

Dependency Parsing exercises: Dependency Structures

Part II

Deadline: 26.04.2021

Please send completed solutions to waszczuk@hhu.de and evang@hhu.de with subject "dependency homework" and attachment "ex2_lastname(s).pdf".

1. Consider the following unlabeled¹ dependency graphs, all defined on top of $V = \{1, 2, 3, 4, 5\}$:

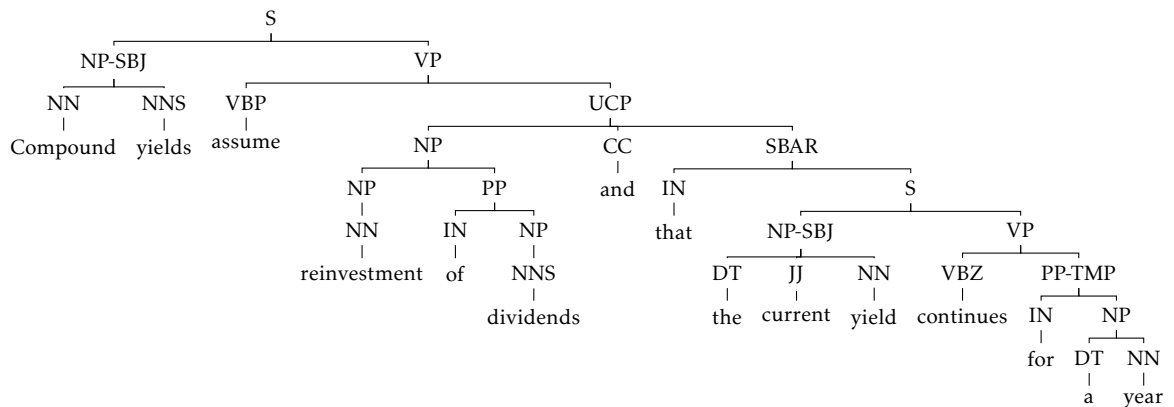
- (a) $A = \{(1, 3), (2, 4), (3, 5), (4, 5)\}$
- (b) $A = \{(5, 5), (4, 3), (3, 2), (2, 1)\}$
- (c) $A = \{(1, 4), (2, 3), (4, 2), (4, 5)\}$
- (d) $A = \{(3, 1), (2, 3), (3, 4), (3, 5)\}$
- (e) $A = \{(5, 3), (3, 1), (5, 3), (1, 5)\}$

Assume there is an implicit *special root node* 0 and an implicit arc $(0, i)$ for every node i that doesn't have its head specified in A .

For each graph (a)-(e), determine if it is (i) *connected*, (ii) *acyclic*, (iii) *projective*, (iv) and whether it obeys the *single-head* constraint.

Hint: draw the graphs when in doubt.

2. Convert the following constituency analysis (following the PTB annotation scheme) into a UD-compliant dependency analysis:



- Mark one child as the head in each constituent. Assume the following set of heuristic head-percolation rules (a slightly clarified version of the rules used in the example):
 - The head of S or VP is its rightmost (main verb or another VP)
 - The head of an NP is its rightmost (noun or another NP)

¹In a labeled dependency graph, each element of A is a triple (i, j, k) where k determines the label; in an unlabeled graph, each arc can be simply represented as a pair $(i, j) \in A$.

- The head of PP is its rightmost daughter

Are these rules sufficient to obtain a UD-compliant tree? If not, propose possible improvements.

- Determine the implied function labels on case-by-case basis using the inventory of UD relations.
- Perform the last, fully automatic step of the conversion.

3. Linguistic phenomena and properties of dependency graphs.

- (a) Give an example of a sentence with non-projective (universal) dependencies. What is the linguistic phenomenon that gives rise to the non-projectivity?
- (b) Give a dependency analysis of the same sentence in another language (again with universal dependencies), and see if the non-projectivity remains. Add glosses to the non-English words.
- (c) Can you think of linguistic phenomena that would benefit from relaxing any of the other properties: connectedness, acyclicity, or single-head constraint?