# Dependency Relations

Natalie Parde

UIC CS 421

# Dependency Relations

- Two components:
  - **Head**
  - **Dependent**
- **Heads** are linked to the words that are immediately **dependent** on them
- Relation types describe the **dependent**'s role with respect to its **head**
  - Subject
  - Direct object
  - Indirect object

# Dependency Relations

- Relation types *tend* to correlate with sentence position and constituent type in English, but there is not an explicit connection between these elements

- In more flexible languages (e.g., those with relatively free word order), the information encoded in these relation types often cannot be estimated from constituency trees

**Just like with CFGs, there are a variety of taxonomies that can be used to label dependencies between words.**

These are often referred to as dependency treebanks

A few of the most popular dependency treebanks include:

- Stanford dependencies
- CoNLL dependencies
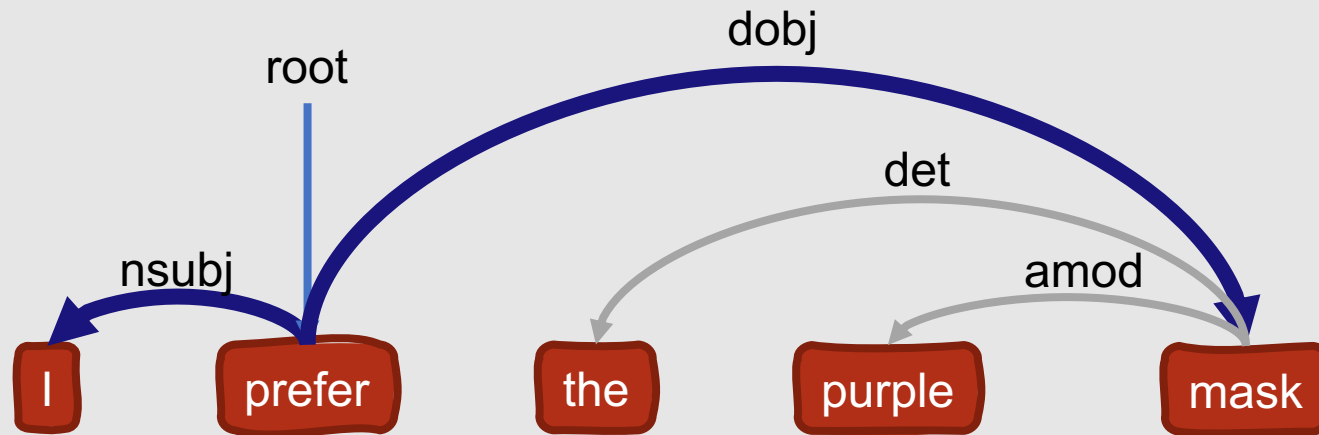- Universal dependencies

Just like with other corpora we've discussed so far, these treebanks are typically created by either:

- Having human annotators manually create dependency structures for a collection of sentences
- Automatically creating initial dependency structures and then having human annotators manually correct those structures
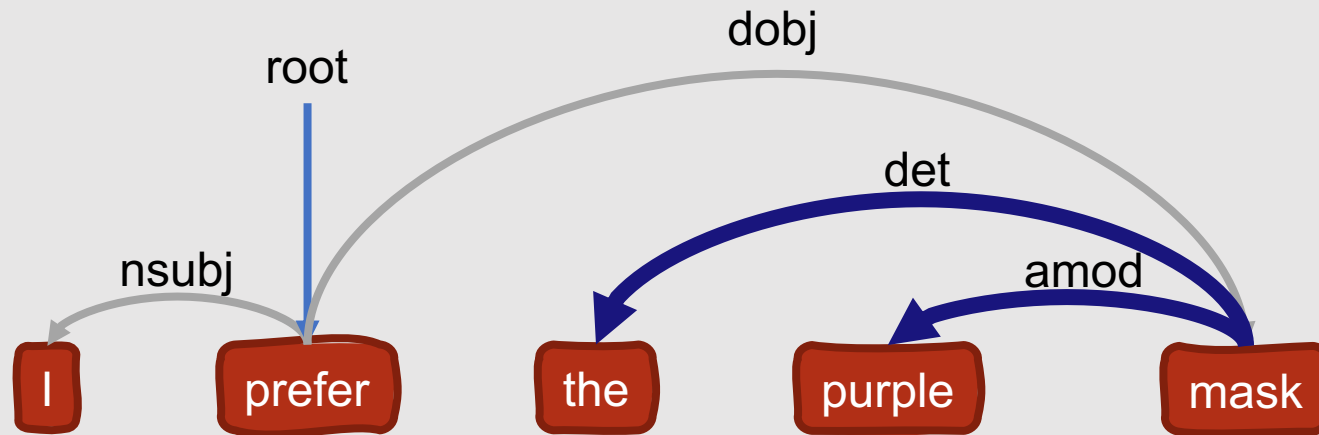
**Recently, most researchers have moved toward using universal dependencies.**

