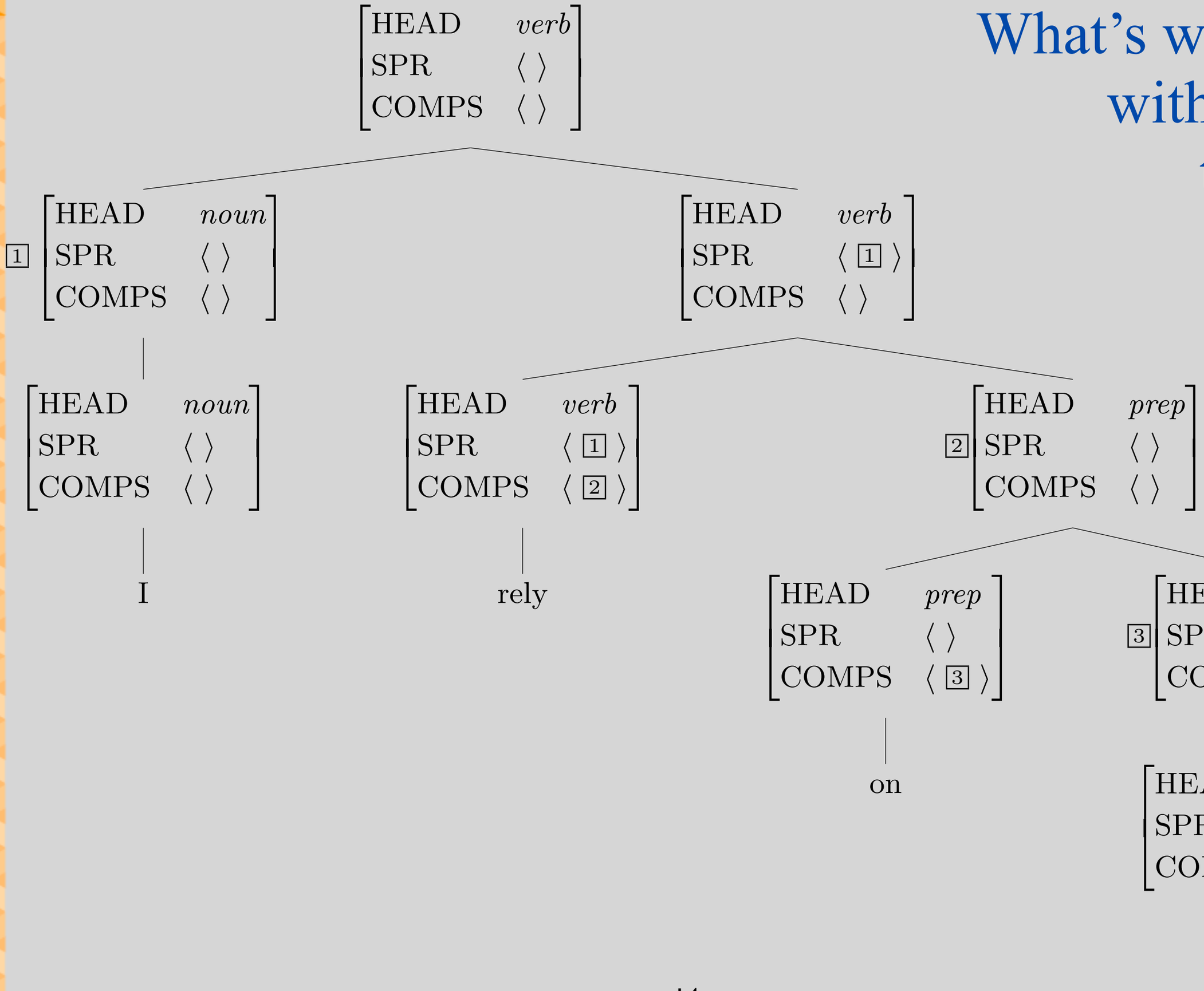
What's wrong with this tree?



