Ling 566
Oct 10, 2019

Semantics

Overview

- Some notes on the linguist’s stance
- Which aspects of semantics we’ll tackle
- Our formalization; Semantics Principles
- Building semantics of phrases
- Modification, coordination
- Structural ambiguity
- Reading questions

The Linguist's Stance: Building a precise model

- Some of our statements are statements about how the model works:

  "[*prep*] and [AGR *3sing*] can't be combined because AGR is not a feature of the type *prep*."

- Some of our statements are statements about how (we think) English or language in general works.

  "The determiners *a* and *many* only occur with count nouns, the determiner *much* only occurs with mass nouns, and the determiner *the* occurs with either."

- Some are statements about how we code a particular linguistic fact within the model.

  "All count nouns are [SPR < [COUNT +]>]."

Semantics: Where's the Beef?

So far, our grammar has no semantic representations. We have, however, been relying on semantic intuitions in our argumentation, and discussing semantic contrasts where they line up (or don't) with syntactic ones.

Examples?

- structural ambiguity
- S/NP parallelism
- count/mass distinction
- complements vs. modifiers

Our Slice of a World of Meanings

Aspects of meaning we won't account for

- Pragmatics
- Fine-grained lexical semantics:

The meaning of *life* is *life'*, or, in our case,

$$\begin{bmatrix} \text{RELN} & \text{life} \\ \text{INST} & i \end{bmatrix}$$

Our Slice of a World of Meanings

$$\begin{bmatrix} \text{MODE} & \text{prop} \\ \text{INDEX} & s \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \text{save} \\ \text{SIT} & s \\ \text{SAVER} & i \\ \text{SAVED} & j \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Chris} \\ \text{NAMED} & i \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Pat} \\ \text{NAMED} & j \end{bmatrix} \right\rangle \end{bmatrix}$$

"... the linguistic meaning of *Chris saved Pat* is a proposition that will be true just in case there is an actual situation that involves the saving of someone named Pat by someone named Chris." (p. 140)

Our Slice of a World of Meanings

What we are accounting for is the compositionality of sentence meaning.

- How the pieces fit together

  Semantic arguments and indices

- How the meanings of the parts add up to the meaning of the whole.

  Appending RESTR lists up the tree

Semantics in Constraint-Based Grammar

- Constraints as (generalized) truth conditions
  - proposition: what must be the case for a proposition to be true
  - directive: what must happen for a directive to be fulfilled
  - question: the kind of situation the asker is asking about
  - reference: the kind of entity the speaker is referring to

- Syntax/semantics interface: Constraints on how syntactic arguments are related to semantic ones, and on how semantic information is compiled from different parts of the sentence.

Feature Geometry

$$\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & pos \\ \text{VAL} & \begin{bmatrix} \text{SPR} & list(expression) \\ \text{COMPS} & list(expression) \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{MODE} & \{\text{prop}, \text{ques}, \text{dir}, \text{ref}, \text{none}\} \\ \text{INDEX} & \{i, j, k, \ldots s_1, s_2, \ldots\} \\ \text{RESTR} & list(pred) \end{bmatrix} \end{bmatrix}$$

How the Pieces Fit Together

$$\left\langle \text{Dana}\ ,\ \begin{bmatrix} \textit{word} & \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{AGR} & \textit{3sing} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\ \rangle \\ \text{COMPS} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & i \\ \text{MODE} & \text{ref} \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Dana} \\ \text{NAMED} & i \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

How the Pieces Fit Together

$$\left\langle \text{slept}, \begin{bmatrix} \textit{word} & \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle\ \text{NP}_j \rangle \\ \text{COMPS} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & s_1 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \text{sleep} \\ \text{SIT} & s_1 \\ \text{SLEEPER} & j \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

The Pieces Together

S

$\boxed{1}$NP $\left[\text{SEM}\ \left[\text{INDEX}\ \ i\right]\right]$ — *Dana*

VP
$$\begin{bmatrix} \text{SYN}\ \left[\text{VAL}\ \left[\text{SPR}\ \langle\ \boxed{1}\ \rangle\right]\right] \\ \text{SEM}\ \begin{bmatrix} \text{RESTR}\ \left\langle \begin{bmatrix} \text{RELN} & \text{sleep} \\ \text{SIT} & s_1 \\ \text{SLEEPER} & i \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \end{bmatrix}$$
— *slept*

A More Detailed View of the Same Tree

S

$$\left[\text{SEM}\ \left[\begin{array}{l}\text{INDEX}\\ \text{MODE}\\ \text{RESTR}\end{array}\right]\right]$$

$\boxed{1}$NP

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & i\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right]\right\rangle\end{array}\right]\right]$$

VP

$$\left[\begin{array}{ll}\text{SYN} & [\ \text{VAL}\ \ [\ \text{SPR}\ \ \langle\ \boxed{1}\ \rangle\ ]\ ]\\ \text{SEM} & \left[\text{RESTR}\ \left\langle \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\right]\end{array}\right]$$

To Fill in Semantics for the S-node

We need the Semantics Principles

- The Semantic Inheritance Principle:

In any headed phrase, the mother's MODE and INDEX are identical to those of the head daughter.

