

SNLP Assignment 5

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1. Context Free Grammars

1.1. POS-Tags

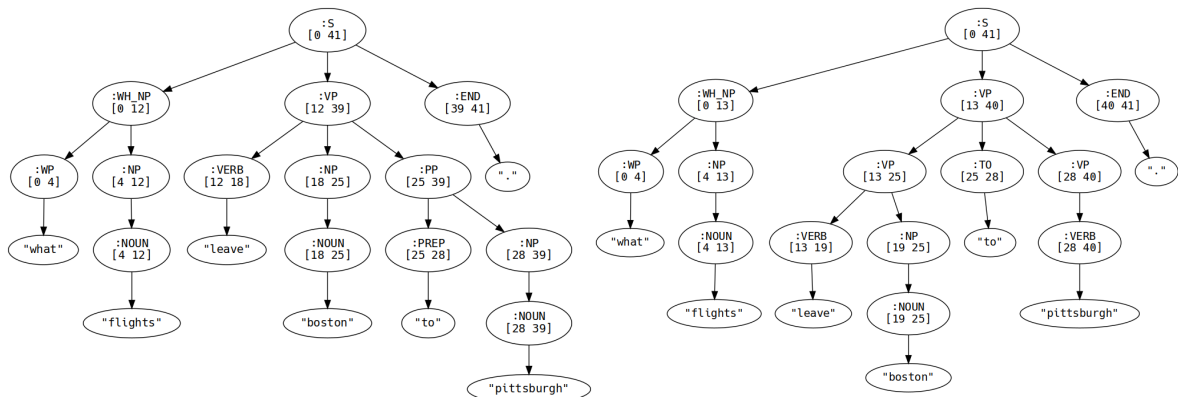
- what_WDT flights_NNS leave_VBP boston_NN to_TO pittsburgh_NN ._.
- what_WDT flights_NNS leave_VBP los_NNS angeles_NNS arriving_VBG in_IN minneapolis_NN ._.
- what_WDT flights_NNS are_VBP available_JJ between_IN chicago_NNP and_CC indianapolis_NNP ._.

1.2. Context Free Grammar

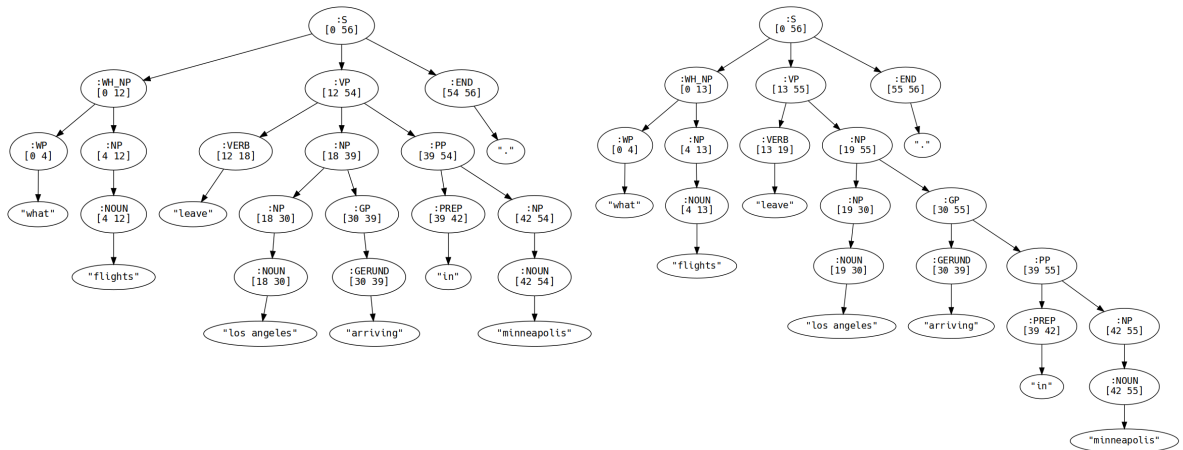
```
S := (NP VP | VP | WH_NP VP) END
NP := NOUN | NP GP | NP CC NP
VP := VERB NP? PP? | BE (GP | AP) | VP TO VP | VP CC VP
GP := GERUND NP? PP?
AP := ADJ PP?
WH_NP := WP NP
PP := PREP NP
WP := 'what'
CC := 'and'
NOUN := 'flights' | 'boston' | 'pittsburgh' | 'los angeles'
        | 'minneapolis' | 'chicago' | 'indianapolis'
VERB := 'leave' | 'pittsburgh' | 'indianapolis'
GERUND := 'arriving'
BE := 'are'
TO := 'to'
PREP := 'in' | 'to' | 'between'
ADJ := 'available'
END := '.' | '?'
```