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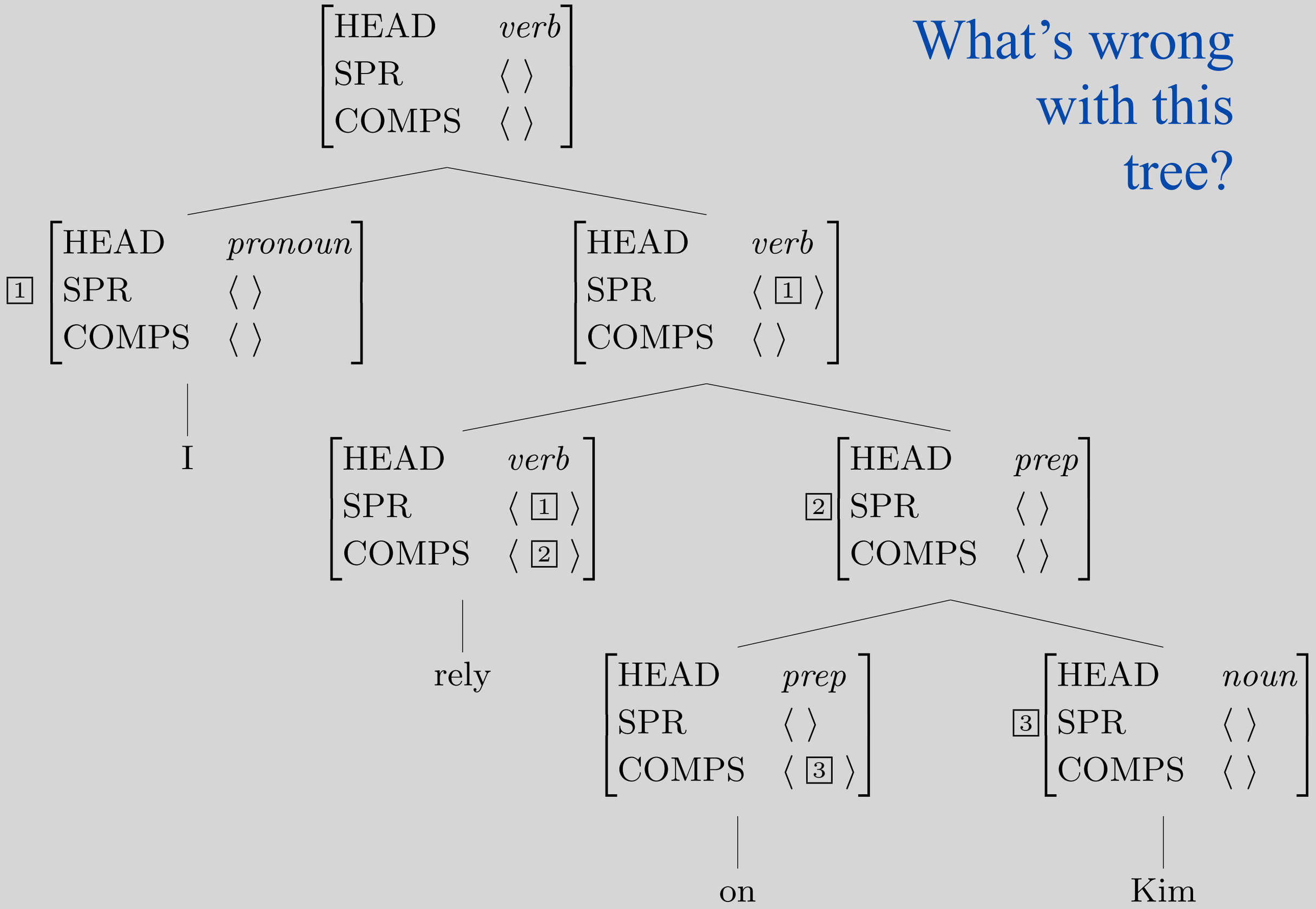