- The Semantic Compositionality Principle:

Semantic Inheritance Illustrated

S

$$\left[\text{SEM}\ \begin{bmatrix}\text{INDEX} & \boxed{s_1} \\ \text{MODE} & \boxed{\text{prop}} \\ \text{RESTR} & \end{bmatrix}\right]$$

$\boxed{1}$NP

$$\left[\text{SEM}\ \begin{bmatrix}\text{INDEX} & i \\ \text{RESTR} & \left\langle \begin{bmatrix}\text{RELN} & \text{name} \\ \text{NAME} & \text{Dana} \\ \text{NAMED} & i\end{bmatrix} \right\rangle\end{bmatrix}\right]$$

VP

$$\begin{bmatrix}\text{SYN} & [\ \text{VAL}\ [\ \text{SPR}\ \langle \boxed{1} \rangle\ ]\ ] \\ \text{SEM} & \left[\text{RESTR}\ \left\langle \begin{bmatrix}\text{RELN} & \text{sleep} \\ \text{SIT} & s_1 \\ \text{SLEEPER} & i\end{bmatrix}, \ldots \right\rangle\right]\end{bmatrix}$$

To Fill in Semantics for the S-node

We need the Semantics Principles

- The Semantic Inheritance Principle:

  In any headed phrase, the mother's MODE and INDEX are identical to those of the head daughter.

- The Semantic Compositionality Principle:

  In any well-formed phrase structure, the mother's RESTR value is the sum of the RESTR values of the daughters.

Semantic Compositionality Illustrated

S

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & s_1\\ \text{MODE} & \text{prop}\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right], \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\end{array}\right]\right]$$

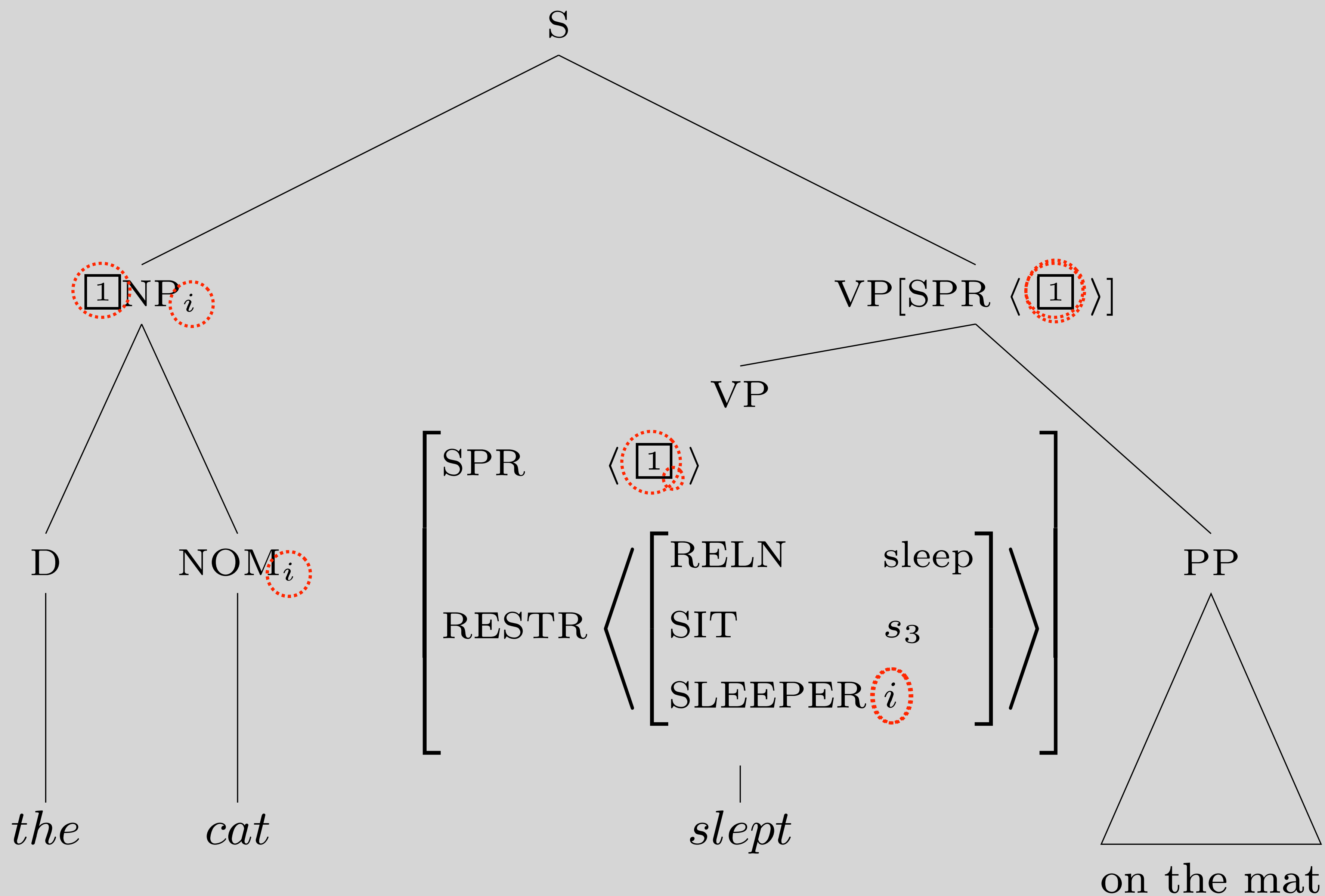
$\boxed{1}$NP

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & i\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right]\right\rangle\end{array}\right]\right]$$

VP

$$\left[\begin{array}{ll}\text{SYN} & [\ \text{VAL}\ \ [\ \text{SPR}\ \ \langle \boxed{1} \rangle\ ]\ ]\\ \text{SEM} & \left[\text{RESTR}\ \left\langle \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\right]\end{array}\right]$$

What Identifies Indices?