1.3. CFG Parse Trees

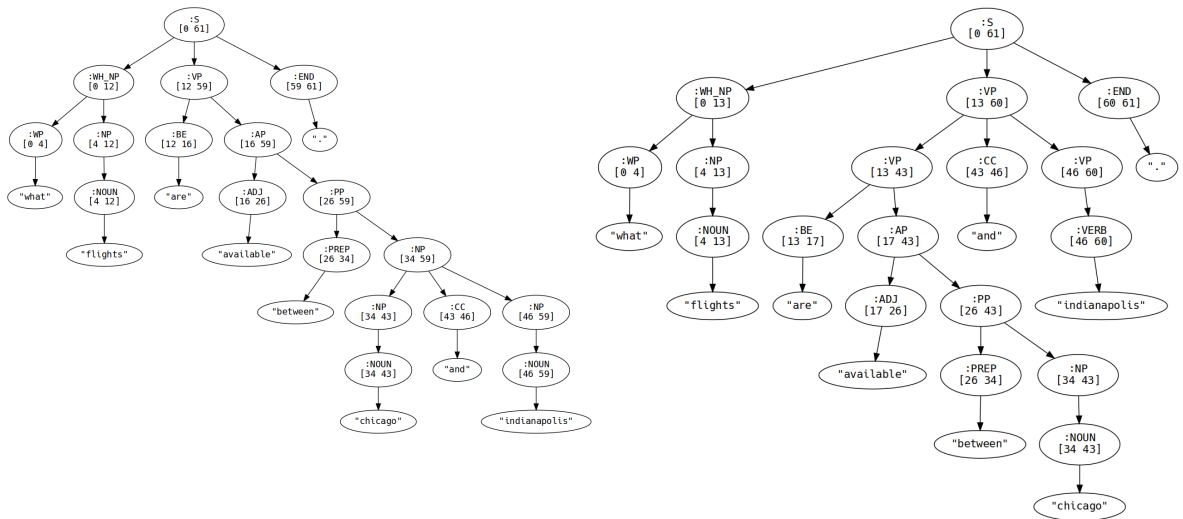
- what flights leave boston to pittsburgh .



- what flights leave los angeles arriving in minneapolis .



- what flights are available between chicago and indianapolis .



