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English NPN Constructions: A Constraint-Based Analysis

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Introduction

What are NPN Constructions?

Noun-Preposition-Noun Constructions

- Consist of two nouns and a preposition, with one noun preceding and the other following the preposition to form a constituent

(1) a. *Day after day*, the weather remained gloomy.
b. The snow fell, *layer upon layer*, covering the entire village in white.
c. The police searched the neighborhood, *house by house*.
d. *Line for line*, the two articles are equally remarkable.
e. The G20 leaders met *face to face*.

Theoretical challenges

NPNs present six theoretical challenges:

- Peculiar properties of NPN nouns
- Constructional meanings
- Dual functionality
- Syntax-semantics mismatch
- Distribution and interpretation of modifiers
- Multiplication

Due to these challenges, NPNs are often treated as “idiomatic” constructions.

e.g., Nonheaded constructions (Poss, 2010; Bargmann, 2019)
Two distinct heads and internal structures (Jackendoff, 2008; Haïk, 2013, 2018)

Aims of the study

This study aims to:

- Demonstrate that the challenges of NPNs can be accounted for within a unified headed analysis, eliminating the need for nonheaded or dual structures
- Provide an analysis that accounts for all six challenges, something previous studies have not attempted

To achieve this, new lexical and constructional constraints for NPNs will be proposed.

e.g., *npn-preposition-lexeme, npn-construction*

Phenomena

Theoretical challenge 1

Peculiar properties of NPN nouns

- The two nouns in NPNs must be *identical*.
- The two nouns in NPNs must be *bare, third-singular count nouns*.

(2) a. *day after month (cf. day after day), *face to shoulder (cf. face to face)

b. *men for men, *books after books, *weeks by weeks

c. *water after water, *dusk for dusk

d. *the man for the man, *a day after a day, *some inch by some inch

(Jackendoff, 2008, p. 9; (2a) my own.)

Q. How can such “defective” nouns, lacking determiners, function as full NPs?
Q. Do prepositions impose constraints, requiring the two nouns to be identical and bare singular count nouns?

Theoretical challenge 2

Constructional meanings

- NPNs exhibit a constructional meaning not predictable from the combination of their individual components (Matsuyama, 2004; Jackendoff, 2008).

(3) a. *Student after student* visited the professor's office.
= 'multiple students in **succession**'

b. *Line for line*, the two articles are equally remarkable.
= 'the **matching** of the corresponding lines from the two articles, i.e., comparison'

c. The G20 leaders met *face to face*.
= 'the **juxtaposition** of the faces of the leaders'

Q. How are these constructional meanings derived?
Q. Do prepositions in NPNs carry richer semantic content than ordinary prepositions?

Theoretical challenge 3

Dual functionality

- NPNs can function as either arguments or adjuncts within a sentence.

(4) a. *Day after day* brings new challenges to overcome.

b. The weather remained gloomy *day after day*.

Q. Which element functions as the head: the noun or the preposition?
Q. If it is the noun, which of the two nouns serves as the head?

Theoretical challenge 4

Syntax-semantics mismatch (in argument NPNs)

- NPNs that are semantically plural agree with singular verbs.

(5) Student after student {was / *were} actively participating in the mock U.N.

- Further evidence for semantic plurality: (un)boundedness

(6) a. Chuck ate **an apple** {**for* an hour / *in* an hour}.

b. Chuck ate **apples** / **apple after apple** {*for* an hour / **in* an hour}.

(adapted from Tenny, 1994, p. 24)

Theoretical challenge 5

Distribution and interpretation of modifiers

- The nouns in *N after N*, *N upon N*, and *N by N* can be premodified by adjectives.

(7) a. *miserable* day after *miserable* day

b. *strong* argument upon *strong* argument

c. *tall* boy by *tall* boy

d. (The two girls met) ?**pretty* face to *pretty* face

e. (They matched) ?**fun* game for *fun* game

Theoretical challenge 5

Distribution and interpretation of modifiers

- The modifiers must be identical.
- The modifier on the first noun (N1) is optional, the one on the second noun (N2) is obligatory.

(8) a. miserable day after {miserable / *awful} day
b. (miserable) day after *(miserable) day

- A similar pattern holds when an NPN noun takes a PP complement.
  e.g., *day *of rain* after day *of snow*, *day *of rain* after day

Theoretical challenge 5

Distribution and interpretation of modifiers

- Interestingly, the scope of modification always encompasses both nouns, even if only N2 is modified.

(9) a. miserable day after miserable day

b. day after miserable day

≈ ‘miserable days in succession’

→ The syntactic distribution of modifiers in NPNs does not always align with their semantic scope.

Theoretical challenge 6

Multiplication

- Within an NPN, the PN sequence can be iterated.

(10) a. *Student after student after student* visited the professor's office.

b. He kept presenting *argument upon argument upon argument*, but none of them were convincing.

c. The rescue team searched *house by house by house* until they found all the missing people.

These six challenges reveal the distinctive syntactic and semantic behavior of NPNs, underscoring their descriptive complexity.

Previous approaches

Major approaches

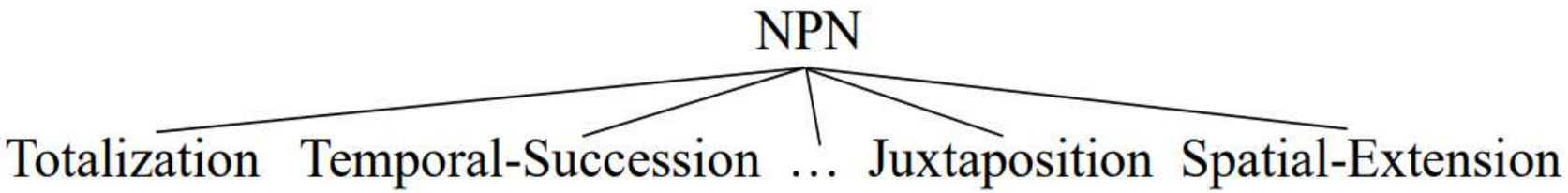
Previous studies on NPNs can be broadly classified into three approaches:

- **Minimalist approaches**
  (e.g., Pi, 1995; Travis, 2001, 2003; Kudo, 2013; Haïk, 2013, 2018; Pskit, 2015, 2021)
- **Construction-based approaches**
  (e.g., Jackendoff, 2008; Poss, 2010; Bargmann, 2019)
- **Semantic approaches**
  (e.g., Matsuyama, 2004, 2006; Beck & von Stechow, 2006, 2007; Kinn, 2022)

Nonheaded construction analyses

Poss (2010)