Summary: Words ...

- contribute predications
- ‘expose’ one index in those predications, for use by words or phrases
- relate syntactic arguments to semantic arguments

$$
\left\langle \text{slept}, \begin{bmatrix} \textit{word} & \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle \text{NP}_j \rangle \\ \text{COMPS} & \langle\ \rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & s_1 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{RELN} & \text{sleep} \\ \text{SIT} & s_1 \\ \text{SLEEPER} & j \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle
$$

Summary: Grammar Rules ...

- identify feature structures (including the INDEX value) across daughters

Head Specifier Rule

$$\begin{bmatrix} \textit{phrase} \\ \text{SYN} \begin{bmatrix} \text{VAL} \begin{bmatrix} \text{SPR} & \langle\, \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \rightarrow \boxed{1} \quad \mathbf{H} \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{VAL} \begin{bmatrix} \text{SPR} & \langle \boxed{1} \rangle \\ \text{COMPS} & \langle\, \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Head Complement Rule

$$\begin{bmatrix} \textit{phrase} \\ \text{SYN} \begin{bmatrix} \text{VAL} \begin{bmatrix} \text{COMPS} & \langle\, \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \rightarrow \mathbf{H} \begin{bmatrix} \textit{word} \\ \text{SYN} \begin{bmatrix} \text{VAL} \begin{bmatrix} \text{COMPS} & \langle \boxed{1}, \ldots, \boxed{n} \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \; \boxed{1} \ldots \boxed{n}$$

Head Modifier Rule

$$[\textit{phrase}] \rightarrow \mathbf{H}\ \boxed{1} \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{COMPS} \ \langle\, \rangle \end{bmatrix} \end{bmatrix} \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{VAL} \begin{bmatrix} \text{COMPS} & \langle\, \rangle \\ \text{MOD} & \langle \boxed{1} \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Summary: Grammar Rules ...

- identify feature structures (including the INDEX value) across daughters
- license trees which are subject to the semantic principles
  - SIP 'passes up' MODE and INDEX from head daughter

S

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & s_1 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right], \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\end{array}\right]\right]$$

$\boxed{1}$NP

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & i \\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right] \right\rangle\end{array}\right]\right]$$

VP

$$\left[\begin{array}{ll}\text{SYN} & [\ \text{VAL}\ [\ \text{SPR}\ \langle \boxed{1} \rangle\ ]\ ] \\ \text{SEM} & \left[\begin{array}{ll}\text{INDEX} & s_1 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\end{array}\right]\end{array}\right]$$

Summary: Grammar Rules ...

- identify feature structures (including the INDEX value) across daughters
- license trees which are subject to the semantic principles
  - SIP ‘passes up’ MODE and INDEX from head daughter
  - SCP: ‘gathers up’ predications (RESTR list) from all daughters

S

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & s_1\\ \text{MODE} & \text{prop}\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right], \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\end{array}\right]\right]$$

$\boxed{1}$NP

$$\left[\text{SEM}\ \left[\begin{array}{ll}\text{INDEX} & i\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{name}\\ \text{NAME} & \text{Dana}\\ \text{NAMED} & i\end{array}\right] \right\rangle\end{array}\right]\right]$$

VP

$$\left[\begin{array}{ll}\text{SYN} & [\ \text{VAL}\ [\ \text{SPR}\ \langle \boxed{1} \rangle\ ]\ ]\\ \text{SEM} & \left[\begin{array}{ll}\text{INDEX} & s_1\\ \text{MODE} & \text{prop}\\ \text{RESTR} & \left\langle \left[\begin{array}{ll}\text{RELN} & \text{sleep}\\ \text{SIT} & s_1\\ \text{SLEEPER} & i\end{array}\right], \ldots \right\rangle\end{array}\right]\end{array}\right]$$

Other Aspects of Semantics

- Tense, Quantification (only touched on here)
- Modification
- Coordination
- Structural Ambiguity

Evolution of a Phrase Structure Rule

Ch. 2: NOM --> NOM PP

VP --> VP PP

Ch. 3: $\begin{bmatrix} \textit{phrase} & \\ \text{VAL} & \begin{bmatrix} \text{COMPS} & \text{itr} \\ \text{SPR} & - \end{bmatrix} \end{bmatrix} \rightarrow \mathbf{H}\begin{bmatrix} \textit{phrase} & \\ \text{VAL} & \begin{bmatrix} \text{SPR} & - \end{bmatrix} \end{bmatrix} \text{PP}$

Ch. 4: $[\textit{phrase}] \rightarrow \mathbf{H}\begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \text{PP}$

