Computational Syntax
Lecture Notes

Mohammad Alobaid

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CFG for John laughs at Mr.D":

S→ NP VP

NP→ John |Mr.D

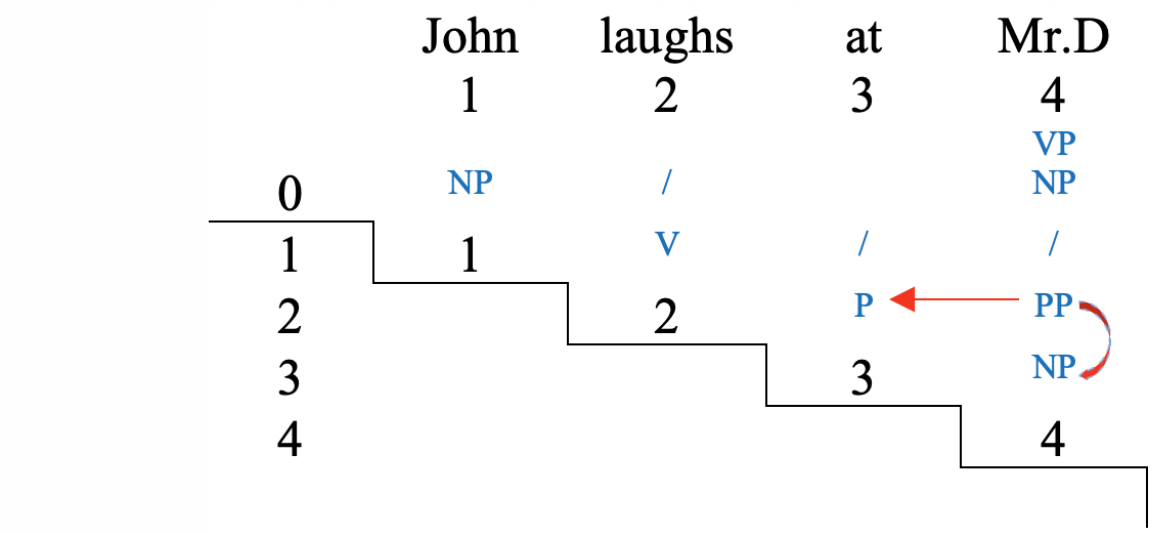
VP → laughs |V PPat

PPat→ P at NP

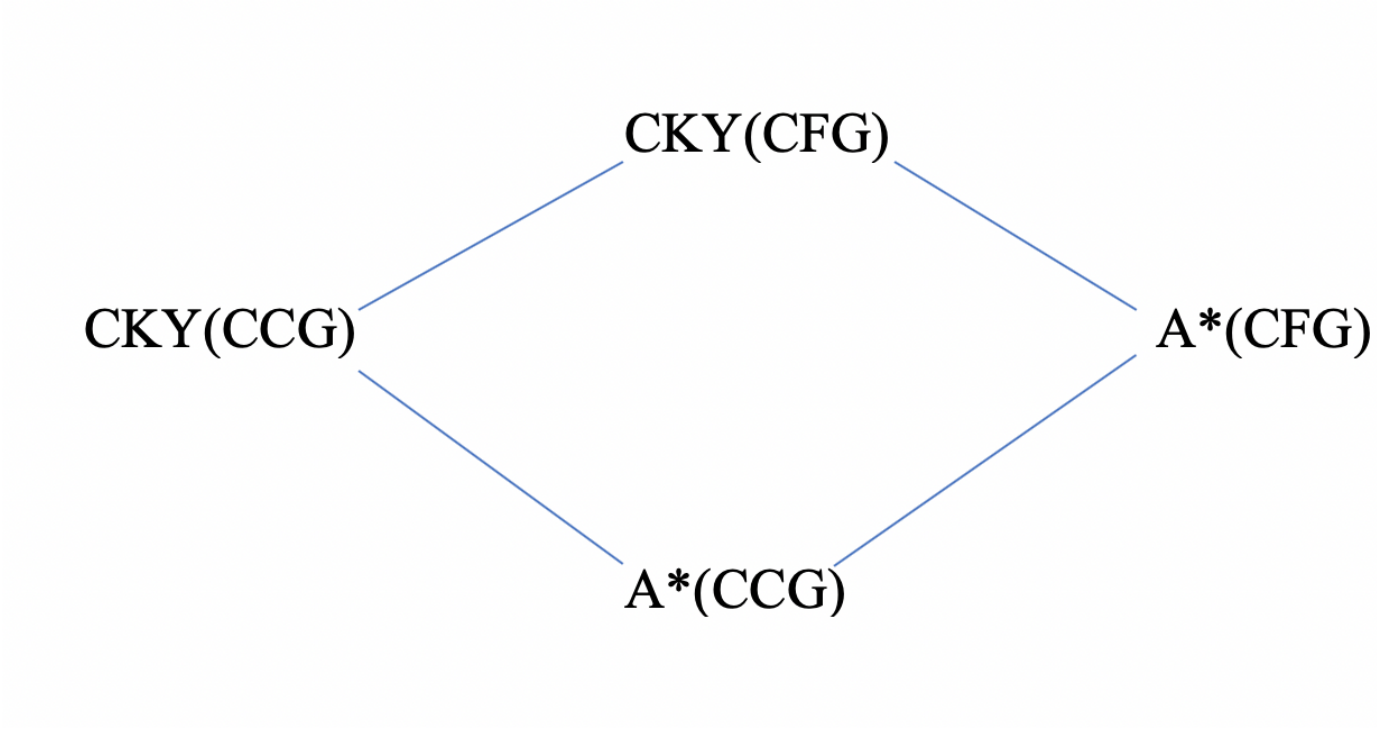
Pat→ P at

V → laughs

CKY parser for the sentence "John laughs at Mr.D":



Types of parsers on different formalisms :



Different rules for (CCG)

Functional Application (FA) :

$$\frac{\delta/\tau \quad \tau}{\delta} >$$

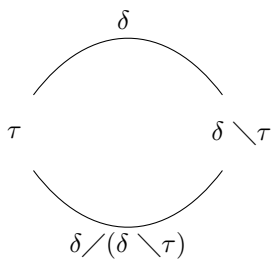
$$\frac{\tau \quad \delta \backslash \tau}{\delta} <$$

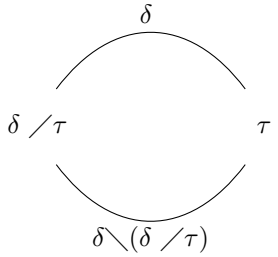
Functional Composition (FC) :

$$\frac{\delta/\tau \qquad \tau/P}{\delta/P} >$$

$$\frac{\tau\backslash P \quad \delta\backslash\tau}{\delta\backslash P} <$$

Type Raising :





FCx :

$$\frac{\delta / \tau \quad \tau \backslash P}{\delta \backslash P()} \beta x >$$

$$\frac{\tau / \quad P \quad \delta \backslash \tau}{\delta \backslash P()} \beta x <$$

Parsing Scheme for CKY parser for CCG:

$$\frac{[i, \quad \delta / \tau \quad j][j, \quad \tau \backslash P,K]}{[i, \quad \delta \backslash P,K]()}$$