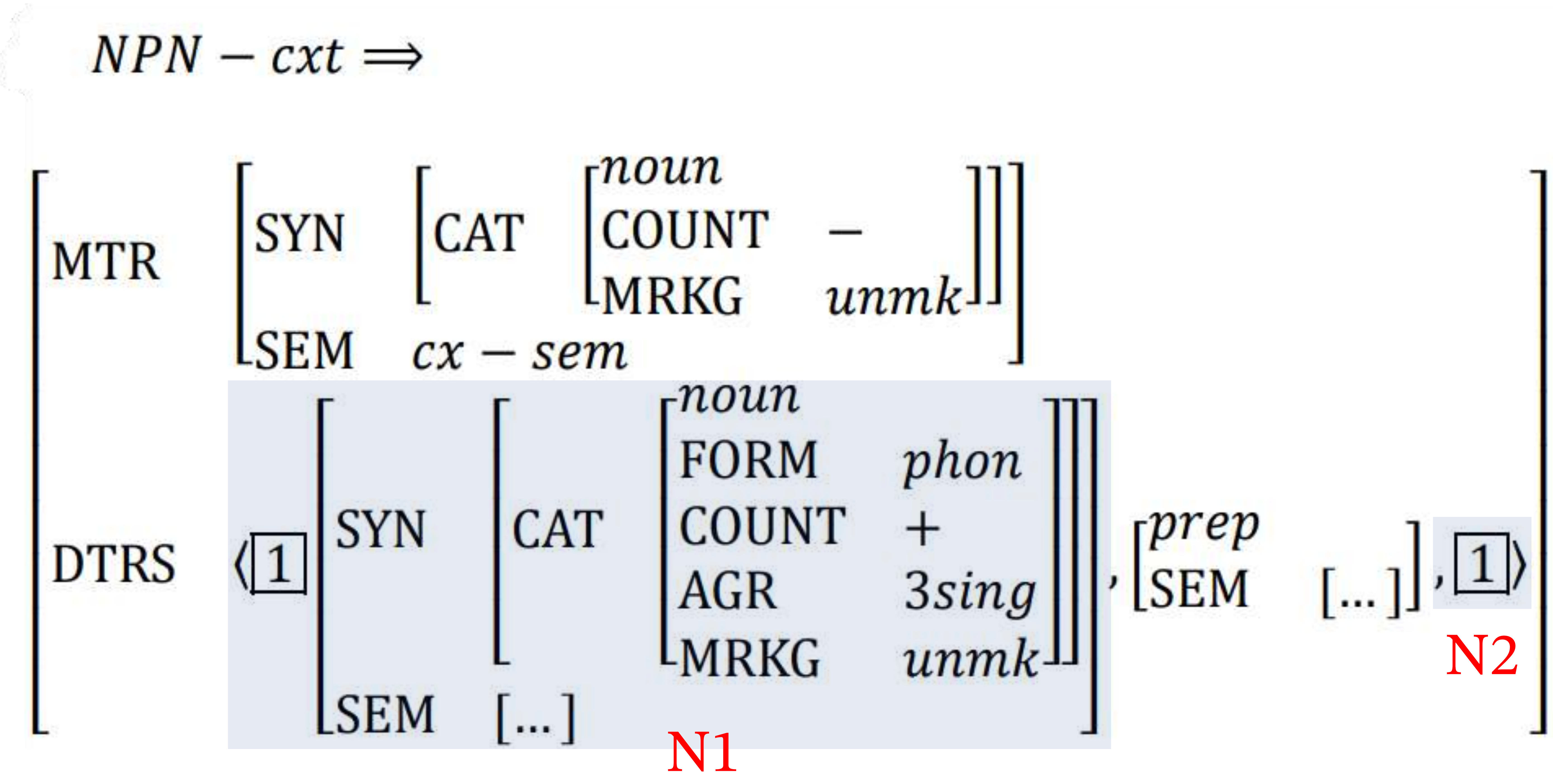
- Inheritance hierarchy for Dutch NPNs



Nonheaded construction analyses

Poss (2010)

- Constructional type *NPN-cxt*
- Peculiar properties of NPN nouns



Nonheaded construction analyses

Poss (2010)

- Constructional type *NPN-cxt*
- Constructional meanings

$$npn - tot - lxm \Longrightarrow \begin{bmatrix} NPN - cxt & \\ \text{MTR} & [\text{SEM} \quad totalization] \\ \text{DTRS} & \begin{bmatrix} prep & \\ \text{PHON} & \langle voor/per \rangle \end{bmatrix} \end{bmatrix}$$

$$NPN - cxt \Longrightarrow$$

$$\begin{bmatrix} \text{MTR} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} noun & \\ \text{COUNT} & - \\ \text{MRKG} & unmk \end{bmatrix} \end{bmatrix} \\ \text{SEM} & cx - sem \end{bmatrix} \\ \text{DTRS} & \langle \boxed{1} \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} noun & \\ \text{FORM} & phon \\ \text{COUNT} & + \\ \text{AGR} & 3sing \\ \text{MRKG} & unmk \end{bmatrix} \end{bmatrix} \\ \text{SEM} & [\dots] \end{bmatrix}, \begin{bmatrix} prep & \\ \text{SEM} & [\dots] \end{bmatrix}, \boxed{1} \rangle \end{bmatrix}$$

Nonheaded construction analyses

Limitations

- Since the SEM value lacks further specification (i.e., it is an atomic value), the proposed subconstructions oversimplify the complex meanings of NPNs.

(11) *Column by column*, we quickly work through the course catalogue of week 17.
= 'the course catalogue is the quantified item that is made up of a finite set of column (i.e., *the totalization of columns*)'

(Poss, 2010, p. 52; Dutch version omitted.)

Nonheaded construction analyses

Bargmann (2019)

- Employs λ-calculus to more precisely capture the semantics of NPNs.
  e.g., a formal representation of *N after N*

$$\begin{bmatrix}
\text{PHON} & \langle N, after, N \rangle \\
\text{SYN} & \begin{bmatrix} \text{HEAD} & \boxed{1}\begin{bmatrix} noun \\ \text{COUNT} & - \\ \text{AGR} & 3sing \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\,\rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\
\text{SEM} & \lambda P.\exists X.|X| > 1 \& \forall_x \in X: N'(x) \& P(x) \& \exists R^{order} \subseteq X^2 \\
\text{DTRS} & \left\langle \begin{bmatrix} \text{PHON} & \langle N \rangle \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \boxed{1}\begin{bmatrix} noun \\ \text{COUNT} & + \\ \text{AGR} & 3sing \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle Det \rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \lambda x. N'(x) \end{bmatrix}, \begin{bmatrix} \text{PHON} & \langle after \rangle \\ \text{SYN|HEAD} & prep \\ \text{SEM} & \exists R^{order} \subseteq X^2 \end{bmatrix}, \begin{bmatrix} \text{PHON} & \langle N \rangle \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle Det \rangle \\ \text{COMPS} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \lambda x. N'(x) \end{bmatrix} \right\rangle
\end{bmatrix}$$

There exists a set X such that…
- The cardinality of set X is greater than 1
- **The ordering relation exists for all the elements of X**

Nonheaded construction analyses

Problems of nonheaded construction analyses

- Cross-linguistic data provide evidence of **P's headhood**.

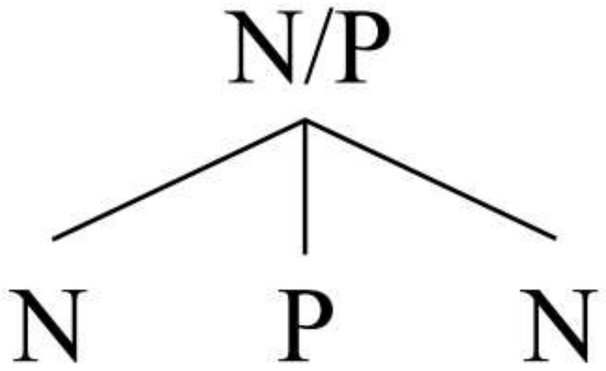
(12) Mijał **dzień** za **dniem**.
pass.3SG.PST day.SG.NOM after day.SG.INS
'Day after day passed.' (Pskit, 2021, p. 93)

(13) Þannig leið **dagur** eftir **dag**.
thus passed.3SG day.SG.NOM after day.SG.ACC
'In this way, day after day passed.' (Kinn, 2022, p. 14)

Dual-head analyses

Haïk (2013, 2018)

- NPNs as lexical units generated through **symmetric Merge**
- A preposition symmetrically and simultaneously merges with a noun on both its right and left sides, resulting in a flat ternary structure.



Dual-head analyses

Haïk (2013, 2018)

- In this analysis, argument NPNs and adjunct NPNs differ in terms of **numeration** and **head**.