Ch. 5: $[\textit{phrase}] \rightarrow \mathbf{H}\boxed{1}\begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} \; \langle\,\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix} \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\,\rangle \\ \text{MOD} & \langle \boxed{1} \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$

Ch. 5 (abbreviated): $[\textit{phrase}] \rightarrow \mathbf{H}\boxed{1}\begin{bmatrix} \text{COMPS} \; \langle\,\rangle \end{bmatrix} \begin{bmatrix} \text{COMPS} & \langle\,\rangle \\ \text{MOD} & \langle \boxed{1} \rangle \end{bmatrix}$

Evolution of Another Phrase Structure Rule

Ch. 2: X --> X$^+$ CONJ X

Ch. 3: $\boxed{1} \rightarrow \boxed{1}^{+} \begin{bmatrix} \textit{word} \\ \text{HEAD} & \textit{conj} \end{bmatrix} \boxed{1}$

Ch. 4: $\begin{bmatrix} \text{VAL } \boxed{1} \end{bmatrix} \rightarrow \begin{bmatrix} \text{VAL } \boxed{1} \end{bmatrix}^{+} \begin{bmatrix} \textit{word} \\ \text{HEAD} & \textit{conj} \end{bmatrix} \begin{bmatrix} \text{VAL } \boxed{1} \end{bmatrix}$

Ch. 5: $\begin{bmatrix} \text{SYN} & [\text{VAL } \boxed{0}] \\ \text{SEM} & [\text{IND} \ \ s_0] \end{bmatrix} \rightarrow$

$$\begin{bmatrix} \text{SYN} & [\text{VAL } \boxed{0}] \\ \text{SEM} & [\text{IND} \ \ s_1] \end{bmatrix} \ldots \begin{bmatrix} \text{SYN} & [\text{VAL } \boxed{0}] \\ \text{SEM} & [\text{IND} \ \ s_{n-1}] \end{bmatrix} \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{conj} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{IND} & s_0 \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{ARGS } \langle s_1 \ldots s_n \rangle \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \begin{bmatrix} \text{SYN} & [\text{VAL } \boxed{0}] \\ \text{SEM} & [\text{IND} \ \ s_n] \end{bmatrix}$$

Ch. 5 (abbreviated):

$$\begin{bmatrix} \text{VAL} & \boxed{0} \\ \text{IND} & s_0 \end{bmatrix} \rightarrow \begin{bmatrix} \text{VAL} & \boxed{0} \\ \text{IND} & s_1 \end{bmatrix} \ldots \begin{bmatrix} \text{VAL} & \boxed{0} \\ \text{IND} & s_{n-1} \end{bmatrix} \begin{bmatrix} \text{HEAD} & \textit{conj} \\ \text{IND} & s_0 \\ \text{RESTR} & \left\langle \begin{bmatrix} \text{ARGS } \langle s_1 \ldots s_n \rangle \end{bmatrix} \right\rangle \end{bmatrix} \begin{bmatrix} \text{VAL} & \boxed{0} \\ \text{IND} & s_n \end{bmatrix}$$