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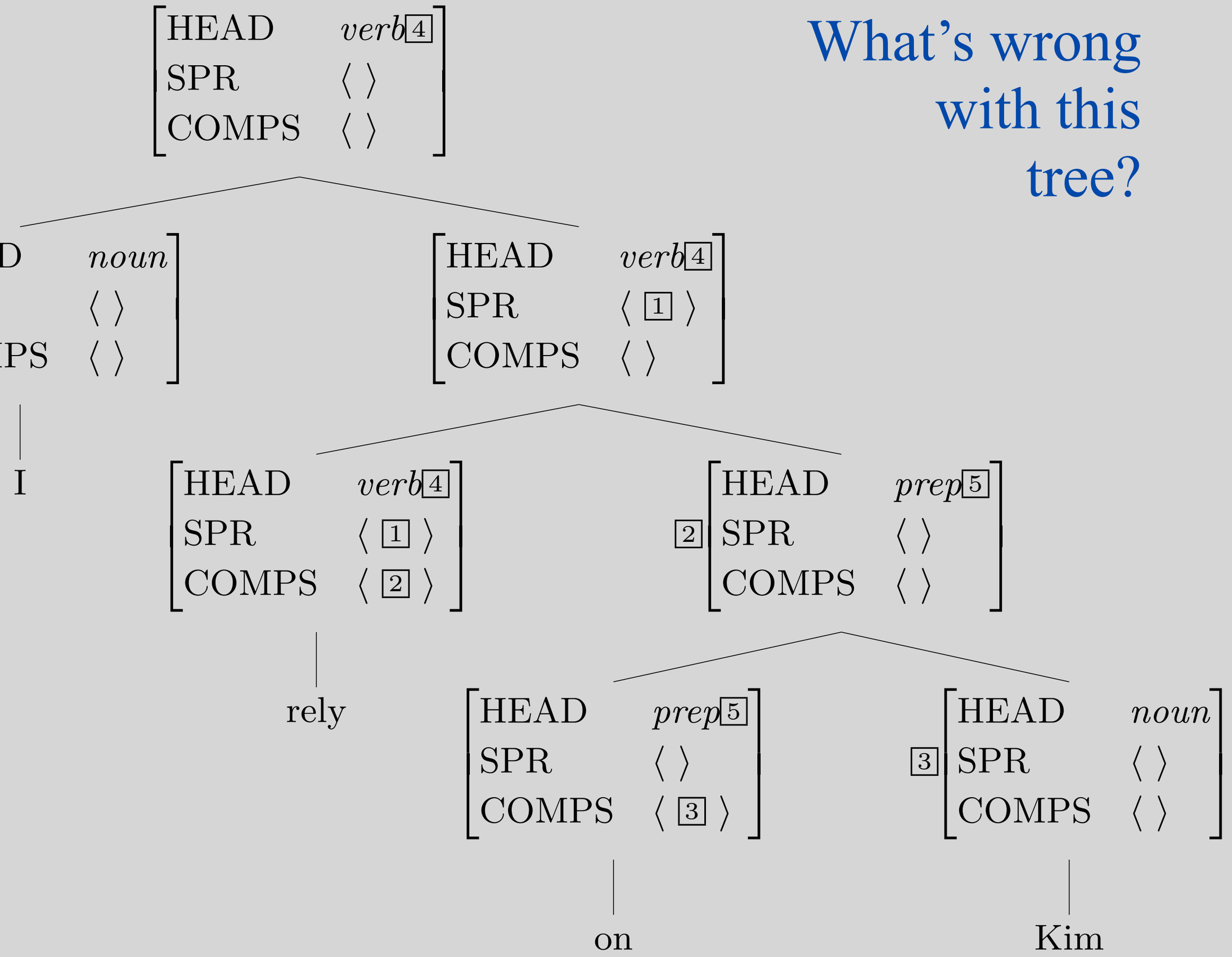