  Adjunct NPNs: {P, N}; P as the head

  Argument NPNs: {N}; N as the head, P as the coordinating conjunction

Jackendoff (2008)

- Two distinct heads:
  adjunct NPNs are regular PPs, argument NPNs are *NPs headed by P*

Dual-head analyses

Problems of dual-head analyses

(14) a. *Day after day* brings new challenges to overcome.
b. The weather remained gloomy *day after day*.

However, given the dual functionality, positing two distinct heads for the same phrase leads to a **context-dependent determination of the head**.

In summary

Problems of previous approaches

- First, they resort to non-standard syntactic or semantic mechanisms in order to explain the properties of NPNs.
- Second, they fail to account for all six properties in a single theoretical framework.

In response to these problems, this study attempts to provide a principled analysis: one that relies on standard syntactic and semantic mechanisms, and one that accounts for all six properties together.

Proposal

The syntax of NPNs

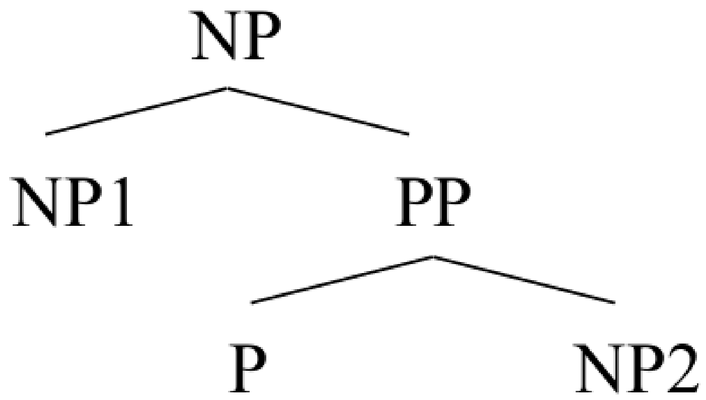
Argumentation on internal structure

- P and NP2 form a constituent, with P as the head and NP2 as the complement.
- There is a modification relation between NP1 and PP in an NPN.

(15) a. They didn't understand [the lecture *about* syntax].

b. [Student *after* student] filed into the classroom.

→ Kinn's (2022) structure of NPNs



The syntax of NPNs

Lexical constraints

The NPN Preposition Lexical Rule

$$\begin{bmatrix} predp-lxm \\ \text{SS|LOC} \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} prep \\ \text{MOD} & \langle \text{Y} \rangle \end{bmatrix} \\ \text{SUBJ} & \langle \text{X} \rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{MODE} & prop \\ \text{RESTR} & \langle \text{Z} \rangle \end{bmatrix} \end{bmatrix} \\ \text{ARG-ST} \ \langle \text{NP}, \text{NP} \rangle \end{bmatrix} \Rightarrow_{LR} \begin{bmatrix} npn-p-lxm \\ \text{CAT} \begin{bmatrix} \text{HEAD|MOD} & \left\langle \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{SPR} & \langle det \rangle \end{bmatrix} \right\rangle \\ \text{SPR} & \langle\,\rangle \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{HEAD} & \boxed{1} \begin{bmatrix} \text{AGR} & 3sing \\ \text{COUNT} & + \end{bmatrix} \\ \text{SPR} & \langle det \rangle \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{CONT} \begin{bmatrix} \text{MODE} & prop \vee ref \\ \text{RESTR} & \langle [\text{RELN } npn-p-rel], \ldots \rangle \end{bmatrix} \end{bmatrix}$$

NP1

NP2

The syntax of NPNs

Lexical constraints

- The identity requirement between the two nouns is attributed to their semantics.

$$npn-p-lxm \Rightarrow \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \text{HEAD|MOD} & \left\langle \left[\text{RESTR} \left\langle \left[\begin{array}{ll}\text{RELN} & \boxed{1} \\ \text{INST} & i\end{array}\right] \right\rangle \oplus \boxed{\text{B}} \right] \right\rangle \\ \text{COMPS} & \left\langle \left[\text{RESTR} \boxed{\text{A}} \left\langle \left[\begin{array}{ll}\text{RELN} & \boxed{1}\, N \\ \text{INST} & j\end{array}\right] \right\rangle \oplus \boxed{\text{B}} \oplus \boxed{\text{C}} \right] \right\rangle \end{array}\right] \\ \text{CONT} & \left[\text{RESTR} \ \boxed{\text{A}} \oplus \boxed{\text{B}} \oplus \boxed{\text{C}} \oplus \langle [\text{RELN}\ npn-p-rel], \ldots \rangle \right] \end{array}\right]$$

The syntax of NPNs

Lexical constraints: advantages

- By attributing the identity requirement to semantics rather than phonology or morphology, cross-linguistic data where the two nouns are case-marked differently are not problematic.

(16) Mijał **dzień** za **dniem**.
pass.3SG.PST day.SG.NOM after day.SG.INS
'Day after day passed.'

- It offers a possible explanation for the puzzling phenomena of modification in NPNs

The syntax of NPNs

Lexical constraints: advantages

- It offers a possible explanation for the distribution and interpretation of modifiers in NPNs.
- In the constraint, the second noun is allows to specify additional information (⊕ C).

→ This rules out cases where **the first NP carries more semantic information**. (e.g., **miserable day after day*).

$$npn-p-lxm \Rightarrow \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \text{HEAD|MOD} & \left\langle \left[\begin{array}{ll} \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \boxed{1} \\ \text{INST} & i \end{array}\right] \right\rangle \oplus \boxed{B} \end{array}\right] \right\rangle \\ \text{COMPS} & \left\langle \left[\begin{array}{ll} \text{RESTR} & \boxed{A} \left\langle \left[\begin{array}{ll} \text{RELN} & \boxed{1}\, N \\ \text{INST} & j \end{array}\right] \right\rangle \oplus \boxed{B} \oplus \boxed{C} \end{array}\right] \right\rangle \end{array}\right] \\ \text{CONT} & \left[\text{RESTR} \quad \boxed{A} \oplus \boxed{B} \oplus \boxed{C} \oplus \langle [\text{RELN}\ npn-p-rel], \ldots \rangle\right] \end{array}\right]$$

The syntax of NPNs

Lexical constraints: advantages

- Importantly, since the RESTR value of the second noun is reflected in the RESTR list of the preposition, the **NP2 determines the semantic contribution of NPN nouns to the construction**.

→ This explains the interpretive property of modifiers.

$$npn-p-lxm \Longrightarrow \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \text{HEAD|MOD} & \left\langle \left[\begin{array}{ll} \text{RESTR} & \left\langle \left[\begin{array}{ll} \text{RELN} & \boxed{1} \\ \text{INST} & i \end{array}\right] \right\rangle \oplus \boxed{B} \end{array}\right] \right\rangle \\ \text{COMPS} & \left\langle \left[\begin{array}{ll} \text{RESTR} & \boxed{A} \left\langle \left[\begin{array}{ll} \text{RELN} & \boxed{1} N \\ \text{INST} & j \end{array}\right] \right\rangle \oplus \boxed{B} \oplus \boxed{C} \end{array}\right] \right\rangle \end{array}\right] \\ \text{CONT} & \left[\text{RESTR} \quad \boxed{A} \oplus \boxed{B} \oplus \boxed{C} \oplus \langle [\text{RELN} \ npn-p-rel], \ldots \rangle \right] \end{array}\right]$$