Combining Constraints and Coordination

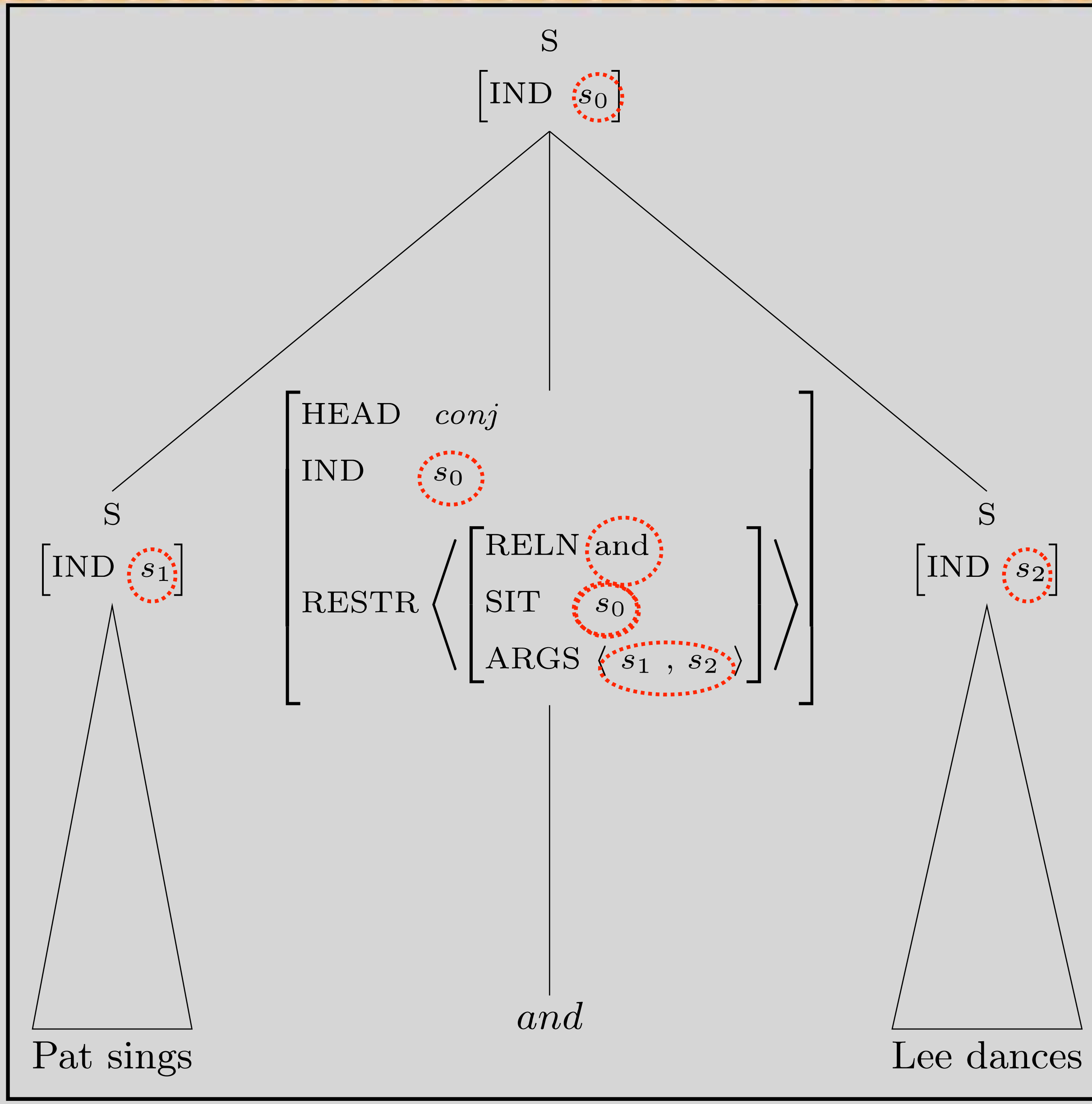
Coordination Rule

$$\begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_0\end{bmatrix} \rightarrow \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_1\end{bmatrix} \ldots \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_{n-1}\end{bmatrix} \begin{bmatrix}\text{HEAD} & \textit{conj} \\ \text{IND} & s_0 \\ \text{RESTR} & \left\langle \begin{bmatrix}\text{ARGS} & \langle s_1 \ldots s_n \rangle\end{bmatrix} \right\rangle\end{bmatrix} \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_n\end{bmatrix}$$

Lexical Entry for a Conjunction

$$\left\langle \text{and} \;,\; \begin{bmatrix}\text{SYN} & \begin{bmatrix}\text{HEAD} & \textit{conj}\end{bmatrix} \\ \text{SEM} & \begin{bmatrix}\text{INDEX} & s \\ \text{MODE} & \text{none} \\ \text{RESTR} & \left\langle \begin{bmatrix}\text{RELN} & \text{and} \\ \text{SIT} & s\end{bmatrix} \right\rangle\end{bmatrix}\end{bmatrix} \right\rangle$$

