

Lecture 17

Syntactic Parsing – PART I

Syntactic Parsing of a sentence

- Rules-based NLP

[3rd option in contrast to NLP based on a) machine learning with feature extraction b) use of lexicons to make sense of a sentence]

- Rules are grammars (Context Free Grammars or CFG)
- Use these rules to determine whether the input sentence is written as per grammar or not
- You can also parse the sentence and extract useful information from the sentence by studying its grammar

Steps to be followed in a parsing task

- Write the grammar (rules) for English sentences
- **Terminals**: words in the sentence **Non-terminals**: symbols used at the back-end
- To left of the arrow in the grammar productions : One **Non-terminal**
- Given this grammar and an input sentence.....
- Parse the sentence –Top down/Bottom up parsing technique
- Display the output of parsing as either Accept/Reject (for a grammar check task)

Rules for English Grammar

- English sentences – divide – into constituents
- Start Variable : S
- Constituents:-
 - a) Noun Phrase : NP
 - b) Verb Phrase : VP
 - c) Preposition phrase : PP

Noun Phrase

- Sequence of words surrounding a Noun

- $NP \rightarrow Noun$

- $NP \rightarrow Pronoun$

- $NP \rightarrow Det\ Noun$

- $NP \rightarrow Det\ Adj\ Noun$

- $Noun \rightarrow girl | boy$, $Pronoun \rightarrow i$, $Det \rightarrow the | a$, $Adj \rightarrow small$ [lexicon]

(**Terminals:** girl, boy,... **Non-terminals:** NP, Noun, Pronoun, Det, Adj)

Eg. : book, i, the book, the interesting book

Verb Phrase

- Sequence of words surrounding a Verb
- $VP \rightarrow Verb$
- $VP \rightarrow Verb\ NP$
- $VP \rightarrow Verb\ PP$
- $VP \rightarrow Verb\ NP\ PP$

Eg. : read, read the book, read on the table, read the book on the table

Preposition Phrase

- Sequence of words surrounding a Preposition
- PP → *Preposition* NP

Eg. : under the bed, on the table

Example

A typical grammar and an input sentence

Starts with S

- $S \rightarrow NP VP$
- $NP \rightarrow Noun$
- $NP \rightarrow Pronoun$
- $NP \rightarrow Det Noun$
- $NP \rightarrow Det Adj Noun$
- $VP \rightarrow Verb$
- $VP \rightarrow Verb NP$
- $VP \rightarrow Verb PP$
- $VP \rightarrow Verb NP PP$
- $PP \rightarrow Preposition NP$
- $Noun \rightarrow girl | boy | book | table, Pronoun \rightarrow i, Det \rightarrow the | a, Adj \rightarrow small, Verb \rightarrow read, Preposition \rightarrow on | under | in$ [lexicon]

Test sentence: **i read a book on the table** (grammatically correct or not?)-----Yes/ACCEPT/Grammatically correct [use parsing]

Derivation: $S \rightarrow NP VP \rightarrow Noun VP \rightarrow Pronoun VP \rightarrow i VP \rightarrow \dots [Parse] \dots$ Sentence (Yes)