The syntax of NPNs

Lexical constraints: The complete type constraint for *npn-p-lxm*

$$npn-p-lxm \Rightarrow$$

$$\left[\begin{array}{ll}
\text{CAT} & \left[\begin{array}{ll}
\text{HEAD|MOD} & \left\langle\left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \boxed{1}\\ \text{SPR} & \langle det\rangle\end{array}\right]\\ \text{CONT} & \left[\begin{array}{ll}\text{RESTR} & \left\langle\left[\begin{array}{ll}\text{RELN} & \boxed{2}\\ \text{INST} & i\end{array}\right]\right\rangle \oplus \boxed{B}\end{array}\right]\end{array}\right]\right\rangle\\
\text{SPR} & \langle\,\rangle\\
\text{COMPS} & \left\langle\left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \boxed{1}\left[\begin{array}{ll}\text{AGR} & 3sing\\ \text{COUNT} & +\end{array}\right]\\ \text{SPR} & \langle det\rangle\end{array}\right]\\ \text{CONT} & \left[\begin{array}{ll}\text{RESTR} & \boxed{A}\left\langle\left[\begin{array}{ll}\text{RELN} & \boxed{2}N\\ \text{INST} & j\end{array}\right]\right\rangle \oplus \boxed{B} \oplus \boxed{C}\end{array}\right]\end{array}\right]\right\rangle
\end{array}\right]\\
\text{CONT} & \left[\begin{array}{ll}\text{MODE} & prop \vee ref\\ \text{RESTR} & \boxed{A} \oplus \boxed{B} \oplus \boxed{C} \oplus \langle[\text{RELN} \quad npn-p-rel], \ldots\rangle\end{array}\right]
\end{array}\right]$$

The semantics of NPNs

Categorization of NPN meanings

- Following Jackendoff (2008), I categorize NPN meanings into three types according to the type of preposition: **succession**, **matching**, and **juxtaposition**.

Typical examples

succession (*after*, *by*, *upon*, …)

e.g., Student after student visited the professor's office.

matching (*for*, …)

e.g., Line for line, the two articles are equally remarkable.

juxtaposition (*to*, *in*, …)

e.g., The two leaders met face to face.

The semantics of NPNs

Formalization of NPN meanings

- NPNs essentially represent two (or more) entities that share a same property and the relation between them.
- That specific property is determined by the noun that is included in the construction.

To capture this:

- I employ the notion of sets, specifying the NPN meanings in the lexical entries of NPN prepositions (i.e., *npn-p-lxm*).

The semantics of NPNs

Formalization of NPN meanings: succession

- In (17), the NPN phrase can be interpreted as denoting entities that share the property of being a student and stand in a succession relation.

(17) a. [Student after student] visited the professor's office.

b. [$\text{Student}_1 \rightarrow \text{Student}_2 \rightarrow \ldots \rightarrow \text{Student}_n$] visited the professor's office.

- Using the notion of sets, this can be described as **a set of students whose elements form a succession relation**, with each element following the previous one.

The semantics of NPNs

Formalization of NPN meanings: succession

- This information is specified in the lexical entries of succession prepositions: $after_{NPN}$, $upon_{NPN}$, and by_{NPN} (i.e., *after*, *upon*, and *by* in their NPN usage).

$$\begin{bmatrix} npn-p-lxm \\ \text{CAT} \quad \left[\text{COMPS} \quad \left\langle \left[\text{CONT|RESTR} \quad \boxed{A}\left\langle \begin{bmatrix}\text{RELN} & N \\ \text{INST} & j\end{bmatrix}\right\rangle\right]\right\rangle\right] \\ \text{CONT} \quad \left[\text{RESTR} \quad \boxed{A} \oplus \left\langle \begin{bmatrix}\text{RELN} & group \\ \text{INST} & i\end{bmatrix}, \begin{bmatrix}\text{RELN} & member \\ \text{SET} & i \\ \text{ELEMENT} & j_{n\geq 2}\end{bmatrix}, \begin{bmatrix}\text{RELN} & in-succession \\ \text{SIT} & s \\ \text{PREDECESSOR} & j_n \\ \text{SUCCESSOR} & j_{n+1}\end{bmatrix} \right\rangle\right] \end{bmatrix}$$

The semantics of NPNs

Formalization of NPN meanings: matching

- Matching denotes the **pairing** of two entities share the same property.

(18) Line for line, the two articles are equally remarkable.

→ *line for line* signifies that the lines of article A and the corresponding lines of article B are matched in a one-to-one manner, facilitating a comparison between the two articles.

- These exists **two sets**:
- The elements of the first set have the property of being lines of article A.
- The elements of the second set have the property of being lines of article B.
- The corresponding elements between these two sets participate in a matching relation.

The semantics of NPNs

Formalization of NPN meanings: matching

- The lexical entry of matching prepositions specifies this information.

$$
\left[\begin{array}{l}
npn-p-lxm \\
\text{CAT} \quad \left[\text{COMPS} \quad \left\langle \left[\text{CONT|RESTR} \quad \boxed{A}\left\langle \left[\begin{array}{ll}\text{RELN} & N \\ \text{INST} & k\end{array}\right]\right\rangle\right]\right\rangle\right] \\
\text{CONT} \left[\begin{array}{ll}\text{RESTR} & \boxed{A} \oplus \left\langle \left[\begin{array}{ll}\text{RELN} & group \\ \text{INST} & i\end{array}\right], \left[\begin{array}{ll}\text{RELN} & group \\ \text{INST} & j\end{array}\right], \left[\begin{array}{ll}\text{RELN} & member \\ \text{SET} & i \\ \text{ELEMENT} & k_{i_n}\end{array}\right], \right. \\ & \left. \left[\begin{array}{ll}\text{RELN} & member \\ \text{SET} & j \\ \text{ELEMENT} & k_{j_n}\end{array}\right], \left[\begin{array}{ll}\text{RELN} & in-matching \\ \text{SIT} & s \\ \text{ARG1} & k_{i_n} \\ \text{ARG2} & k_{j_n}\end{array}\right] \right\rangle\end{array}\right]
\end{array}\right]
$$

The semantics of NPNs

Formalization of NPN meanings: juxtaposition

- Juxtaposition NPNs describes the placement of entities with the same property in close proximity to each other.

(19) a. The two leaders met face to face.
b. The couple walked hand in hand along the beach.

→ *face to face* describes the situation where the faces of the leaders are positioned closely together, meaning they are facing each other

→ *hand in hand* indicates that the hands of the couple are positioned very close together, ultimately resulting in them holding hands

The semantics of NPNs

Formalization of NPN meanings: juxtaposition

- Crucially, there exists a clear **part-whole relation**.

- The nouns are primarily “body-part” nouns (e.g., *face*, *hand*).

- The corresponding “whole” entities appear within the sentence (e.g., *the leaders*, *the couple*).

- These parts and wholes stand in a correspondence.

e.g., the face of leader A, the face of leader B, and so forth…

The semantics of NPNs

Formalization of NPN meanings: juxtaposition

- Given this, the formal representation of juxtaposition is as follows:

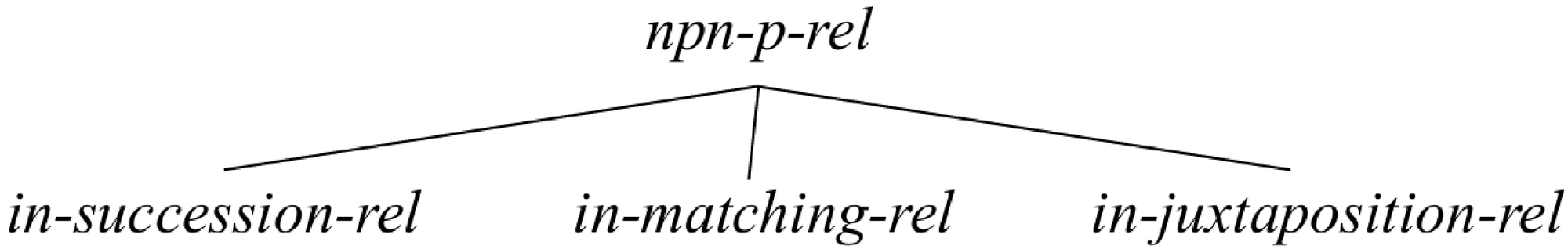
$$\left[\begin{array}{l} npn-p-lxm \\ \text{CAT} \quad \left[\text{COMPS} \quad \left\langle \left[\text{CONT|RESTR} \quad \boxed{\text{A}} \left\langle \left[\begin{array}{ll}\text{RELN} & N \\ \text{INST} & j\end{array}\right] \right\rangle \right] \right\rangle \right] \\ \text{CONT} \quad \left[\text{RESTR} \quad \boxed{\text{A}} \oplus \left\langle \left[\begin{array}{ll}\text{RELN} & part-whole \\ \text{PART} & j_n \\ \text{WHOLE} & k_n\end{array}\right], \left[\begin{array}{ll}\text{RELN} & individual \\ \text{INST} & k_{n\geq 2}\end{array}\right], \left[\begin{array}{ll}\text{RELN} & in-juxtaposition \\ \text{SIT} & s \\ \text{ARGS} & \{j_1, j_2, \ldots, j_n\}\end{array}\right] \right\rangle \right] \end{array}\right]$$

