

September 9, 2013

11-721: Grammars and Lexicons

Dependency Grammar

- Dependency
 - A relation between two words
 - One word is the head
 - The other is the dependent

Which word is the head?

- Lexical words
 - the **book**
 - at **school**
 - has **yawned**
 - Open class: you can make up new nouns and verbs
- Function words
 - **the** book
 - **at** school
 - **has** yawned
 - Closed class: you cannot make up new determiners, prepositions, or auxiliary verbs (although new ones can develop over time)

Stanford Dependency Parser provides two versions: lexical heads or functional heads

What you see most often in dependency treebanks

- the **book**
- **at** school
- The student **has** yawned
- The student has **yawned**
- very **tall**
- **that** the student yawned
- that the student **yawned**
 - As in “I think that the student yawned”

So what is the definition of “head”?

- Challenge: ask people who work on dependency parsing and see what they say.

So what is the definition of “head”?

- The word that provides the main meaning:
 - “this smart student of linguistics with long hair” is a student, not a smart or a hair or a long, etc. So “student” is the head.
- The word that provides the most important inflectional features
 - Inflection includes things like tense, number, and gender

Which noun phrases are plural?

Singular

- The **teacher**
- The short **teacher**
- The **teacher** of the class
- The **teacher** of the classes
- The children's **teacher**
- The child's **teacher**

Plural

- The **teachers**
- The short **teachers**
- The **teachers** of the class
- The **teachers** of the classes
- The children's **teachers**
- The child's **teachers**

Only the head “teacher/teachers” determines whether the noun phrase is singular or plural. The other nouns “class/classes” and “child/children” do not make the noun phrase singular or plural.

Main Verbs and Auxiliary Verbs share head properties

- The main verb determines the number of arguments in the sentence:
 - The student yawned (one argument)
 - The student read a book (two arguments)
 - The teacher handed the student a book (three arguments)
- The tense of the sentence is carried on the auxiliary verb or the main verb if there is no auxiliary, or you may think of it as a combination of the auxiliary verb and main verb:
 - The student did yawn.
 - The student does yawn.
 - The student is yawning.
 - The student was yawning.
 - The student yawns.
 - The student yawned.

X-bar theory

Headedness and Constituency

English Noun Phrases

- There is a kind of constituent (an N-bar) that you probably didn't know was there.
 - The methodology of using tests for constituency lead to this discovery.
 - This is an advantage of a precise methodology; it leads you to discover things.
- Phrases have heads.
- The heads are surrounded by layers of modifiers.
 - Innermost layer: complements/arguments
 - Second layer (recursive): adjuncts
 - Outermost layer: specifiers

Test for constituency

- This student of linguistics
- Coordination
 - This student of linguistics and teacher of chemistry
- Pro-form substitution
 - This one

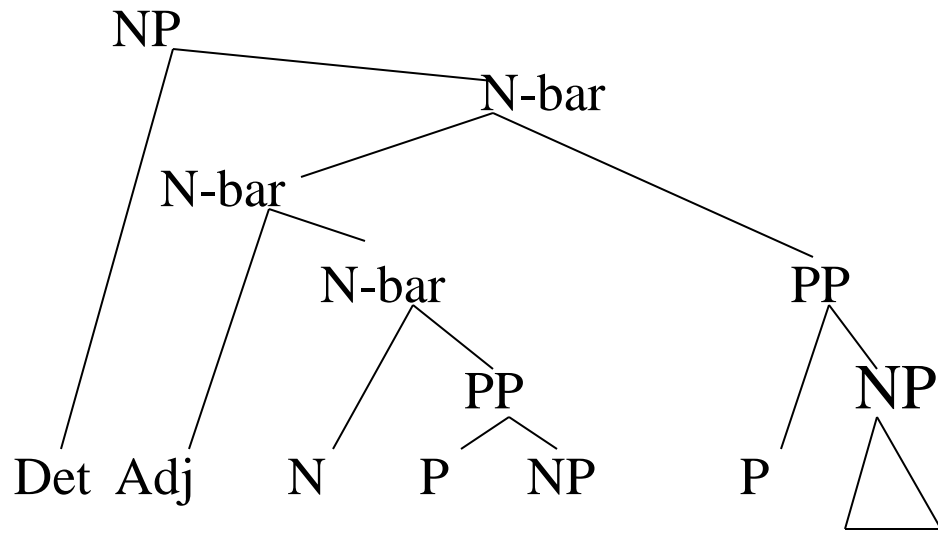
(Based on Radford, *Transformational Grammar*)