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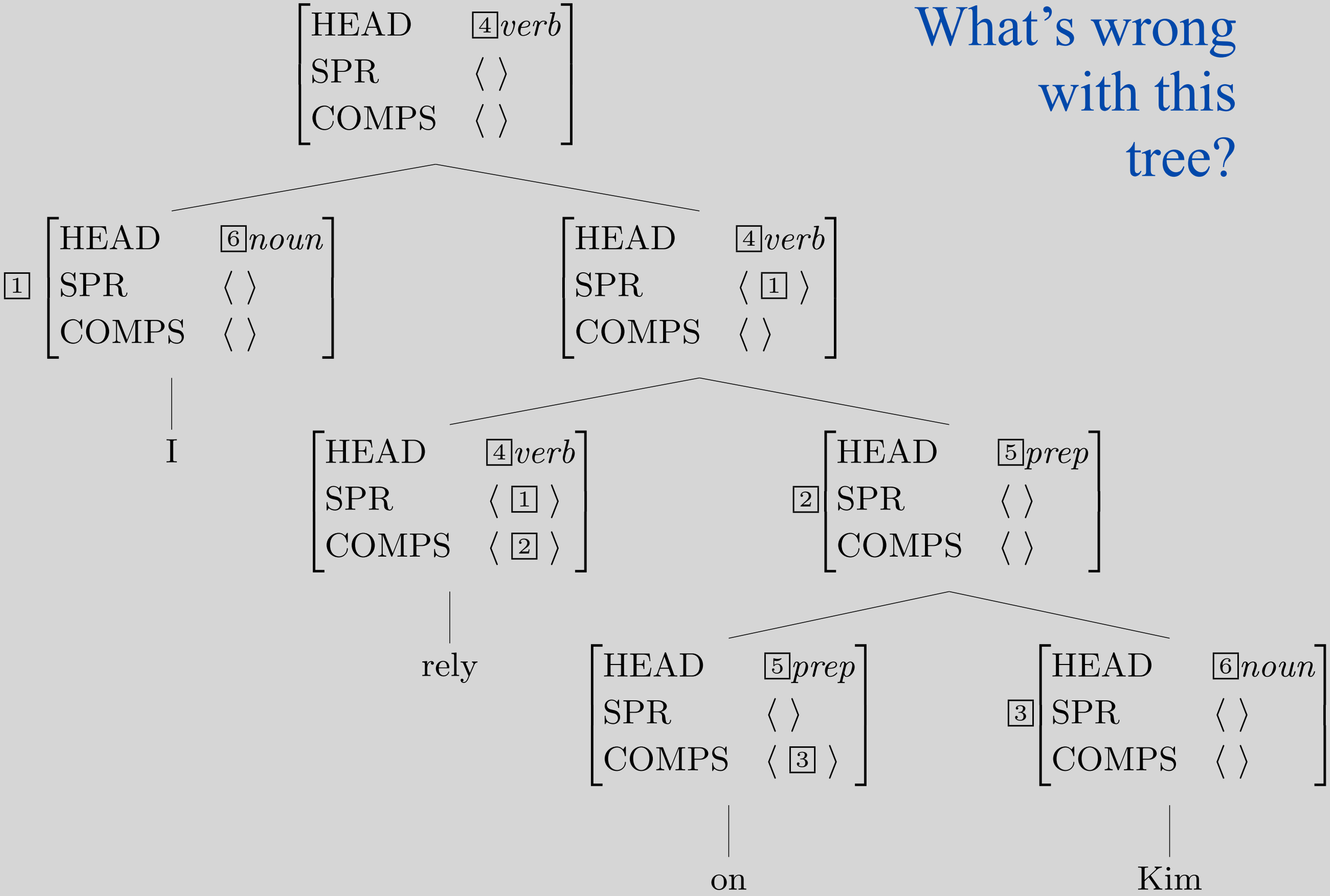
What's wrong with this tree?