The semantics of NPNs

Summary

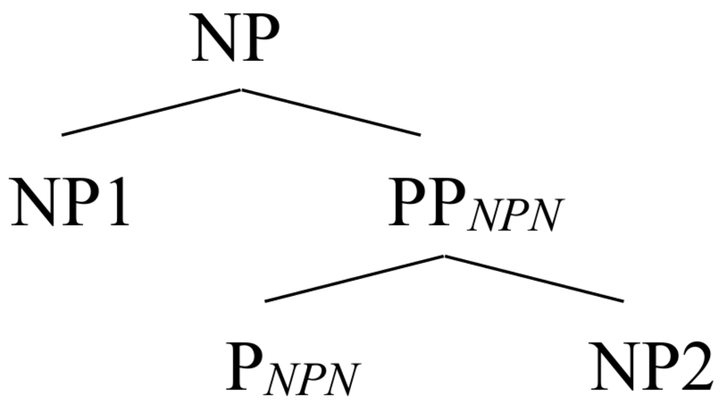
- *npn-p-rel* of *npn-p-lxm* includes *in-succession-rel*, *in-matching-rel*, and *in-juxtaposition-rel*. Accordingly, these relations are organized into a hierarchy.

$$\begin{bmatrix} npn-p-lxm \\ \text{RESTR} \ \langle [\text{RELN} \quad npn-p-rel], \ldots \rangle \end{bmatrix}$$



NPNs at the syntax-semantics interface

The propagation of semantic information



The mother NP consist of two daughters:

- **The head daughter NP1**
- **The adjunct (modifier) daughter PP$_{NPN}$**

- According to the GHFP (Ginzburg & Sag, 2000), the NP inherits the CONT value of its head daughter NP1.
- Problem: The semantic information of the preposition can only be propagated to the PP. That is, **the construction fails to convey the NPN meaning**.

NPNs at the syntax-semantics interface

The propagation of semantic information

- To address this issue, I use the type constraint of *hd-adj-ph*.

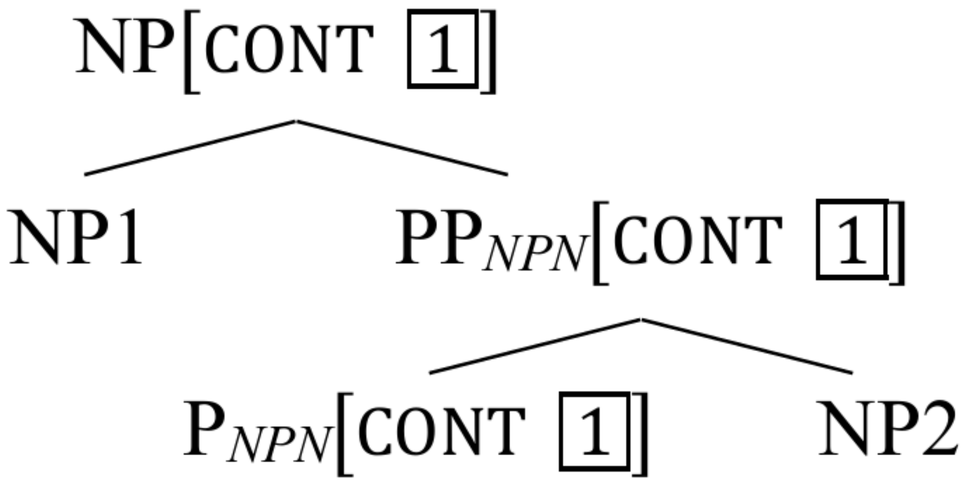
hd-adj-ph: $\left[\text{CONT} \quad /\boxed{1}\right] \rightarrow \mathbf{H}\left[\text{SYNSEM} \quad \boxed{2}\right], \begin{bmatrix} \text{MOD} & \langle \boxed{2} \rangle \\ \text{CONT} & /\boxed{1} \end{bmatrix}$

- The SYNSEM value of the head daughter is token identical to the MOD value of the adjunct daughter.
- The CONT value of the mother is, *by default*, token-identical to that of the adjunct daughter.