Test for constituency

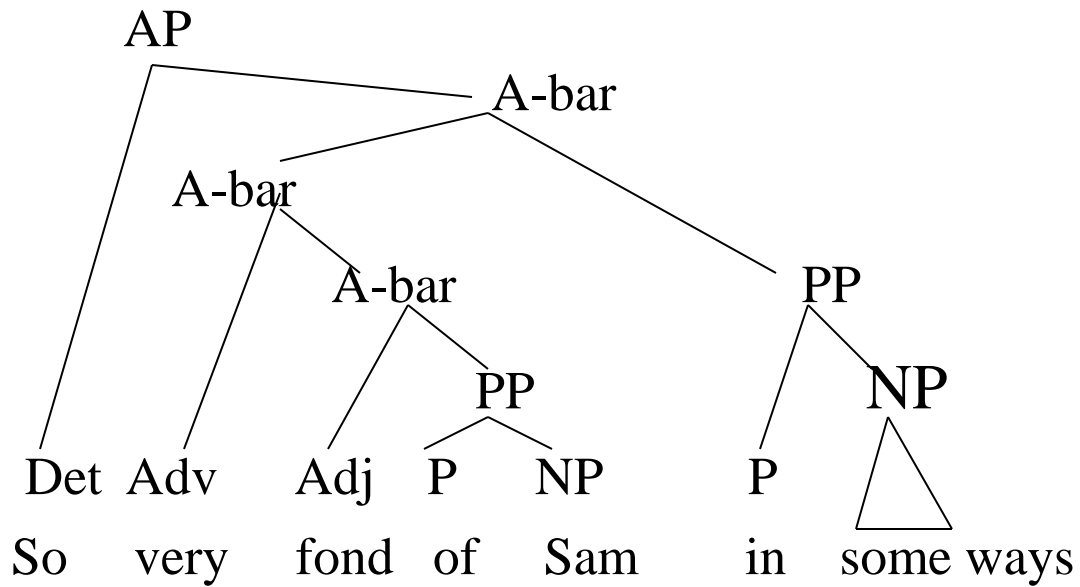
- This student of linguistics with long hair
- These *students of linguistics and teachers of chemistry* with long hair.
- I saw that student of linguistics and you saw that *one* with long hair.

Test for constituency

- This smart student of linguistics with long hair.
- I saw this tall student of linguistics with short hair and you saw that smart *one* with long hair.
- These smart *students of linguistics and teachers of chemistry* with long hair.

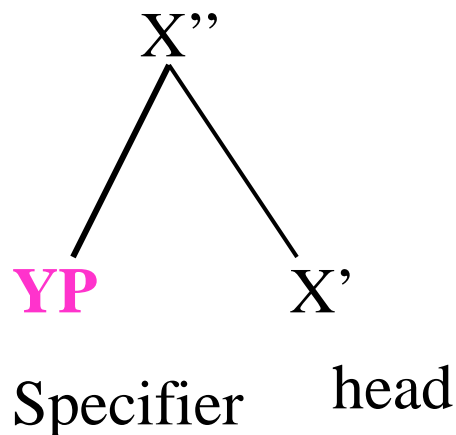


This smart student of linguistics with long hair

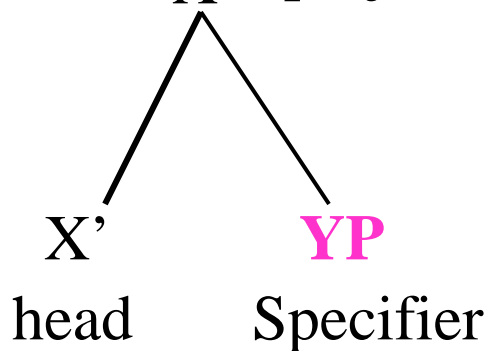


So very fond of Sam in some ways

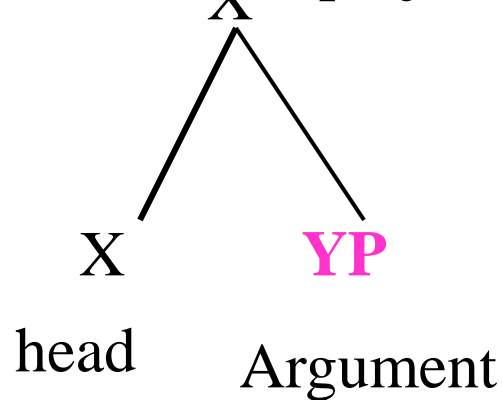
projection



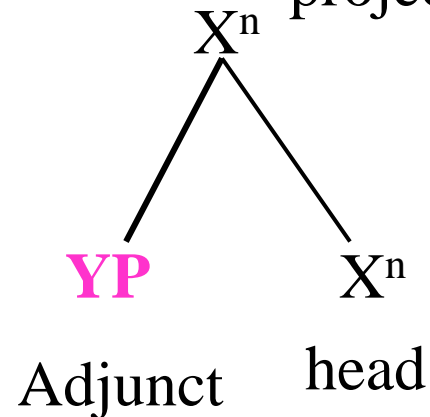
X'' projection



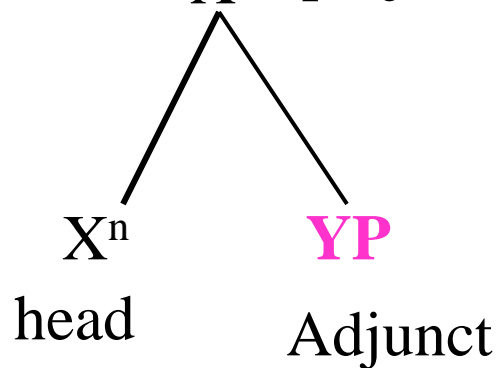
X^n projection



X^n projection



X^n projection



X' projection