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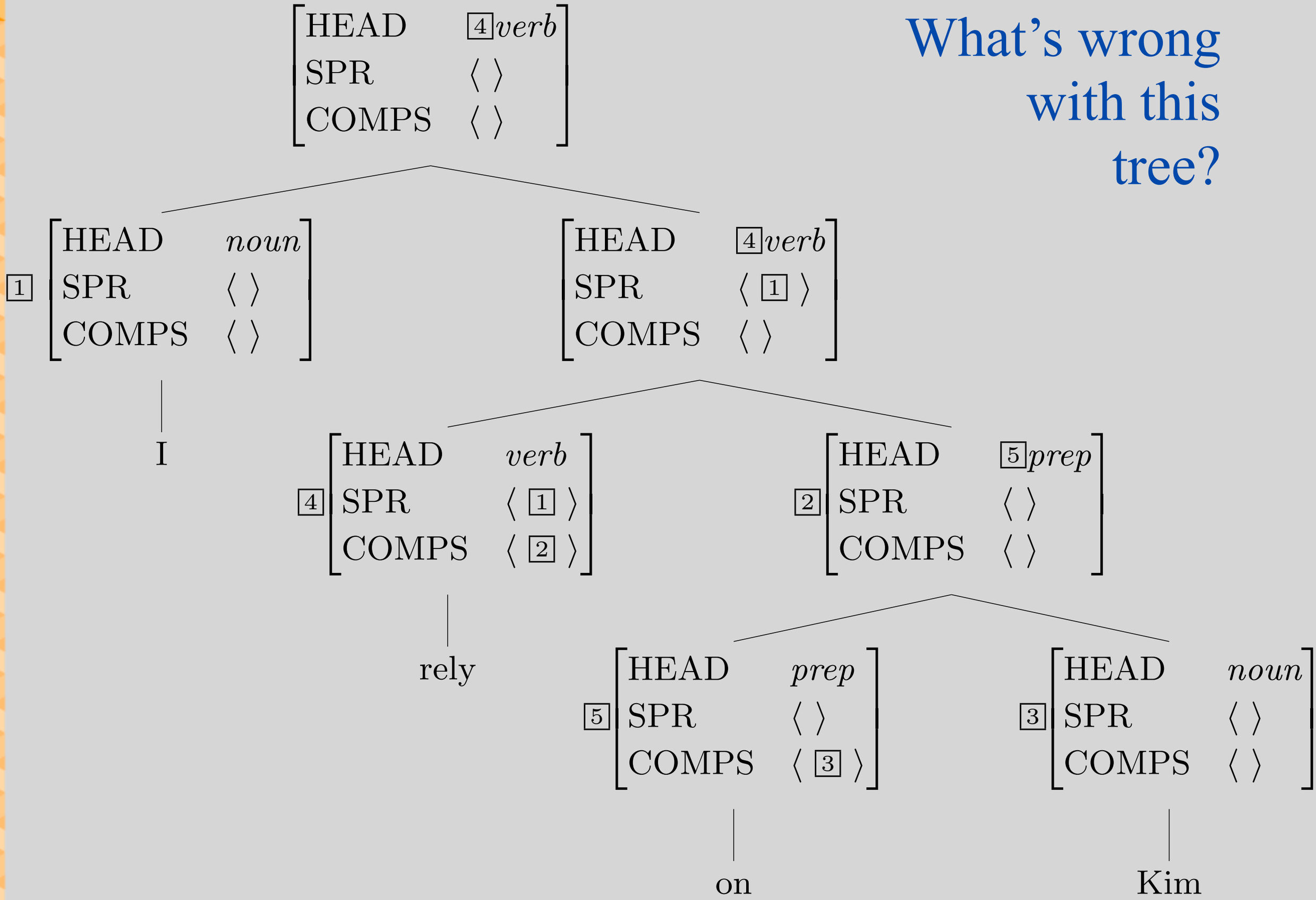
What's wrong with this tree?



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What's wrong with this?

$$\left\langle \text{hundred} \;,\; \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{number} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle \begin{bmatrix} \text{HEAD} & \textit{number} \\ \text{INDEX} & j \end{bmatrix} \rangle \\ \text{COMPS} & \langle \begin{bmatrix} \text{HEAD} & \textit{number} \\ \text{INDEX} & k \end{bmatrix} \rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & m \\ \text{MODE} & \textit{ref} \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \textit{hund-number} \\ \text{MULTIPLIER} & j \\ \text{ADDEND} & k \\ \text{HUND-VALUE} & m \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

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And this?