NPNs at the syntax-semantics interface

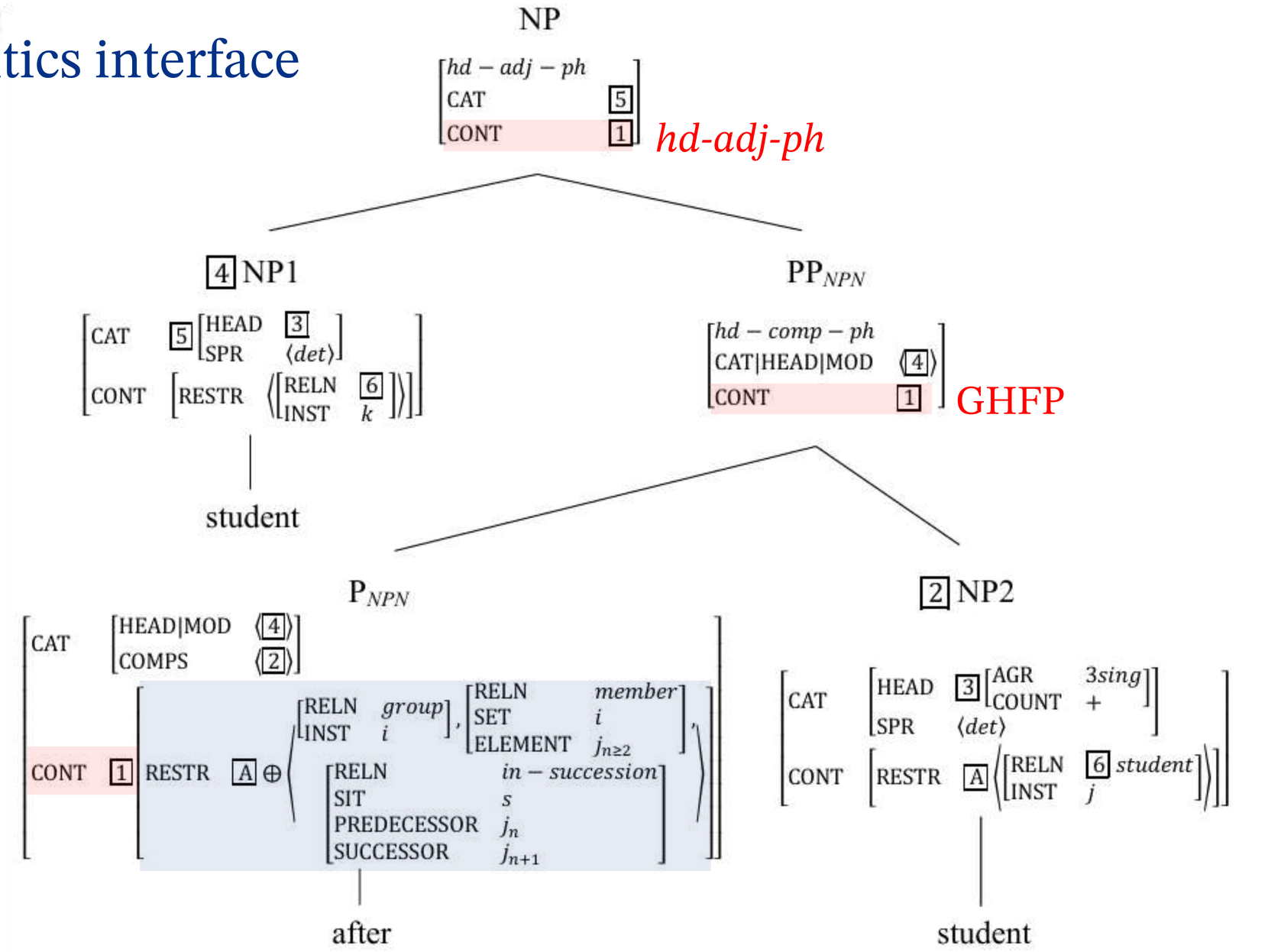
The propagation of semantic information

- Given this constraint, the propagation of semantic information within NPNs can be schematized as below:



NPNs at the syntax-semantics interface

e.g., *student after student*



NPNs at the syntax-semantics interface

The propagation of semantic information: advantages

- It provides a principled account of how NPNs inherit the meaning of their prepositions.

→ It can now be argued that **the semantics of NPNs are neither constructional nor noncompositional**.

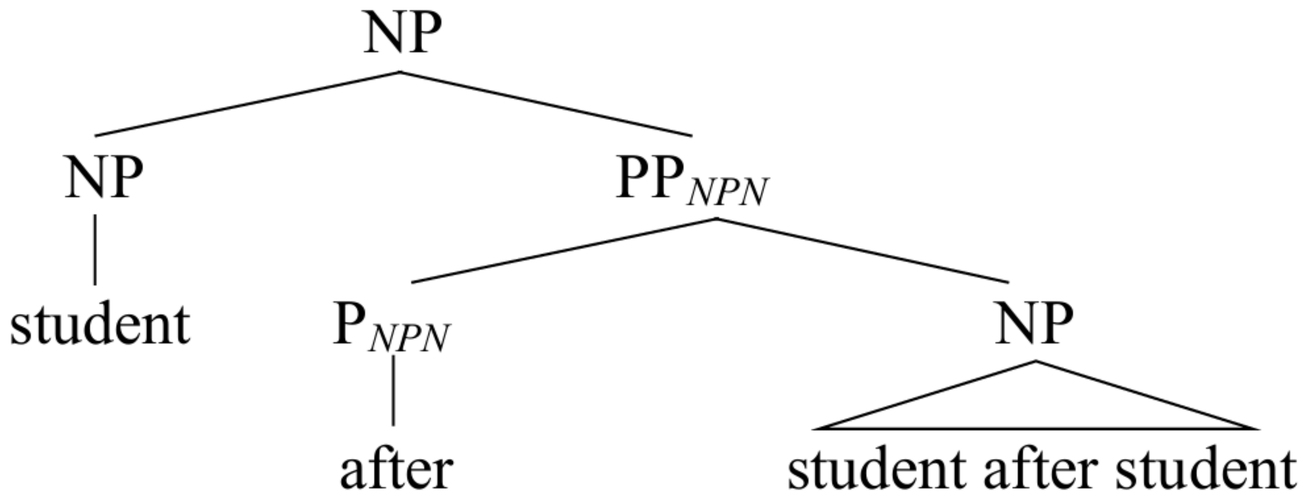
- It also demonstrates that the syntactic and semantic information of NPNs is derived from different sources.

→ This provides a potential explanation for the syntax-semantics mismatch.

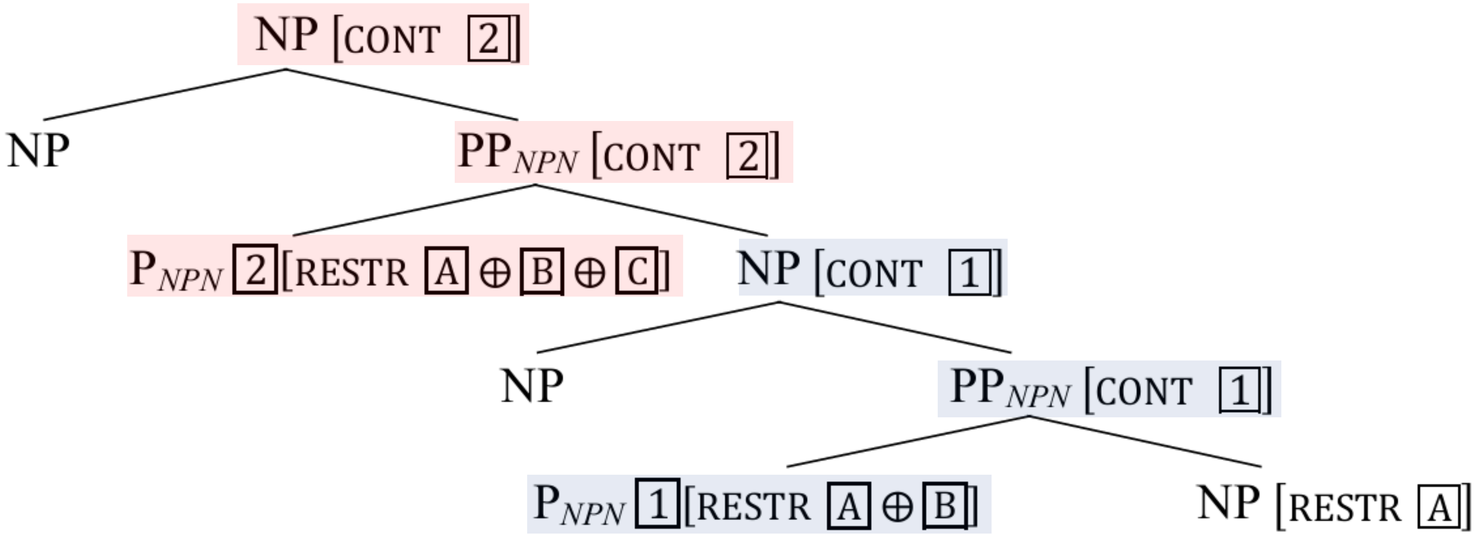
NPNs at the syntax-semantics interface

The propagation of semantic information: advantages

- It also provides a possible explanation for multiplicated NPNs.



NPNs at the syntax-semantics interface



$$\boxed{A} = \left\langle \begin{bmatrix} \text{RELN} & N \\ \text{INST} & j \end{bmatrix} \right\rangle$$

$$\boxed{B} = \left\langle \begin{bmatrix} \text{RELN} & group \\ \text{INST} & i \end{bmatrix}, \begin{bmatrix} \text{RELN} & member \\ \text{SET} & i \\ \text{ELEMENT} & j_{n\geq 2} \end{bmatrix}, \begin{bmatrix} \text{RELN} & in-succession \\ \text{SIT} & s_1 \\ \text{PREDECESSOR} & j_n \\ \text{SUCCESSOR} & j_{n+1} \end{bmatrix} \right\rangle$$

$$\boxed{C} = \left\langle \begin{bmatrix} \text{RELN} & group \\ \text{INST} & k \end{bmatrix}, \begin{bmatrix} \text{RELN} & member \\ \text{SET} & k \\ \text{ELEMENT} & j_{n\geq 2} \end{bmatrix}, \begin{bmatrix} \text{RELN} & in-succession \\ \text{SIT} & s_2 \\ \text{PREDECESSOR} & j_n \\ \text{SUCCESSOR} & j_{n+1} \end{bmatrix} \right\rangle$$

NPNs at the syntax-semantics interface

Constructional constraints

- As introduced, NPNs can function as either arguments or adjuncts in a sentence.

