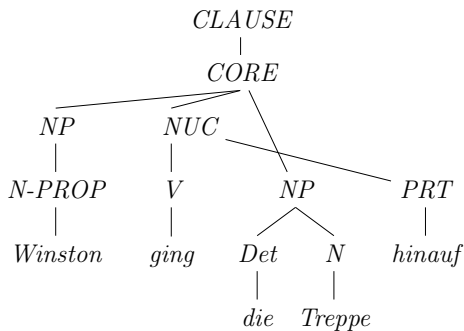# Parsing Beyond CFG
Homework 10: Data-driven LCFRS Parsing

Laura Kallmeyer

Question 1

Consider the following treebank tree[1]:

Assuming that we extract LCFRS rules from this tree, how do they look like?

Question 2 *Consider the following PLCFRS (the numbers in parentheses are the log values of the probabilities):*

> 1 (0): $S(XYZ) \rightarrow A(X,Z)\ B(Y)$
> 0.8(-0.1): $A(X,Y) \rightarrow B(X)\ D(X)$ 0.2(-0.7): $A(X,Y) \rightarrow C(X)\ D(X)$
> 0.5 (-0.3): $B(b) \rightarrow \varepsilon$ 0.5 (-0.3): $B(c) \rightarrow \varepsilon$
> 1 (0): $C(b) \rightarrow \varepsilon$ 1 (0): $D(d) \rightarrow \varepsilon$

Perform a weighted deductive CYK parsing for the input bbd using this grammar.

1. *Give the trace in a table. The left column lists in every step only the item that has been added to the chart in the last step; the right column lists all items that are in the agenda, including their weights.*

Chart	Agenda
	$0{:}[C, \langle\langle 0, 1\rangle\rangle]$, $0{:}[C, \langle\langle 1, 2\rangle\rangle]$, $0{:}[D, \langle\langle 2, 3\rangle\rangle]$, $-0.3{:}[B, \langle\langle 0, 1\rangle\rangle]$, $-0.3{:}[B, \langle\langle 1, 2\rangle\rangle]$
$0{:}[C, \langle\langle 0, 1\rangle\rangle]$	$0{:}[C, \langle\langle 1, 2\rangle\rangle]$, $0{:}[D, \langle\langle 2, 3\rangle\rangle]$, $-0.3{:}[B, \langle\langle 0, 1\rangle\rangle]$, $-0.3{:}[B, \langle\langle 1, 2\rangle\rangle]$
$0{:}[C, \langle\langle 1, 2\rangle\rangle]$	$0{:}[D, \langle\langle 2, 3\rangle\rangle]$, $-0.3{:}[B, \langle\langle 0, 1\rangle\rangle]$, $-0.3{:}[B, \langle\langle 1, 2\rangle\rangle]$
...	...

2. *Given the weight of the goal item, what is the probability of the corresponding derivation? (Hint: weights are $\log_{10}$ values.)*

---

[1]Adapted from rrgparbank.phil.hhu.de.