School of Computing and Information Systems
The University of Melbourne
COMP90042
NATURAL LANGUAGE PROCESSING (Semester 1, 2020)

Workshop exercises: Week 9

choose only one tree ↗ choose multiple Trees

Discussion

1. What differentiates **probabilistic CYK parsing** from **CYK parsing**? Why is this important? How does this affect the algorithms used for parsing?
2. What is a **probabilistic context-free grammar** and what problem does it attempt to solve?
3. A hidden Markov model assigns each word in a sentence with a tag, e.g.,

   Donald/NNP has/VBZ small/JJ hands/NNS

   adjacent

   The probability of the sequence is based on the tag-word pairs, and the pairs of adjacent tags. Show how this process can be framed as a CFG, and how the various probabilities (e.g., observation, transition, and initial state) can be assigned to productions. What are the similarities and differences between CYK parsing with this grammar, and the HMM's Viterbi algorithm for finding the best scoring state sequence?

Head Relation

Similarity

2

4. Using typical dependency types, construct (by hand) a dependency parse for the following sentence: *Yesterday, I shot an elephant in my pyjamas.* Check your work against the output of the online GUI for the Stanford Parser (`https://corenlp.run/`).

① pos-tag ② CYK only allows relation with local neighbour.

5. In what ways is **(transition–based, probabilistic) dependency parsing** similar to **(probabilistic) CYK parsing**? In what ways is it different?

Root has no head.

CYK looks for every path viable to construct ... normal form using the existing production rule.
PCYK uses probability to select the optimum path to construct the CFG tree of given sentences.

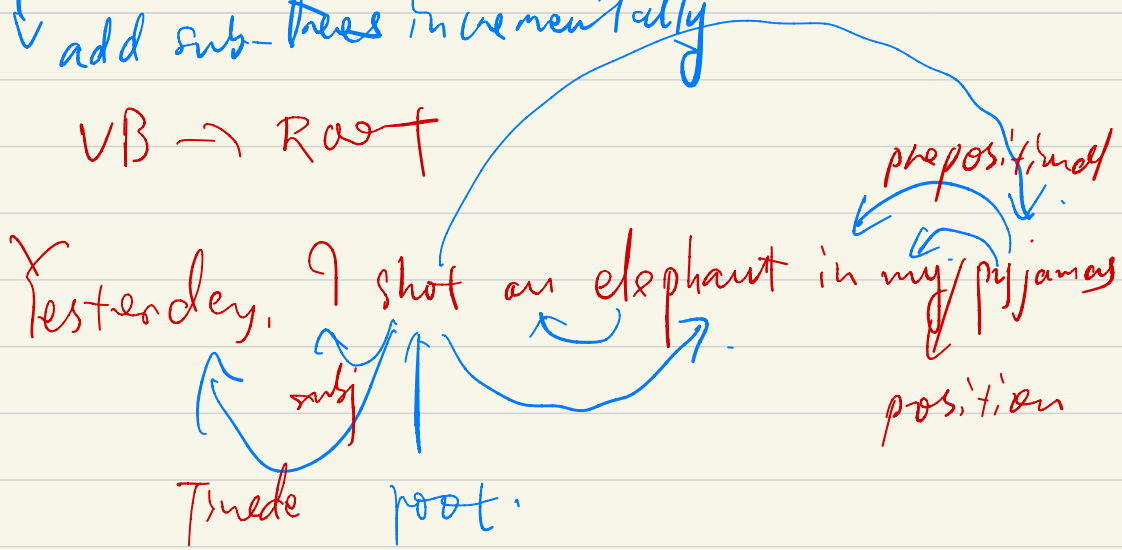
Dependency → have relation with non-local neighbour.

2. PCYK adds weights to each production in CFG. Provide a language model that recommends the best likely sentences based on grammar (syntactical knowledge).

Ronald has small hands
NNP VBZ JJ NNS.

First step: probability assigned by HMM to the tagged sentences.

Dependency Parser: no pos-tag
C/K: only local relations
can do non-local relations.
add sub-trees incrementally



1) Determine sentence structure
disambiguate parsing trees
2) Use probabilistic grammar to disambiguate ...