(20) a. *Day after day* brings new challenges to overcome.

b. The weather remained gloomy *day after day*.

- Key distinction: The function of modification

Adjunct NPNs modify the VPs with which they combine.

Argument NPNs serve solely as arguments of the verb without modifying the VP.

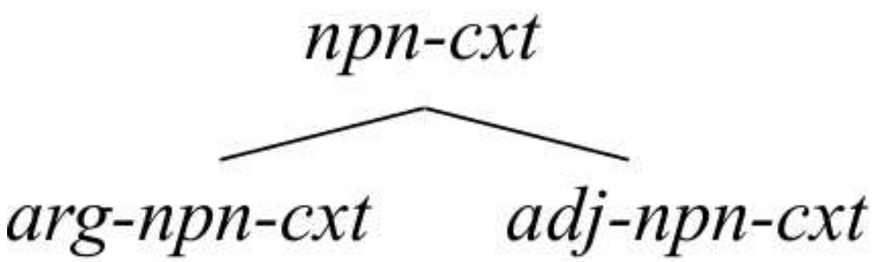
NPNs at the syntax-semantics interface

Constructional constraints

- Constructional type *npn-cxt*

$$npn-cxt \Longrightarrow \begin{bmatrix} hd-adj-ph & \\ \text{CAT|SPR} & \langle\,\rangle \\ \text{DTRS} & \langle \text{X}, \text{PP}_{NPN} \rangle \end{bmatrix}$$

- Subtypes of *npn-cxt:* ***arg(ument)-npn-cxt*** *and* ***adj(unct)-npn-cxt***



NPNs at the syntax-semantics interface

Constructional constraints

- Type constraints of *arg-npn-cxt and adj-npn-cxt*

$$arg-npn-cxt \Longrightarrow$$

$$\begin{bmatrix} \text{CAT|HEAD|MOD} & \langle\,\rangle \\ \text{CONT} & \boxed{1}\begin{bmatrix}\text{MODE} & ref \\ \text{INDEX} & i\end{bmatrix} \\ \text{DTRS} & \left\langle \text{X}, \begin{bmatrix}\text{CONT} & \boxed{1}\begin{bmatrix}\text{RESTR} & \left\langle \begin{bmatrix}\text{RELN} & group \\ \text{INST} & i\end{bmatrix}, \ldots \right\rangle\end{bmatrix}\end{bmatrix} \right\rangle \end{bmatrix}$$

$$adj-npn-cxt \Longrightarrow$$

$$\begin{bmatrix} \text{CAT|HEAD|MOD} & \left\langle \text{VP} \vee \text{N}' : \begin{bmatrix}\text{INDEX} & \boxed{2} \\ \text{RESTR} & \boxed{\text{E}}\end{bmatrix} \right\rangle \\ \text{CONT} & \begin{bmatrix}\text{MODE} & prop \\ \text{INDEX} & s_2 \\ \text{RESTR} & \boxed{\text{D}} \oplus \boxed{\text{E}} \oplus \left\langle \begin{bmatrix}\text{RELN} & in-the-manner-of \\ \text{SIT} & s_2 \\ \text{EVENTUALITY} & \boxed{2} \\ \text{MANNER} & s_1\end{bmatrix} \right\rangle\end{bmatrix} \\ \text{DTRS} & \left\langle \text{X}, \begin{bmatrix}\text{CONT|RESTR} & \boxed{\text{D}}\left\langle \begin{bmatrix}\text{RELN} & npn-p-rel \\ \text{SIT} & s_1\end{bmatrix}, \ldots \right\rangle\end{bmatrix} \right\rangle \end{bmatrix}$$

NPNs at the syntax-semantics interface

Constructional constraints

- Type constraints of *arg-npn-cxt and adj-npn-cxt*

$$arg-npn-cxt \Longrightarrow$$

$$\begin{bmatrix} \text{CAT|HEAD|MOD} \ \langle\,\rangle \\ \text{CONT} \quad \boxed{1}\begin{bmatrix}\text{MODE} & ref \\ \text{INDEX} & i\end{bmatrix} \\ \text{DTRS} \quad \left\langle \text{X}, \begin{bmatrix}\text{CONT} & \boxed{1}\begin{bmatrix}\text{RESTR} & \left\langle \begin{bmatrix}\text{RELN} & group \\ \text{INST} & i\end{bmatrix}, \ldots \right\rangle\end{bmatrix}\end{bmatrix} \right\rangle \end{bmatrix}$$

NPNs at the syntax-semantics interface

Constructional constraints

- Type constraints of *arg-npn-cxt and adj-npn-cxt*

$$adj-npn-cxt \Longrightarrow$$

$$\begin{bmatrix} \text{CAT|HEAD|MOD} & \left\langle \text{VP} \vee \text{N}' : \begin{bmatrix} \text{INDEX} & \boxed{2} \\ \text{RESTR} & \boxed{E} \end{bmatrix} \right\rangle \\ \text{CONT} & \begin{bmatrix} \text{MODE} & prop \\ \text{INDEX} & s_2 \\ \text{RESTR} & \boxed{D} \oplus \boxed{E} \oplus \left\langle \begin{bmatrix} \text{RELN} & in-the-manner-of \\ \text{SIT} & s_2 \\ \text{EVENTUALITY} & \boxed{2} \\ \text{MANNER} & s_1 \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{DTRS} & \left\langle \text{X}, \begin{bmatrix} \text{CONT|RESTR} & \boxed{D} \left\langle \begin{bmatrix} \text{RELN} & npn-p-rel \\ \text{SIT} & s_1 \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