$$\left\langle \text{hundred}\ , \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{VAL} & \left[\begin{array}{lll} \text{SPR} & \langle & \left[\text{HEAD}\quad \textit{number}\right]\rangle \\ \text{COMPS} & \langle & \left[\text{HEAD}\quad \textit{number}\right]\rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{INDEX} & i \\ \text{MODE} & \textit{ref} \\ \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \textit{times} \\ \text{RESULT} & k \\ \text{FACTOR1} & l \\ \text{FACTOR2} & m \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{constant} \\ \text{INST} & m \\ \text{VALUE} & \textit{100} \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{plus} \\ \text{RESULT} & i \\ \text{TERM1} & j \\ \text{TERM2} & k \end{array}\right] \right\rangle \end{array}\right] \end{array}\right] \right\rangle$$

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How about this?

$$\left\langle \text{hundred} , \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \left\langle \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{INDEX} & l \end{array}\right] \right\rangle \\ \text{COMPS} & \left\langle \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{INDEX} & j \end{array}\right] \right\rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{INDEX} & m \\ \text{MODE} & \textit{ref} \\ \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \textit{times} \\ \text{RESULT} & k \\ \text{FACTOR1} & l \\ \text{FACTOR2} & m \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{constant} \\ \text{INST} & m \\ \text{VALUE} & \textit{100} \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{plus} \\ \text{RESULT} & i \\ \text{TERM1} & j \\ \text{TERM2} & k \end{array}\right] \right\rangle \end{array}\right] \end{array}\right] \right\rangle$$

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Better version

$$\left\langle \text{hundred}\ , \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{HEAD} & \textit{number} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SPR} & \left\langle \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{INDEX} & l \end{array}\right] \right\rangle \\
\text{COMPS} & \left\langle \left[\begin{array}{ll} \text{HEAD} & \textit{number} \\ \text{INDEX} & j \end{array}\right] \right\rangle
\end{array}\right]
\end{array}\right] \\
\text{SEM} & \left[\begin{array}{ll}
\text{INDEX} & i \\
\text{MODE} & \textit{ref} \\
\text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \textit{times} \\ \text{RESULT} & k \\ \text{FACTOR1} & l \\ \text{FACTOR2} & m \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{constant} \\ \text{INST} & m \\ \text{VALUE} & \textit{100} \end{array}\right], \left[\begin{array}{ll} \text{RELN} & \textit{plus} \\ \text{RESULT} & i \\ \text{TERM1} & j \\ \text{TERM2} & k \end{array}\right] \right\rangle
\end{array}\right]
\end{array}\right] \right\rangle$$

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SPR value on AP/PP?

- Kim grew fond of baseball.
- Kim and Sandy ate lunch in the park.
- Kim and Sandy are in the park.

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Qs from Tuesday

- For a word like “brunette” wouldn’t 3sing pose a problem? Because it is a gendered word in a way but it also can be plural
- Why does photos have a complement? Why is it not a modifier?
- How do we handle optional arguments, and how do you tell the difference between an optional argument and an adjunct?

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RQs: Mutual selection

- On page 177, clarifying this because it doesn't feel natural yet. Do VPs not specify NPs and that is why "they" does not have a COMPS value? But rather, just "sent" has a SPR pointing to "they" even though "they" could not appear without a following verb?

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RQs: Valence & ValP

- On page 187, is "to" the head daughter of this PP? If so, I thought the VAL would match between the two by the Valence Principle, but "to" has COMPS <[7]> and the PP has COMPS <>. Is this one of the "unless rule states otherwise" scenarios and if so, how do we identify that? Is it the Head Complement Rule negating the Valence Principle here?

- INDEX now appears in the SYN level, when it was originally introduced as a feature of the SEM level. I'm having difficulty understanding how that works.

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RQs: Fully resolved v. underspecified

- In the first paragraph of page 166, what is exactly a Φ, a conceptual tree structure or a set of grammatical requirements? In other words, why don't we just express a lexical entry like <ω,F>?
- I'm not sure I understand why "the information specified by our rules and lexical entries is thus partial information" (p. 168).

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RQs: Fully resolved v. underspecified

- If there are many fully resolved word-structures that a lexical entry can realize, wouldn't there be a lot of redundancy in the grammar? Even if we have phrase-structure rules, grammatical principles and constraints to define which word-structure can be combined in the syntax (in the right context), there will still be many word-structures floating around.

