Parsing: Example for k-best parsing

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Consider the PCFG G with $N = \{S, A\}$, $T = \{a\}$, start symbol S and productions

0.5 $S \to SS$ 0.125 $S \to AS$ 0.25 $S \to SA$ 0.125 $S \to a$ 1 $A \to a$

For weights, we use $|log_2(p)|$.

The inside estimates up to length 2 are

S	3	5	
A	0	∞	
	1	2	l

As outside estimates for length 2, we obtain

$l = 2$: $out(A, 0, 2, 0) = \infty$, $out(S, 0, 2, 0) = 0$

$l = 1$: $out(A, 0, 1, 1) = 6$, $out(A, 1, 1, 0) = 5$, $out(S, 0, 1, 1) = 2$, $out(S, 1, 1, 0) = 3$

We perform a k-best weighted deductive parsing of the input aa with $k = 2$, following the Pauls & Klein algorithm. We give only the subsequent agenda contents, marking the best item each time. The chart is then understood as containing everything that has been marked in the previous agenda contexts. The sequence of agenda contents is as follows (best item is in bold, newly added items are in red):

Agenda (best item is bold)
(0, 6):I[A, 0, 1] **(0,5):I[A, 1, 2]** (3,2):I[S, 0, 1] (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] **(3,2):I[S, 0, 1]** (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] **(5,0):I[S, 0, 2]** (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] **(5,0):O[S, 0, 2]** (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] **(3,2):O[S, 0, 1]** (0,5):O[A, 1, 2] (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] **(0,5):O[A, 1, 2]** (0,6):[A(a), 0, 1] (0,5):[A(a), 1, 2] (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] **(0,5):[A(a), 1, 2]** (3,2):[S(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] **(3,2):[S(a), 0, 1]** (3,3):[S(a), 1, 2]
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] (3,3):[S(a), 1, 2] **(5,0):[S(S(a),A(a)), 0, 2]**
(first goal item found)
(0,6):I[A, 0, 1] (3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] (3,3):[S(a), 1, 2]
(3,3):I[S, 1, 2] (0,6):[A(a), 0, 1] (3,3):[S(a), 1, 2]
(0,6):[A(a), 0, 1] (3,3):[S(a), 1, 2]
(3,3):[S(a), 1, 2]
(6,0):[S(A(a),S(a)), 0, 2] (7,0):[S(S(a),S(a)), 0, 2]
(second goal item found)