

Parsing Beyond CFG

Homework 5: LTIG formalism and LTIG Earley Parsing

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Question 1 (LTIG)

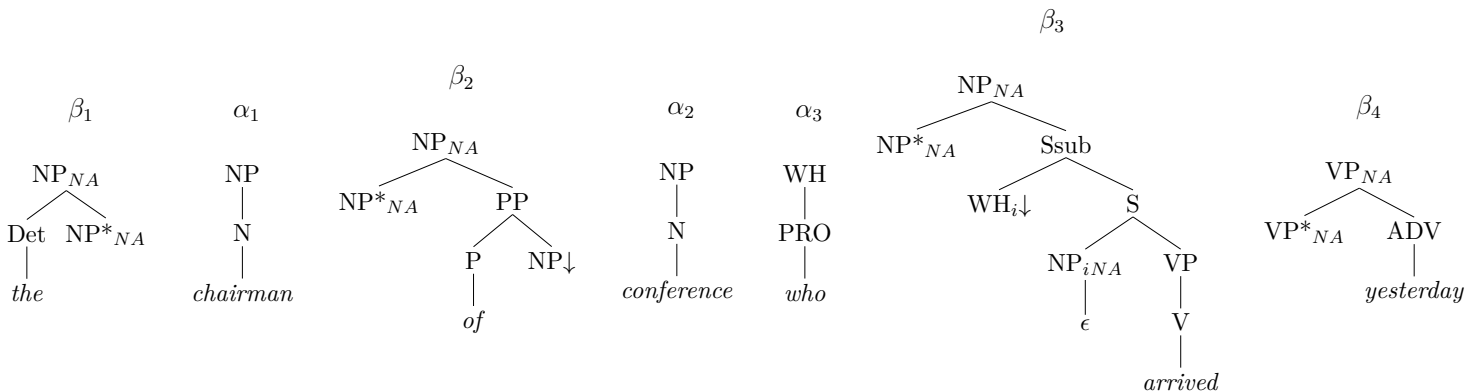
Consider the sentence:

(1) *The chairman of the conference who arrived yesterday*

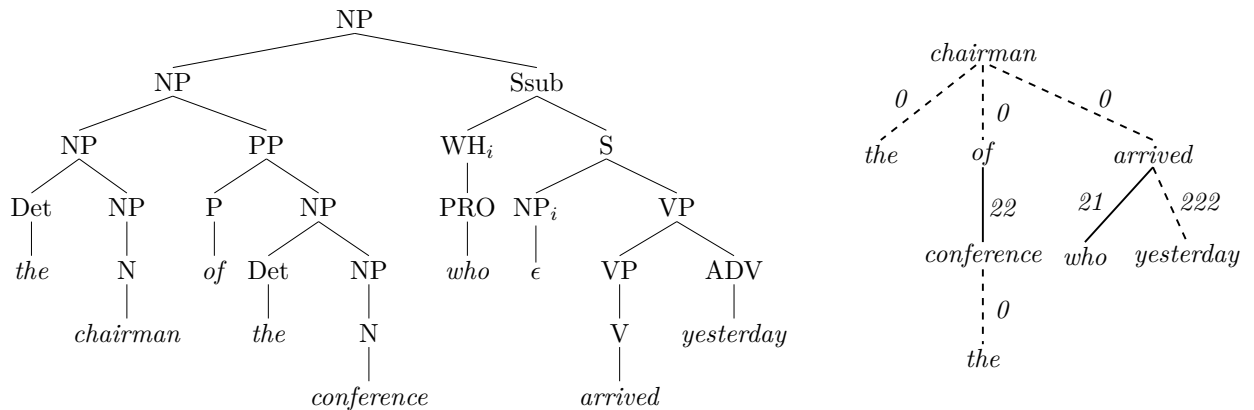
(a) Give the elementary trees in LTIG that generate this sentence and give the LTIG analysis of this sentence. The elementary trees should follow the design principles of LTIG (see the slides). Do not use the sister-adjunction. Please mark all nodes in the elementary trees which disallow adjunction (except for substitution nodes) with $_{NA}$ subscript (null adjunction) and mark substitution nodes with \downarrow .

(b) Give the derived tree and the derivation tree for this sentence.