Combining Constraints and Coordination



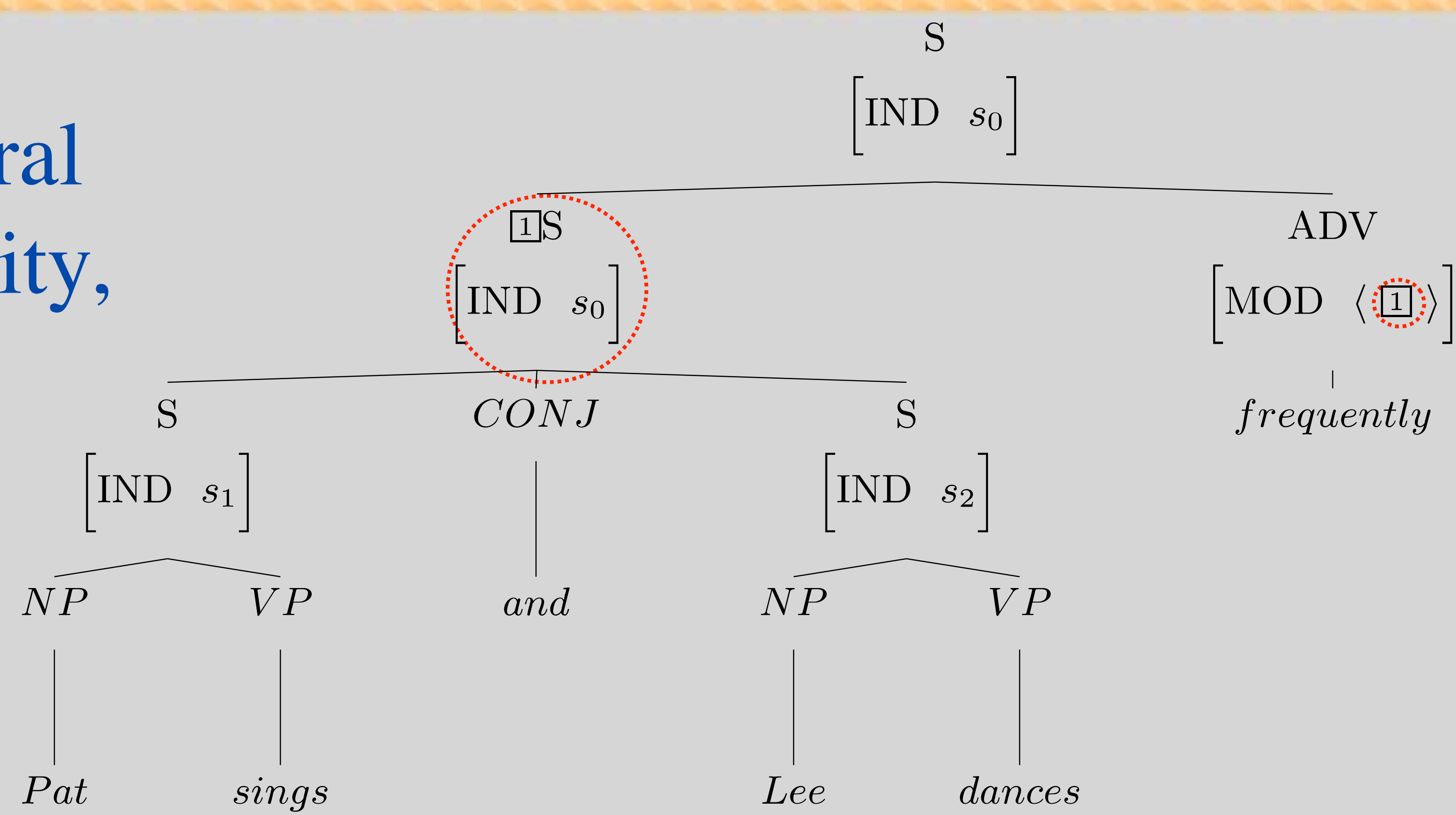
Lexical Entry for *and*

$$\left\langle \text{and}\ ,\ \begin{bmatrix} \text{SYN} & \begin{bmatrix}\text{HEAD} & \textit{conj}\end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & s \\ \text{MODE} & \text{none} \\ \text{RESTR} & \left\langle \begin{bmatrix}\text{RELN} & \text{and} \\ \text{SIT} & s\end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \right\rangle$$

Coordination Rule

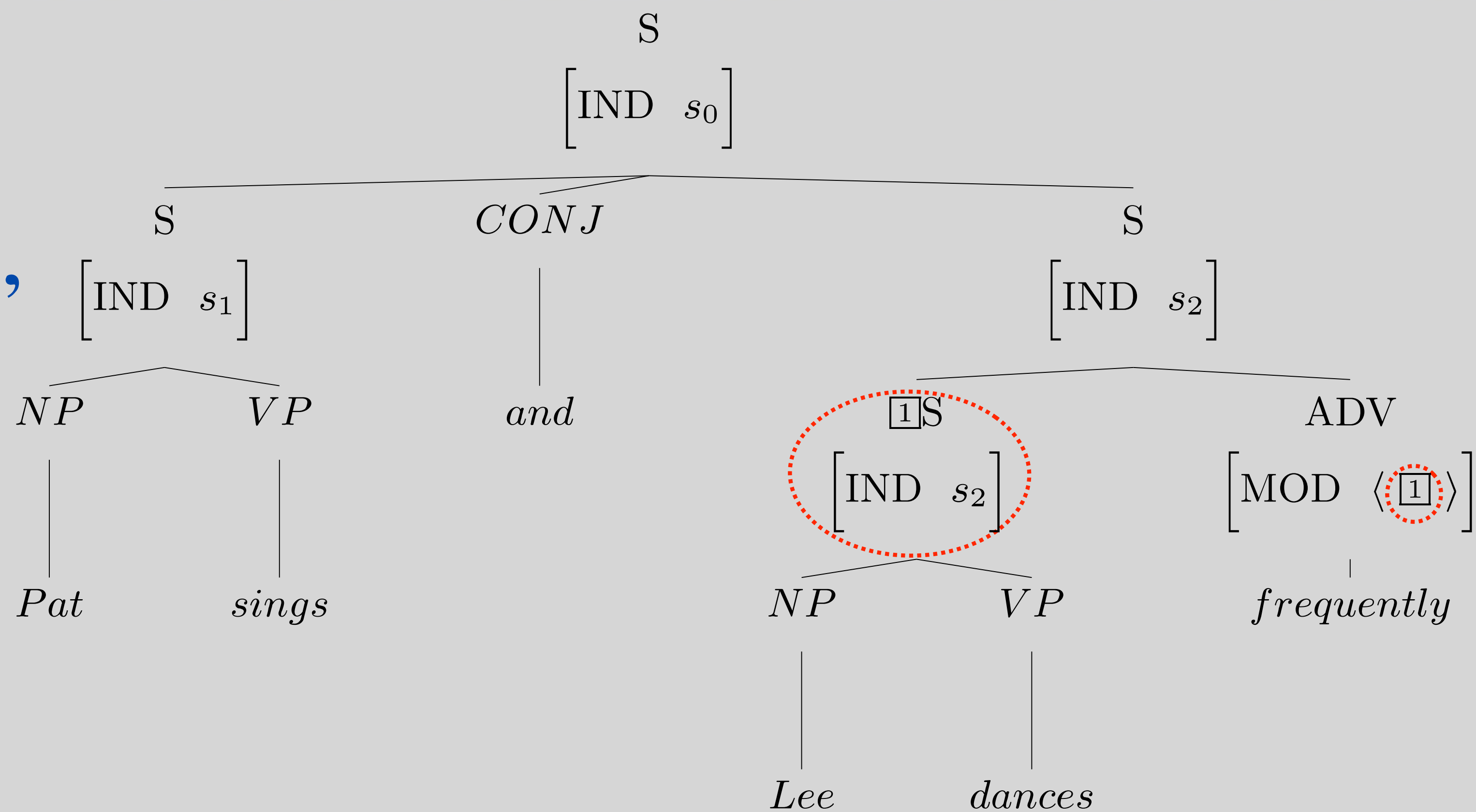
$$\begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_0\end{bmatrix} \rightarrow \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_1\end{bmatrix} \cdots \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_{n-1}\end{bmatrix} \begin{bmatrix}\text{HEAD} & \textit{conj} \\ \text{IND} & s_0 \\ \text{RESTR} & \left\langle \begin{bmatrix}\text{ARGS} & \langle s_1 \ldots s_n \rangle\end{bmatrix} \right\rangle\end{bmatrix} \begin{bmatrix}\text{VAL} & \boxed{0} \\ \text{IND} & s_n\end{bmatrix}$$