- Is it possible to have fully-resolved word structures that are not 'real' words in a particular language?

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RQs: Fully resolved v. underspecified

- Since rules and lexical entries can both be under-specified, does that mean a sentence could have multiple models even if there is no structural differences among these models? If not, how do we make sure the grammar can generate one model for each sentence it licenses? If yes, what are some of the considerations when we make the lexical entries so that only desired models can be generated by the grammar?

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RQs: Ambiguity, unexpressed arguments

- I still don't quite understand the two different RESTRs for "to Lee". I think I don't quite get what the two interpretations would be here because they sound the same to me, despite the footnote on page 191.

- On page 191, I guess the example I sometimes inadvertently send letters to my sister to my brother would make sense when to my sister and to my brother had different roles. However in examples (18) (30) (31), how are SENDEE and ADDRESSEE differ if Lee is the receiver of the letter? How do we decide when it is unsubtle / ambiguous enough to have different representations?

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RQs: Ambiguity, unexpressed arguments

- Is it the case that not all indices need to be indexed? For example, with the structural ambiguity around the sentence We sent two letters to Lee, in one reading Lee is the sendee and is indexed as j, but in another she is the addressee and is indexed as m. When Lee is indexed as one, does the other just remain unindexed? Are there rules for when some index does not need to be specified?

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RQs: Ambiguity, unexpressed arguments

- Looking at example (14) on pg 176, "sent", is it safe to say that if we aren't expecting three arguments then we would omit them in the lexical entry itself? For example, would we change the lexical entry of "sent" to perhaps only "SENDER" and "SENT" if the sentence in question is something like "Mark sent a letter". Or would we still have the third value "SENDEE" and simply omit it from the syntax? I suppose this means lexical entries depend on the sentences the words are a part of, versus the word and possible arguments themselves, so perhaps I'm just confused as to the relationship between the "lexical entry of a word" and "that word's feature set in a sentence"

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RQs: Predication design

- In page 179, the RESTR value of the top node of (16) consists of seven predications. I am wondering how elaborately this should be done. I'd like to know what role RELN member plays in the interpretation of this sentence? Is the semantic relation unclear without it?

- At the moment, the semantic restrictions seem somewhat arbitrary in choice. Are there any restrictions on what kinds of relations you can have? Or an explanation of what the goal is, to guide what sort of things you should choose when building semantic features?

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RQs: Predication design

- On page 169 why does the lexical entry for "letter" have an addressee but not a addresser/writer attached to it as well?
- Why is here [NAME Lee] feature in RESTR of Lee? Isn't it a bit redundant?

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RQs: Semantically empty Ps

- I'm having trouble understanding why 'to' is treated as semantically empty rather than affecting the meaning of 'Lee' in some way (e.g., by indexing Lee as the recipient or addressee).
- How do we know when a word's RESTR should be the empty list?

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RQs: INDEX on determiners

- In (5) on p. 169, The SPR's INDEX is listed as k. this is the same as in the SEM feature for letter. Why is this?
- I might be missing something, but I don't quite understand the reasoning behind identifying the INDEX and INST values of a noun with the INDEX of its specifier. Is it suggesting there can't be an instance of something without a specifier?
- Why do we use BV in examples (24) and (25) for the lexical entry two? Why can't we use INST? Would it be just as valid to say that it's an instance of two objects?

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Lexical Entry for *a*

$$\left\langle \text{a}\ , \left[\begin{array}{ll} \textit{word} & \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \left[\begin{array}{ll} \textit{det} & \\ \text{AGR} & \textit{3sing} \\ \text{COUNT} & + \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{COMPS} & \langle\ \rangle \\ \text{SPR} & \langle\ \rangle \\ \text{MOD} & \langle\ \rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{MODE} & \text{none} \\ \text{INDEX} & j \\ \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \text{a} \\ \text{BV} & j \end{array}\right] \right\rangle \end{array}\right] \end{array}\right] \right\rangle$$

- Is this a fully specified (resolved) description?
- What features are unspecified?
- How many word structures can this entry license?