Solution:



Derived tree and derivation tree:

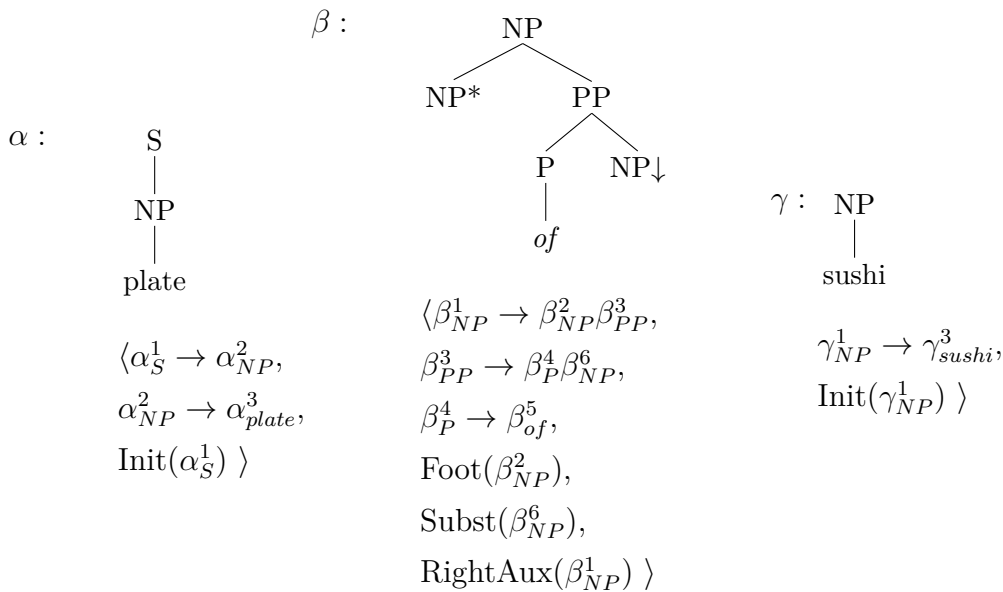


Question 2 (LTIG Earley parsing)

Now consider the following sentence:

(2) *Plate of sushi*

Using the following LTIG elementary trees for *plate* and *sushi* and the elementary tree for the word *of* you defined in the previous exercise, give the trace of the Earley parser (the first three items are given in the table below):



	item	dotted tree	rule
1.	$[\alpha_S^1 \rightarrow \bullet \alpha_{NP}^2, 0, 0]$	<pre> S • NP plate </pre>	Initialize
2.	$[\alpha_{NP}^2 \rightarrow \bullet \alpha_{plate}^3, 0, 0]$	<pre> S NP • plate </pre>	MoveDown from 1
3.	$[\alpha_{NP}^2 \rightarrow \alpha_{plate}^3 \bullet, 0, 1]$	<pre> S NP plate • </pre>	Scan from 2
4.	$[\beta_{NP}^1 \rightarrow \bullet \beta_{NP}^2 \beta_{PP}^3, 1, 1]$	<pre> NP / \ • NP* PP / \ P NP↓ of </pre>	PredictRightAdjunction from 3
5.	$[\beta_{NP}^1 \rightarrow \beta_{NP}^2 \bullet \beta_{PP}^3, 1, 1]$	<pre> NP / \ NP* • PP / \ P NP↓ of </pre>	ScanFoot from 4

	item	dotted tree	rule
6.	$[\beta_{PP}^3 \rightarrow \bullet \beta_P^4 \beta_{NP}^6, 1, 1]$		MoveDown from 5
7.	$[\beta_P^4 \rightarrow \bullet \beta_{of}^5, 1, 1]$		MoveDown from 6
8.	$[\beta_P^4 \rightarrow \beta_{of}^5 \bullet, 1, 2]$		Scan from 7
9.	$[\beta_{PP}^3 \rightarrow \beta_P^4 \bullet \beta_{NP}^6, 1, 2]$		CompleteNode from 8,6
10.	$[\gamma_{NP}^1 \rightarrow \bullet \gamma_{sushi}^2, 2, 2]$		PredictSubst from 9
11.	$[\gamma_{NP}^1 \rightarrow \gamma_{sushi}^2 \bullet, 2, 3]$		Scan from 10
12.	$[\beta_{PP}^3 \rightarrow \beta_P^4 \beta_{NP}^6 \bullet, 1, 3]$		Substitute from 11,9
13.	$[\beta_{NP}^1 \rightarrow \beta_{NP}^2 \beta_{PP}^3 \bullet, 1, 3]$		CompleteNode from 12,5
14.	$[\alpha_{NP}^2 \rightarrow \alpha_{plate}^3 \bullet, 0, 3]$		RightAdjoin from 13, 3
15.	$[\alpha_S^1 \rightarrow \alpha_{NP}^2 \bullet, 0, 3]$		CompleteNode from 14, 1 \Rightarrow goal item