Structural Ambiguity, Tree I



$$
\begin{bmatrix}
\text{IND} & s_0 \\
\text{MODE} & \text{prop} \\
\text{RESTR} & \left\langle
\begin{matrix}
\begin{bmatrix}\text{RELN} & \text{name}\\ \text{NAME} & \text{Pat}\\ \text{NAMED} & \text{k}\end{bmatrix},
\begin{bmatrix}\text{RELN} & \text{sing}\\ \text{SIT} & s_1\\ \text{SINGER} & \text{k}\end{bmatrix},
\begin{bmatrix}\text{RELN} & \text{and}\\ \text{SIT} & s_0\\ \text{ARGS} & \langle s_1 , s_2 \rangle\end{bmatrix}, \\
\begin{bmatrix}\text{RELN} & \text{name}\\ \text{NAME} & \text{Lee}\\ \text{NAMED} & \text{j}\end{bmatrix},
\begin{bmatrix}\text{RELN} & \text{dance}\\ \text{SIT} & s_2\\ \text{DANCER} & \text{j}\end{bmatrix},
\begin{bmatrix}\text{RELN} & \text{frequently}\\ \text{ARG} & s_0\end{bmatrix}
\end{matrix}
\right\rangle
\end{bmatrix}
$$

Structural Ambiguity, Tree II



$$\begin{bmatrix} \text{IND} & s_0 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{matrix} \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Pat} \\ \text{NAMED} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{sing} \\ \text{SIT} & s_1 \\ \text{SINGER} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{and} \\ \text{SIT} & s_0 \\ \text{ARGS} & \langle s_1 , s_2 \rangle \end{bmatrix}, \\ \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Lee} \\ \text{NAMED} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{dance} \\ \text{SIT} & s_2 \\ \text{DANCER} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{frequently} \\ \text{ARG} & s_2 \end{bmatrix} \end{matrix} \right\rangle \end{bmatrix}$$

Question About Structural Ambiguity

Why isn't this a possible semantic representation for the string *Pat sings and Lee dances frequently*?

$$\begin{bmatrix} \text{IND} & s_0 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{array}{l} \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Pat} \\ \text{NAMED} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{sing} \\ \text{SIT} & s_1 \\ \text{SINGER} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{and} \\ \text{SIT} & s_0 \\ \text{ARGS} & \langle\, s_1 \,,\, s_2 \,\rangle \end{bmatrix}, \\ \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Lee} \\ \text{NAMED} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{dance} \\ \text{SIT} & s_2 \\ \text{DANCER} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{frequently} \\ \text{ARG} & s_1 \end{bmatrix} \end{array} \right\rangle \end{bmatrix}$$

Semantic Compositionality

$$\begin{bmatrix} \text{IND} & s_0 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{matrix} \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Pat} \\ \text{NAMED} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{sing} \\ \text{SIT} & s_1 \\ \text{SINGER} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{and} \\ \text{SIT} & s_0 \\ \text{ARGS} & \langle\, s_1 \,,\, s_2 \,\rangle \end{bmatrix}, \\ \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Lee} \\ \text{NAMED} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{dance} \\ \text{SIT} & s_2 \\ \text{DANCER} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{frequently} \\ \text{ARG} & s_0 \end{bmatrix} \end{matrix} \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \text{IND} & s_0 \\ \text{MODE} & \text{prop} \\ \text{RESTR} & \left\langle \begin{matrix} \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Pat} \\ \text{NAMED} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{sing} \\ \text{SIT} & s_1 \\ \text{SINGER} & \text{k} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{and} \\ \text{SIT} & s_0 \\ \text{ARGS} & \langle\, s_1 \,,\, s_2 \,\rangle \end{bmatrix}, \\ \begin{bmatrix} \text{RELN} & \text{name} \\ \text{NAME} & \text{Lee} \\ \text{NAMED} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{dance} \\ \text{SIT} & s_2 \\ \text{DANCER} & \text{j} \end{bmatrix}, \begin{bmatrix} \text{RELN} & \text{frequently} \\ \text{ARG} & s_2 \end{bmatrix} \end{matrix} \right\rangle \end{bmatrix}$$

Overview

- Some notes on the linguist's stance
- Which aspects of semantics we'll tackle
- Our formalization; Semantics Principles
- Building semantics of phrases
- Modification, coordination
- Structural ambiguity
- Next time: How the grammar works

Reading Questions

- Oftentimes it seems like the Ch4-5 trees just jump over the phrase straight to an individual word. Is there any reason for this or is it just shorthand since the lexical entry for the phrase would be essentially the same?