NPNs at the syntax-semantics interface

Constructional constraints

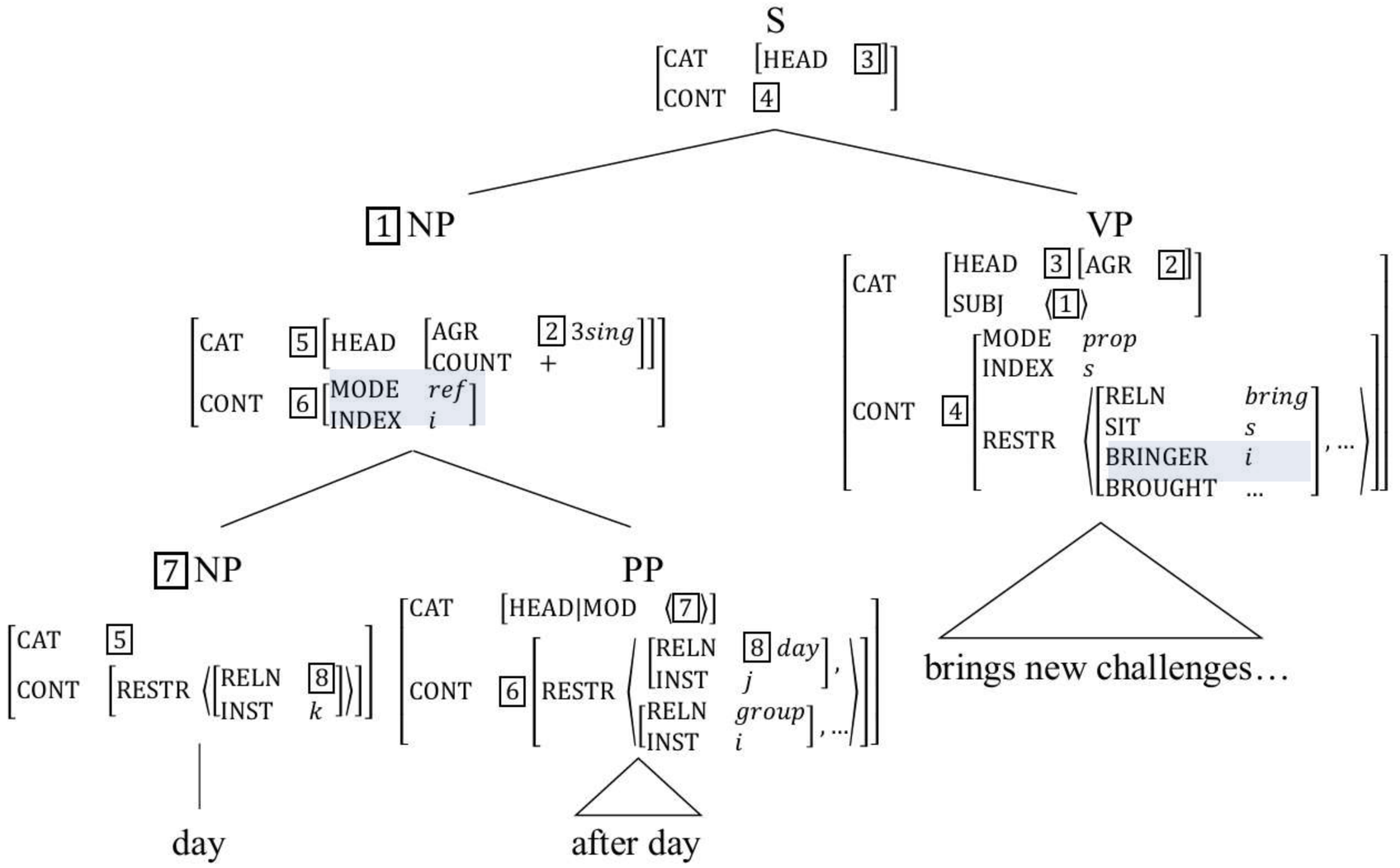
- Type constraints of *arg-npn-cxt and adj-npn-cxt*

$$adj-npn-cxt \Longrightarrow$$

$$\begin{bmatrix} \text{CAT|HEAD|MOD} & \left\langle \text{VP} \vee \text{N}' : \begin{bmatrix} \text{INDEX} & \boxed{2} \\ \text{RESTR} & \boxed{\text{E}} \end{bmatrix} \right\rangle \\ \text{CONT} & \begin{bmatrix} \text{MODE} & prop \\ \text{INDEX} & s_2 \\ \text{RESTR} & \boxed{\text{D}} \oplus \boxed{\text{E}} \oplus \left\langle \begin{bmatrix} \text{RELN} & in-the-manner-of \\ \text{SIT} & s_2 \\ \text{EVENTUALITY} & \boxed{2} \\ \text{MANNER} & s_1 \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{DTRS} & \left\langle \text{X}, \begin{bmatrix} \text{CONT|RESTR} & \boxed{\text{D}} \left\langle \begin{bmatrix} \text{RELN} & npn-p-rel \\ \text{SIT} & s_1 \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}$$

NPNs at the syntax-semantics interface

e.g., *Day after day* brings new challenges to overcome.



NPNs at the syntax-semantics interface

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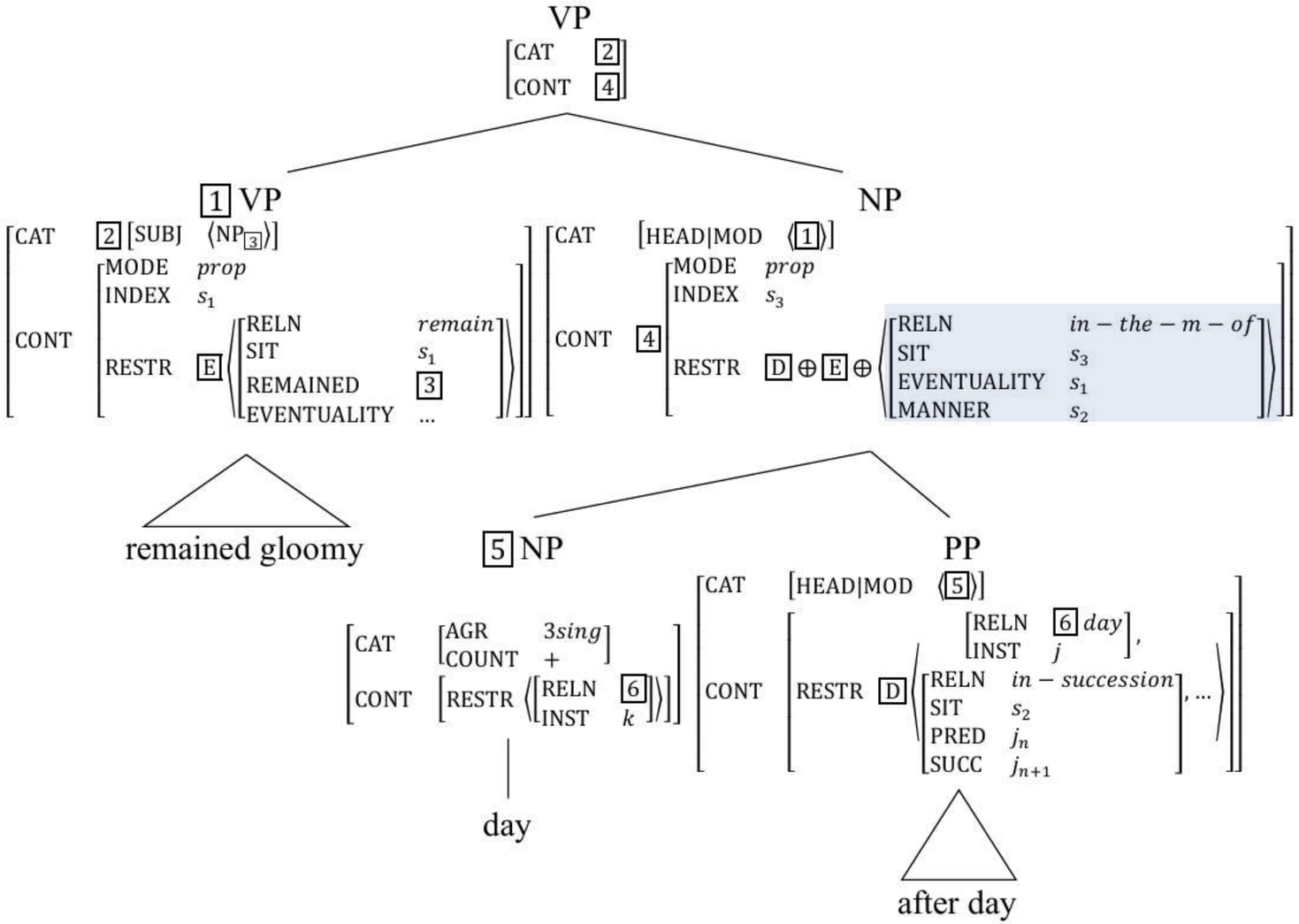

Conclusion

Conclusion

The primary contribution of this study

- It provides a unified headed analysis of NPNs, without positing nonheaded or dual-head structures.
- It accounts for six theoretical challenges of NPNs within a single theoretical framework.
- Ultimately, it highlights the explanatory power of constraint-based grammar in addressing the alleged “unprincipledness” of idiomatic constructions.

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$$\begin{bmatrix} thank-rel & \\ \text{ARG1} & hyeonjoon \\ \text{ARG2} & you \\ \text{ARG3} & for\ listening \end{bmatrix}$$

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