- Universal dependencies can be broken into two sets
  - **Clausal Relations:** Describe syntactic roles with respect to predicates (the part(s) of the sentence that say something about the subject)
  - **Modifier Relations:** Describe the ways that words can modify their heads

# Clausal Relations

# Modifier Relations

# Universal Dependencies

Structural categories of dependent

| | Nominals | Clauses | Modifier Words | Function Words |
|---|---|---|---|---|
| **Core Arguments of Clausal Predicates** | nsubj<br>obj<br>iobj | csubj<br>ccomp<br>xcomp | | |
| **Non-Core Dependents of Clausal Predicates** | obl<br>vocative<br>expl<br>dislocated | advcl | advmod<br>discourse | aux<br>cop<br>mark |
| **Dependents of Nominals** | nmod<br>appos<br>nummod | acl | amod | det<br>case |

Functional categories w.r.t. head

Other miscellaneous dependency relations (see https://universaldependencies.org/u/dep/index.html for details): conj, cc, fixed, flat, compound, list, parataxis, orphan, goeswith, reparandum, punct, root, dep

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*Functional categories w.r.t. head*

Natalie wrote a dissertation.
**nsubj(wrote, Natalie)**

Natalie wrote a dissertation.
**obj(wrote, dissertation)**

Natalie wrote him a dissertation.
**iobj(wrote, him)**

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Functional categories w.r.t. head

Natalie wrote a dissertation for him.
**obl(wrote, him)**

Natalie, read my dissertation!
**vocative(read, Natalie)**

It is clear that her dissertation is a masterpiece.
**expl(clear, it)**

You must not eat it, the dissertation.
**dislocated(eat, dissertation)**

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*Functional categories w.r.t. head*

The purpose of this dissertation is to determine an optimal strategy for selecting fantasy football teams.
**nmod(purpose, dissertation)**

My advisor, Natalie, is boring me.
**appos(advisor, Natalie)**

Yesterday she wrote five dissertations.
**nummod(dissertations, five)**

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*Functional categories w.r.t. head*

What she said about only choosing fantasy football players from northern teams makes sense.
**csubj(makes, said)**

She said you should read her second dissertation for more tips.
**ccomp(said, read)**

I consider her a genius.
**xcomp(consider, genius)**

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He was upset when she read her dissertation to him.
**advcl(upset, read)**

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*Functional categories w.r.t. head*

She added an appendix discussing fantasy bachelor.
**acl(appendix, discussing)**

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*(left side, rotated)* Functional categories w.r.t. head

He was deeply offended by the generalization from football to reality show.
**advmod(offended, deeply)**

She said, "Well, I have other dissertations that explain this further."
**discourse(explain, well)**

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Functional categories w.r.t. head

He sat with rapt attention as she began reading an excerpt from her third dissertation.
**amod(attention, rapt)**

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She had included case studies.
**aux(included, had)**

She was a professor, after all.
**cop(professor, was)**

He knew that this would change life as he knew it.
**mark(change, that)**

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Functional categories w.r.t. head

She told him that was the point.
**det(point, the)**

She left the Zoom call after that.
**case(that, after)**

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