Introduction to Probability Parsing

1 S→ NP VP

.7 NP→ NP PP

.2 NP → Det N

.8 VP→ V N

1 PP→ P NP

1 V → likes

.9 V → saw

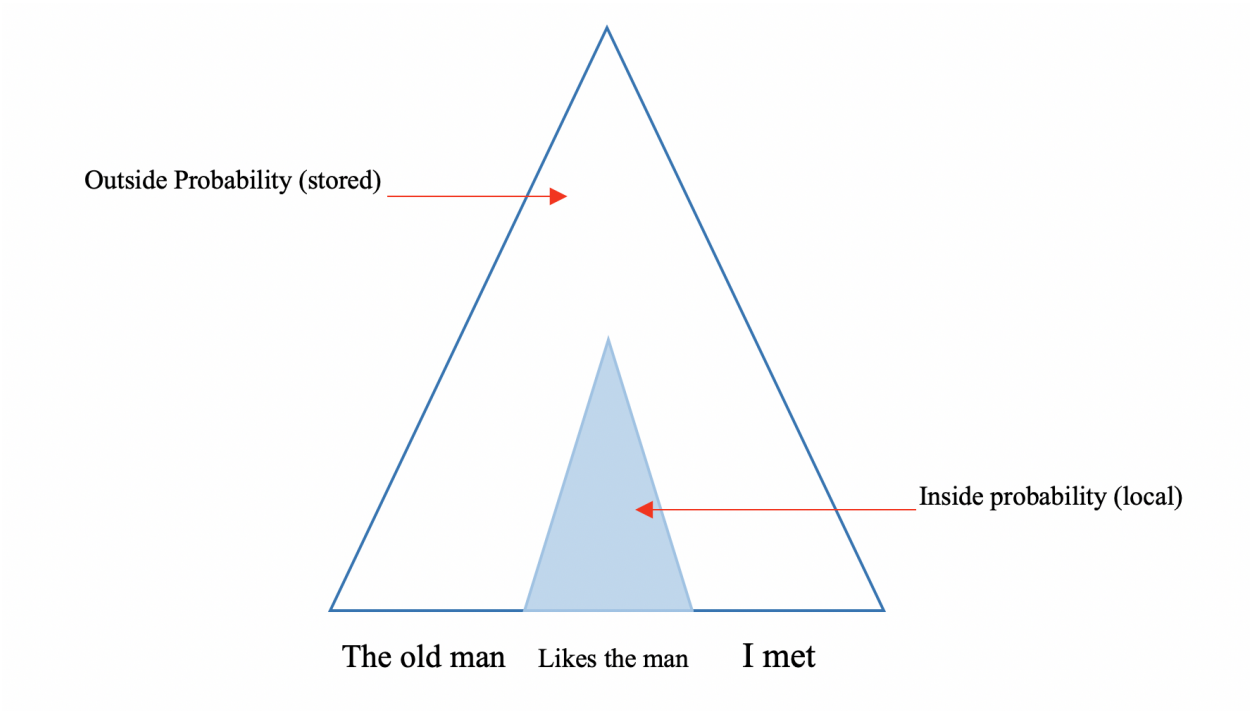
1 Det → the

.5 N → man

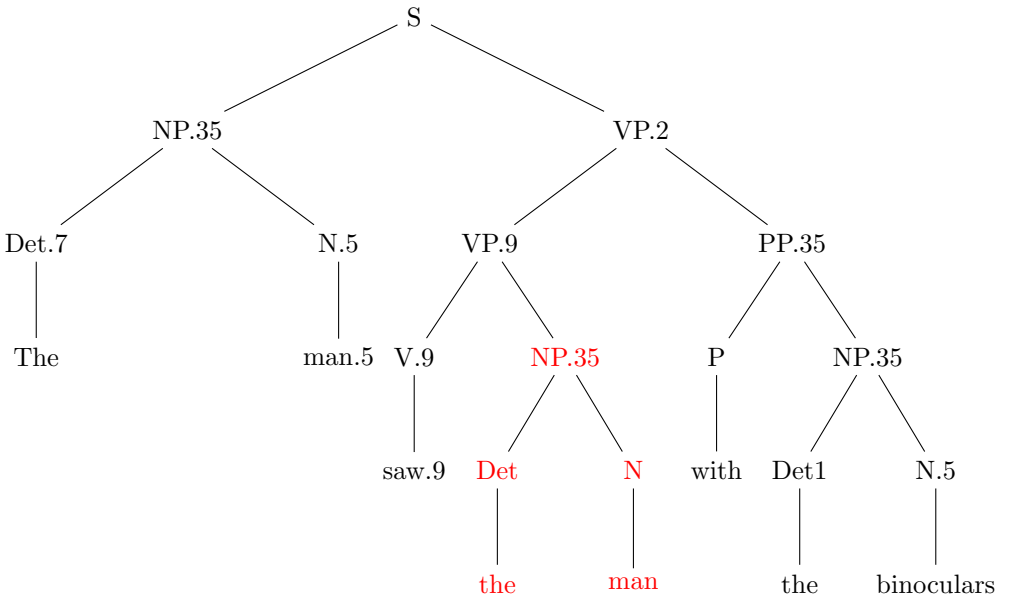
.5 N → binoculars

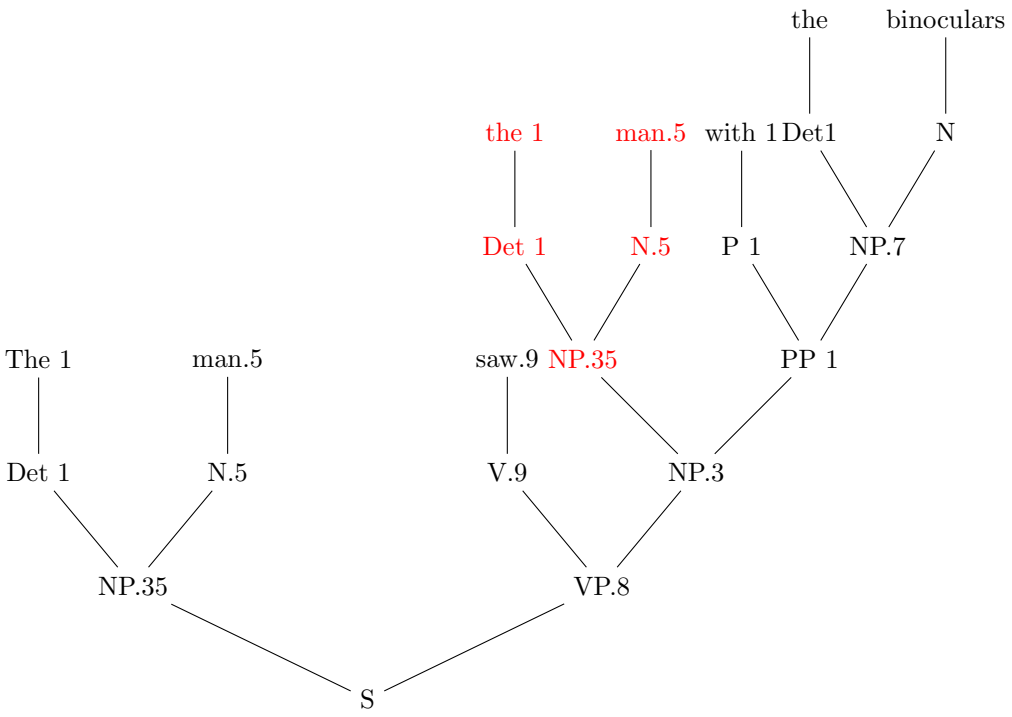
P → with

The colored above represents probability parsing (A* (CFG)), while the digram structure below shows processing of a sentence with this model of grammar.

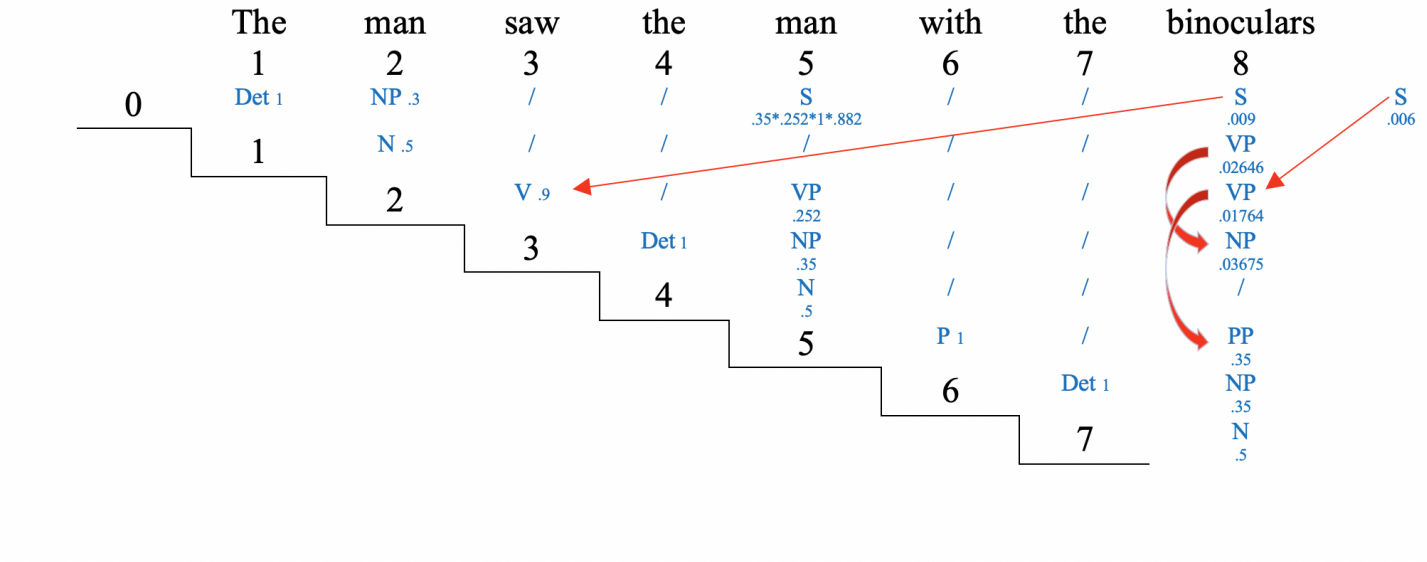


The up down tree describe probability parsing of two interpretations. The colored text describe the (inside probability) while the rest of the sentence left and right is the (outside probability)

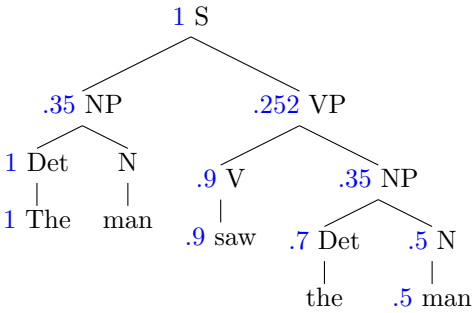




Probability Parsing with CKY (resemble the above model but with CKY):



The shorter version of the tree in the CKY parser represented in node 5 gives (1*.35*.252*.0882):



The probabality of the of the second parsing is higher as compared to the first one:

.2 S → NP VP .5

.8 S′ → NP VP .25