

Parsing Lab

Questions in Lecture 6

Exercise 1

Given this grammar and lexicon

Lexicon
<i>Det</i> → <i>that</i> <i>this</i> <i>the</i> <i>a</i>
<i>Noun</i> → <i>book</i> <i>flight</i> <i>meal</i> <i>money</i>
<i>Verb</i> → <i>book</i> <i>include</i> <i>prefer</i>
<i>Pronoun</i> → <i>I</i> <i>she</i> <i>me</i>
<i>Proper-Noun</i> → <i>Houston</i> <i>NWA</i>
<i>Aux</i> → <i>does</i>
<i>Preposition</i> → <i>from</i> <i>to</i> <i>on</i> <i>near</i> <i>through</i>

\mathcal{L}_1 in CNF
$S \rightarrow NP VP$
$S \rightarrow XI VP$
$XI \rightarrow Aux NP$
$S \rightarrow book \mid include \mid prefer$
$S \rightarrow Verb NP$
$S \rightarrow X2 PP$
$S \rightarrow Verb PP$
$S \rightarrow VP PP$
$NP \rightarrow I \mid she \mid me$
$NP \rightarrow TWA \mid Houston$
$NP \rightarrow Det Nominal$
$Nominal \rightarrow book \mid flight \mid meal \mid money$
$Nominal \rightarrow Nominal Noun$
$Nominal \rightarrow Nominal PP$
$VP \rightarrow book \mid include \mid prefer$
$VP \rightarrow Verb NP$
$VP \rightarrow X2 PP$
$X2 \rightarrow Verb NP$
$VP \rightarrow Verb PP$
$VP \rightarrow VP PP$
$PP \rightarrow Preposition NP$

Exercise 1

Parse the following sentence

Book	the	flight	through	Houston

Exercise 2

Retrieve all possible parse trees

[illegible]

Exercise 3

Given this corpus, show its complete PCFG:

```
( (S
  (NP-SBJ (DT The) (NN move))
  (VP (VBD followed)
    (NP
      (NP (DT a) (NN round))
      (PP (IN of)
        (NP
          (NP (JJ similar) (NNS increases))
          (PP (IN by)
            (NP (JJ other) (NNS lenders)))
          (PP (IN against)
            (NP (NNP Arizona) (JJ real) (NN estate) (NNS loans))))))
    (, ,)
    (S-ADV
      (NP-SBJ (-NONE- *))
      (VP (VBG reflecting)
        (NP
          (NP (DT a) (VBG continuing) (NN decline))
          (PP-LOC (IN in)
            (NP (DT that) (NN market))))))
    (. .)))
```

$T =$

$N =$

$S =$

$R =$

$q =$

Exercise 4 – The CKY algorithm for PCFG

Example by Michael Collins

Given the grammar:

S	⇒	NP	VP	1.0
VP	⇒	Vi		0.4
VP	⇒	Vt	NP	0.4
VP	⇒	VP	PP	0.2
NP	⇒	DT	NN	0.3
NP	⇒	NP	PP	0.7
PP	⇒	IN	NP	1.0

Vi	⇒	sleeps	1.0
Vt	⇒	saw	1.0
NN	⇒	man	0.7
NN	⇒	woman	0.2
NN	⇒	telescope	0.1
DT	⇒	the	1.0
IN	⇒	with	0.5
IN	⇒	in	0.5

Generate the best parse tree for the sentence:

The woman saw the man with the telescope

Exercise 4 – The CKY algorithm for PCFG

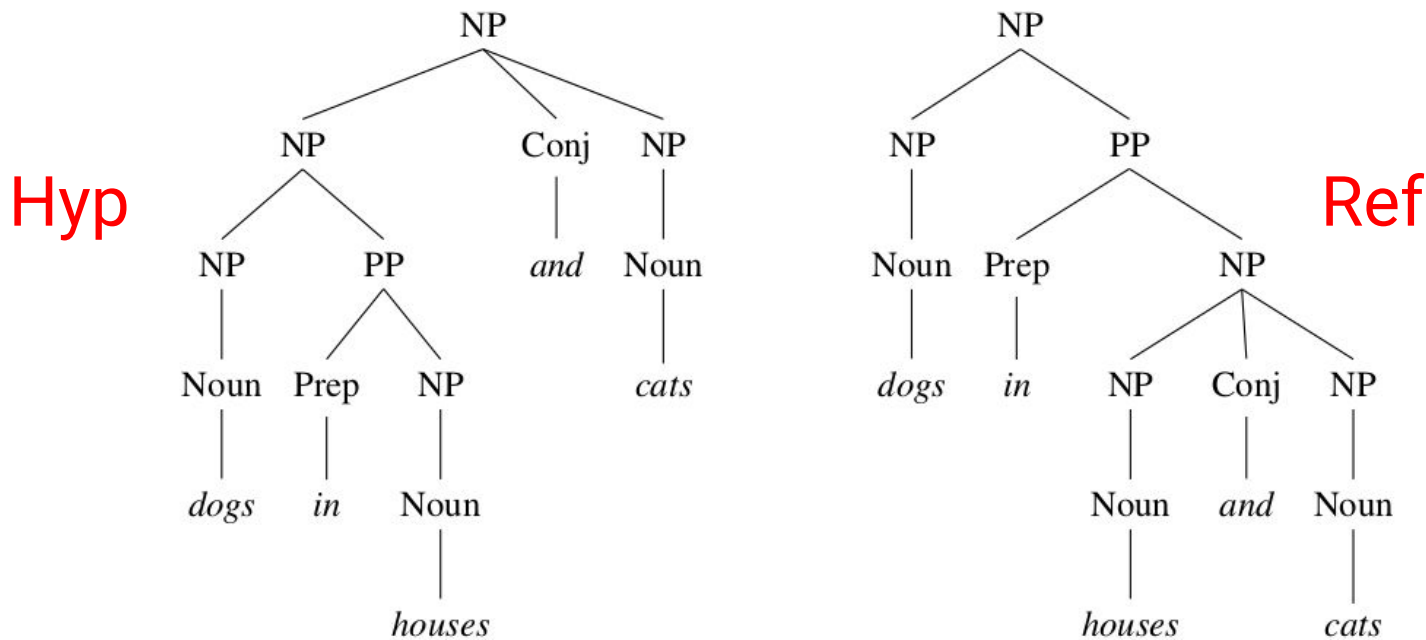
Example by Michael Collins

Generate the best parse tree for the sentence:

The woman saw the man with the telescope

Exercise 5

- Given the hyp and ref parse trees below, compute recall, precision and f-measure



Exercise 6 – Lexicalised CFG

Given the following CFG grammar, convert it into a LCFG

$S \rightarrow NP VP$

$VP \rightarrow V NP$

$VP \rightarrow VP PP$

$PP \rightarrow P NP$

$P \rightarrow \text{with}$

$V \rightarrow \text{saw}$

$NP \rightarrow NP PP$

$NP \rightarrow \text{astronomers}$

$NP \rightarrow \text{ears}$

$NP \rightarrow \text{saw}$

$NP \rightarrow \text{stars}$

$NP \rightarrow \text{telescope}$