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Lexical Entry for *cat*

$$\left\langle \text{cat} , \left[\begin{array}{l} \textit{word} \\ \text{SYN} \left[\begin{array}{ll} \text{HEAD} & \left[\begin{array}{ll} \textit{noun} & \\ \text{AGR} & \left[\begin{array}{ll} \textit{3sing} & \\ \text{GEND} & \text{neut} \end{array}\right] \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \left\langle \left[\begin{array}{ll} \text{COUNT} & + \\ \text{INDEX} & k \end{array}\right] \right\rangle \\ \text{COMPS} & \langle\,\rangle \\ \text{MOD} & \langle\,\rangle \end{array}\right] \end{array}\right] \\ \text{SEM} \left[\begin{array}{ll} \text{MODE} & \text{ref} \\ \text{INDEX} & k \\ \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \text{cat} \\ \text{INSTANCE} & k \end{array}\right] \right\rangle \end{array}\right] \end{array}\right] \right\rangle$$

- Which feature paths are abbreviated?
- Is this a fully specified description?
- What features are unspecified?
- How many word structures can this entry license?

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NP *a cat*

$$\left[\begin{array}{ll} \textit{phrase} & \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \boxed{6} \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \boxed{3} \\ \text{MOD} & \boxed{4} \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{MODE} & \boxed{8} \\ \text{INDEX} & k \\ \text{RESTR} & \boxed{\text{A}} \oplus \boxed{\text{B}} \end{array}\right] \end{array}\right]$$

$$\boxed{7}\left[\begin{array}{ll} \textit{word} & \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \left[\begin{array}{ll} \textit{det} & \\ \text{AGR} & \boxed{2} \\ \text{COUNT} & + \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{COMPS} & \langle\ \rangle \\ \text{SPR} & \langle\ \rangle \\ \text{MOD} & \langle\ \rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{MODE} & \text{none} \\ \text{INDEX} & k \\ \text{RESTR} & \boxed{\text{A}}\left\langle\left[\begin{array}{ll} \text{RELN} & \text{a} \\ \text{BV} & k \end{array}\right]\right\rangle \end{array}\right] \end{array}\right]$$

$$\left[\begin{array}{ll} \textit{word} & \\ \text{SYN} & \left[\begin{array}{ll} \text{HEAD} & \boxed{6}\left[\begin{array}{ll} \textit{noun} & \\ \text{AGR} & \boxed{2}\left[\begin{array}{ll} \textit{3sing} & \\ \text{GEND} & \text{neut} \end{array}\right] \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{SPR} & \langle\ \boxed{7}\ \rangle \\ \text{COMPS} & \boxed{3}\langle\ \rangle \\ \text{MOD} & \boxed{4}\langle\ \rangle \end{array}\right] \end{array}\right] \\ \text{SEM} & \left[\begin{array}{ll} \text{MODE} & \boxed{8}\text{ref} \\ \text{INDEX} & k \\ \text{RESTR} & \boxed{\text{B}}\left\langle\left[\begin{array}{ll} \text{RELN} & \text{cat} \\ \text{INSTANCE} & k \end{array}\right]\right\rangle \end{array}\right] \end{array}\right]$$

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Terminology

- Over to Liz…

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Type hierarchy analogies

- How is this formalism like OOP?
- How is it different?
- How is the type hierarchy like an ontology?
- How is it different?
- How is this formalism like the MP's formalism?
- How is it different?

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English Resource Grammar

- Broad-coverage, precision HPSG for English
- Under continuous development since 1993
- >90% validated coverage on open-domain (well edited) English text
- Demo: https://delph-in.github.io/delphin-viz/demo
- Flickinger 2000, 2011

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Redwoods Treebank

- https://github.com/delph-in/docs/wiki/RedwoodsTop
- Use grammar to create parse forest
- Hand select preferred parse based on discriminants (Carter 1997)
- Store these choices!
- Oepen et al 2004, Flickinger et al 2017
- Demo: http://erg.delph-in.net/logon

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HPSG formalism as Turing machine

- https://delph-in.github.io/docs/summits/Fairhaven2022-Emerson-Turing-types/

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