1.4. Chomsky Normal Form

1.4.1. CNF Grammar

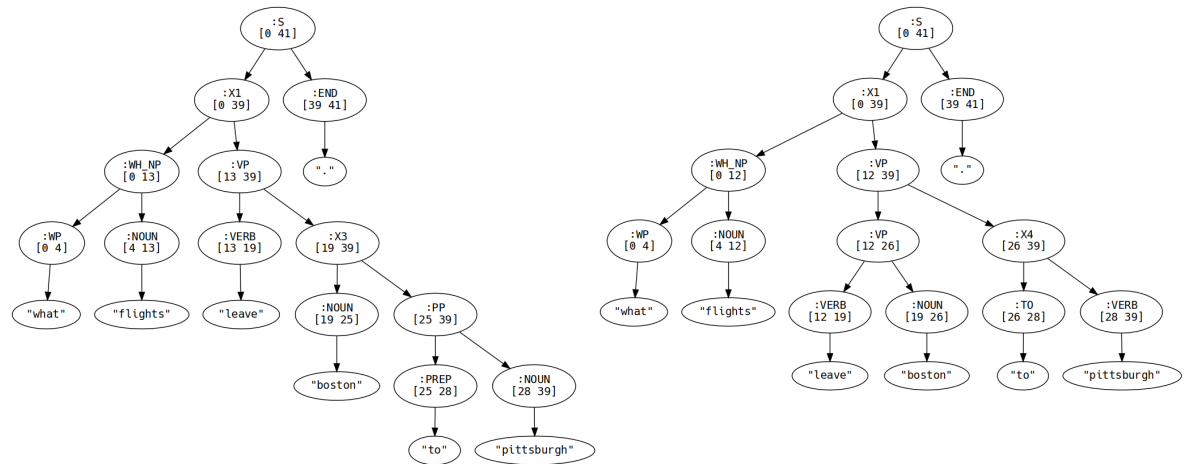
```

S := X1 END | VP END | VERB END
X1 := NP VP | NOUN VP | WH_NP VP | NP VERB | NOUN VERB | WH_NP VERB
NP := NP GP | NP X2 | NOUN GP | NOUN X2 | NP GERUND | NOUN GERUND
X2 := CC NP | CC NOUN
VP := VERB NP | VERB NOUN | VERB PP | VERB X3 | BE GP | BE GERUND
      | BE AP | BE ADJ | VP X4 | VERB X4
X3 := NP PP | NOUN PP
X4 := TO VP | TO VERB | CC VP | CC VERB
GP := GERUND NP | GERUND PP | GERUND X3
AP := ADJ PP
WH_NP := WP NP | WP NOUN
PP := PREP NP | PREP NOUN
WP := 'what'
CC := 'and'
NOUN := 'flights' | 'boston' | 'pittsburgh' | 'los angeles'
      | 'minneapolis' | 'chicago' | 'indianapolis'
VERB := 'leave' | 'pittsburgh' | 'indianapolis'
GERUND := 'arriving'
BE := 'are'
TO := 'to'
PREP := 'in' | 'to' | 'between'
ADJ := 'available'
END := '.' | '?'

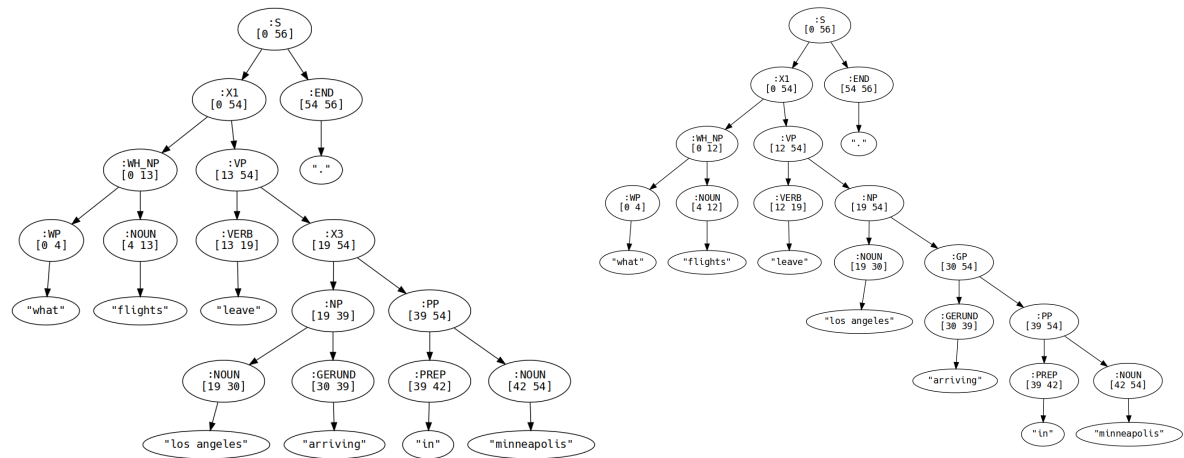
```

1.4.2. CNF Parse Trees

- what flights leave boston to pittsburgh .



- what flights leave los angeles arriving in minneapolis .



- what flights are available between chicago and indianapolis .

