Parsing

Homework 5 (CYK), due 25 May 2020

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Question 1 (CYK recognition – general version)

Consider the CFG with non-terminals S, A, C, terminals a, b, start symbol S and productions $S \to AS \mid S \to \epsilon$, $A \to a \mid AC \mid \varepsilon$, $C \to c$.

Give the chart (the $(n+1) \times (n+1)$-table) that results from the general CYK algorithm for the input aaac.

Solution:

4	S				
3	S	S			
2	S	S	A, S		
1	a, A, S	a, A, S	a, A, S	c, C, A, S	
0	S, A	S, A	S, A	S, A	S, A
	1	2	3	4	5

Question 2 (CYK parsing for CNF grammars)

Consider the CFG with non-terminal S, terminal a, start symbol S and productions $S \to S\ S$, $S \to a$.

This grammar is in Chomsky Normal Form.

1. *Give the chart (the $n \times n$-table) that results from the CYK parsing algorithm (for CNF) for the input aaaa. The chart should include not only the non-terminals that we find but the entire productions with, in the rhs, the indices of the antecedent chart items in the complete rule that has been applied.*
2. *Give all parse trees for the input.*

Solution:

1. Chart:

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4	$S \to S_{1,1}S_{2,3}$, $S \to S_{1,2}S_{3,2}$, $S \to S_{1,3}S_{4,1}$				
3	$S \to S_{1,1}S_{2,2}$, $S \to S_{1,2}S_{3,1}$	$S \to S_{2,1}S_{3,2}$, $S \to S_{2,2}S_{4,1}$			
2	$S \to S_{1,1}S_{2,1}$	$S \to S_{2,1}S_{3,1}$	$S \to S_{3,1}S_{4,1}$		
1	$S \to a$	$S \to a$	$S \to a$	$S \to a$	
	1	2	3	4	i

2.