Overview

• Ch 13 examples
• Big picture
• Untangle this...
## Some Type Constraints

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FEATURES/CONSTRAINTS</th>
<th>IST</th>
</tr>
</thead>
</table>
| verb-lxm    | SYN \[
\begin{align*}
\text{HEAD} & \left[ \text{verb} \right. \\
\text{AUX} & \left. / - \right]\end{align*}
\right. \\
\text{ARG-ST} & \left\langle [\text{HEAD nominal}], \ldots \right\rangle \\
\text{SEM} & \left[ \text{MODE prop} \right]\end{align*}
| infl-lxm    |
| srv-lxm     | ARG-ST \left\langle 1, \left[ \text{SPR} \left\langle 1 \right\rangle, \text{COMPS} \left\langle \emptyset \right\rangle \right\rangle \right\rangle \right. | verb-lxm  |
| ic-srv-lxm  | ARG-ST \left\langle X, \left[ \text{INF} \left[ \text{INDEX} \left[ s \right] \right] + \right\rangle \right. | srv-lxm   |
|             | SEM \left[ \text{RESTR} \left\langle [\text{ARG} s] \right\rangle \right] \right.                                                                                                                                         |           |
| auxv-lxm    | SYN \left[ \text{HEAD} \left[ \text{AUX} + \right] \right]                                                                                                                                                        | srv-lxm   |
The \( \text{ADV}_{pol} \)-Addition Lexical Rule

\[
\begin{align*}
\text{INPUT} & \quad \langle X, \rangle \\
\text{SYN} & \quad \langle \text{HEAD} \rangle \\
\text{HEAD} & \quad \langle \text{VERB} \rangle \\
\text{VERB} & \quad \langle \text{FORM} \rangle \\
\text{POL} & \quad \langle \text{POL} \rangle \\
\text{AUX} & \quad \langle \text{AUX} \rangle \\
\text{OUTPUT} & \quad \langle Y, \rangle \\
\text{ARG-ST} & \quad \langle [1] \rangle \\
\text{SEM} & \quad \langle \text{INDEX} \rangle \\
\end{align*}
\]
Negation and Reaffirmation: A Sample Tree

S

NP

 Leslie

VP

V

did

ADV_{pol}

so

eat the whole pizza
The Inversion Lexical Rule

\[ \pi\text{-rule} \]

**INPUT** \( \langle W, \)
\begin{align*}
&\quad \text{SYN} \quad \text{HEAD} \quad [verb \\
&\quad \text{VAL} \quad \text{FORM} \quad \text{fin} \\
&\quad \text{ARG-ST} \quad [A] \\
&\quad \text{SEM} \quad \text{AUX} + \\
&\quad [SPR \langle X \rangle] \\
&\quad \text{MODE} \quad \text{prop} \end{align*}
\rangle

**OUTPUT** \( \langle Z, \)
\begin{align*}
&\quad \text{SYN} \quad [INV +] \\
&\quad \text{VAL} \quad [SPR \langle \rangle] \\
&\quad \text{ARG-ST} \quad [A] \\
&\quad \text{SEM} \quad \text{MODE} \quad \text{ques} \end{align*}
\rangle
Inversion: A Sample Tree

S

V

NP

VP

Did

Leslie

eat the entire pizza?
The Contraction Lexical Rule

\[
\text{INPUT} \quad \langle [2], \ \begin{array}{c}
\text{ARG-ST} \quad \boxed{B} \\
\text{SEM} \\
\text{INDEX} \\
\text{RESTR} \quad \boxed{A}
\end{array}
\rangle
\]

\[
\text{OUTPUT} \quad \langle F_{\text{NEG}}([2]), \ \begin{array}{c}
\text{ARG-ST} \quad \boxed{B} \\
\text{SEM} \\
\text{INDEX} \\
\text{RESTR} \quad \boxed{A}
\end{array}
\rangle
\]

\[
\text{pi-rule}
\]

\[
\begin{array}{c}
\text{SYN} \\
\text{HEAD} \\
\text{verb} \\
\text{FORM} \\
\text{fin} \\
\text{AUX} \\
\text{+} \\
\text{POL} \\
\text{−}
\end{array}
\]

\[
\begin{array}{c}
\text{SYN} \\
\text{HEAD} \\
\text{POL} \\
\text{+}
\end{array}
\]

\[
\begin{array}{c}
\text{VAL} \\
\text{SPR} \\
\langle X \rangle
\end{array}
\]

\[
\begin{array}{c}
\text{RELN} \\
\text{not} \\
\text{SIT} \\
\text{ARG} \\
\text{not}
\end{array}
\]

\[
\oplus \boxed{A}
\]
Contraction: Sample Tree

S
  
NP  VP
  |   
Leslie  V
    |   
  wouldn’t  VP
        |   
eat the entire pizza
The Ellipsis Lexical Rule

\[
\begin{align*}
d-rule \quad & \\
\text{INPUT} \quad & \langle 1, \left[ \begin{array}{c}
\text{auxv-lxm} \\
\text{ARG-ST} \langle 2 \rangle \oplus A
\end{array} \right] \rangle \\
\text{OUTPUT} \quad & \langle 1, \left[ \begin{array}{c}
\text{dervv-lxm} \\
\text{ARG-ST} \langle 2 \rangle
\end{array} \right] \rangle
\end{align*}
\]

- Note that this is a derivational LR (\textit{d-rule}) -- that is, lexeme-to-lexeme

- This means that SYN and SEM are unchanged, by default
Ellipsis: A Sample Tree

[Diagram of a tree structure with the following node labels:
- S
- NP
- Kim
- V
- could
- VP
- could have been attending the conference]
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Parts of our model

• Type hierarchy (lexical types, other types)
• Phrase structure rules
• Lexical rules
• Lexical entries
• Grammatical principles
• Initial symbol
Pause for reflection

• What have you learned about the nature of human language?
• What have you learned about how linguists think about language?
• How does this model/type of model differ from CFG (with atomic categories)?
• In what applications might (atomic category) CFG be sufficient?
• What applications might benefit from something linguistically more motivated?
Complicated example #1

• What phenomena are illustrated by this sentence?

• What rules or interesting lexical types are involved in our analysis of it?

• What tree structure does our grammar assign?

*It was explained to me that Kim left.*
It was explained to me that Kim left.
I expect it to continue to surprise Kim that Sandy laughed.
I expect it to continue to surprise Kim that Sandy laughed.
Why not these?

*I expect it to continue to surprise Kim Sandy laughed.

*I expect there to continue to surprise Kim that Sandy laughed.

*I expect that Sandy laughed to Kim be surprised.
Complicated example #4

You all laughed, did you not?

*You all laughed, did not you?

You all laugheded, didn’t you?
you all laughed did you not
You all didn't laugh you
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