# Constituency parsing

# "Constituency" **on the table**

e.g. the *prepositional phrase* is a "constituent" of the *sentence*

... extrapolate to define the *noun phrase* and *verb phrase*

# Noun phrase

Anything that can serve in place of a simple noun:

*NP* is in the hole.

- Water

- A monkey

- A curious monkey

- The man with the yellow hat

# Verb phrase

Anything that can serve as an action:

The woman *VP*.

- runs
- runs quickly
- runs to the water
- builds a boat out of palm fronds

# Context-free grammar

- a set of rules for composing constituents

- a lexicon of words and symbols

# Examples

- George ate.

- George ate pizza.

- George ate a horse.

- George ate in the jungle.

- George of the jungle ate pizza and a horse.

- George ate pizza and went to the jungle.

# Full grammar

- S → NP VP

- NP → Det Nom
  | NP "and" NP

- Nom → Noun
  | Nom Noun
  | Nom PP

- VP → Verb
  | Verb NP
  | VP PP
  | VP "and" VP

- PP → Preposition NP

- Noun → "George"

  | "pizza"

  | "horse"

  | "jungle"

- Verb → "ate"

  | "went"

- Det → "a"

  | "the"

- Preposition → "at"

  | "in"

  | "of"

  | "to"

# Chomsky Normal form

rules of the form:

- `A → B C`

- `A → w`

as opposed to e.g. `A → B C D` or `A → B w C`

... but we can map these losslessly to CNF.

# Ambiguity

```
"Bob killed the man with the fedora."
 NNP VBD    DT  NN  IN   DT  NN
```

What does "with the fedora" refer to? "the man" or "killed"?

# CKY parsing

"Cocke-Kasami-Younger" algorithm

Jurafsky and Martin ch 13.2.2

# Real examples

https://semver.org/#backusnaur-form-grammar-for-valid-semver-versions

https://docs.python.org/3/reference/grammar.html