Reading Questions

- The feature structure for "Chris saved Pat." includes "RELN, SIT, SAVER, and SAVED" as some of the RESTR constraints for the phrase. Given that "SAVER" and "SAVED" are unique to a situation that involves saving, and there are many different transitive verbs ("to buy", "to get", etc.) with many possible types of constraints that do not apply to all situations, does this mean that we can never create fully-specified predications?

Reading Questions

- The feature structure for save includes RESTR SAVER and SAVED, for love - LOVER and LOVED. Why do we want to keep them specific for each lexical entry and not to have more abstract agent-patient roles connected by RELN save, love, etc.?
- What do semantic features of word with many different meanings look like? For example, have and give. Or are semantic features of words solely based on current context?

Reading Questions

- I didn't quite understand how RESTR tags work. Is there a specific order they must be in?
- Why doesn't the order of RESTR elements matter?

Reading Questions

- Semantic Compositionality Principle: it defines the 'sum' here as 'the sum of the RESTR values of the daughters is the list whose members are those values *taken in order*' I read the footnotes in regards to this principle at the bottom where it states that the order does not indicate semantic significance but will be used later on. I just want to clarify: the order of the lists of the daughters' IS significant i.e., <A>, <B>, <C>, but the order of the elements within list <A> is insignificant?

Reading Questions

- If the order in the list of restrictions is not semantically significant, is it still syntactically significant? Also, since we have the Semantic Compositionality Principle, does that mean that the list of restrictions will always be made up of the RESTR values of the daughters and you can't insert a restriction in the middle?
- What is the difference between "," in (36) and "⊕" in (43)?
- I am confused about the RESTR feature structure and the elements that define it. On page 144, in the SEM feature structure of love, there is an index j in the LOVED feature which doesn't seem to point to any element. What am I misunderstanding here?

Reading Questions

- On page 136, the author claims that "The semantics of our grammar will be classified in terms of four SEMANTIC MODES..." Why are those four SEMANTIC MODES enough to classify our grammar? Can we add more modes to make our grammar even better?
- I wonder what the MODE of an utterance like "I think there's class tomorrow?" would be - it seems to me that the asker at once both making a statement and an inquiry

Reading Questions

- For words that include a predication of only one (non situation) argument (such as book, happy) why do we still need a features INST. Why can't we have only SIT for these kinds of words?
- "The senator visited a classmate a week before being sworn in."
- The INDEX seems to be a complex feature of the semantic object, when do we know the INDEX refers to an individual or situation? And also sometimes in the book where INDEX is omitted, when should we include it?

Reading Questions

- *Alice and Bob and Charlie* still seems to be ambiguous in our current Ch.5 grammar, in both syntactic structure and semantics. Since [RELN and] has a list for ARGS, is it safe to collapse *Alice and Bob and Charlie* to a flat structure now?

- In the Coordination Rule (42), is there a reason why RESTR values are not stated in the mother and the daughters (besides the head daughter)? They seem to be given in the following tree example in (43).

Reading Questions

- It's somewhat awkward thinking about MOD because all the other principles and rules are focused on the headedness, that is, to assign certain values to the head. However, the Head-Modifier Rule assigns the value to the non-head daughter.

Reading Questions

- Is there an effective way to express whether an adjective or adverb modifier can appear before or after the phrase they describe? Now that we have introduced semantics it's interesting thinking about whether the modifier's placement affects the overall meaning.
- Example (26) can have the adjective responsible appear before and after the noun it modifies, but this changes the meaning ("the person responsible" vs "the responsible person").
- An example where the placement of the adjective doesn't seem to affect the overall meaning would be:
  - *The person responsibly confessed*.
  - *The person confessed responsibly.*

Reading Questions

- I am having trouble understanding quantifiers, even in their simplified notation. I don't quite understand the mechanics of how the BV binds a determiner/quantifier to what it's quantifying.
- I understand that two different interpretations of "a dog saved every family" exist. However, would you be able to explain more in layman's terms what is going on in (52) semantically, specifically with the BV value? I didn't quite understand what the BV value does.

Reading Questions

- It is interesting to see how HPSG handled compositionality and quantifier scope using features, so I am a little curious if there is there any major semantic problem that can be modeled using the usual first-order logic and lambda calculus, but is not so easy to model in HPSG? What is HPSG particularly good at in semantic analysis?

Reading Questions

- How do we know when we have to specify both SYN and SEM? Would we use SEM if we wanted to emphasize different interpretations, but then always use SYN? Do we need to mark SYN if it's the only thing in the feature structure?