



LING 388: Computers and Language

Lecture 27

Today's Topics

- You should be working on your Term Project
- Last Time "programming"
 1. PP attachment
 2. word sense disambiguation (WSD)
- Today, more grammar stuff ...
 - *more hands-on programming*
 - empty categories and ambiguity
 - *the chicken is ready to eat*

g.txt

Recall the three lines of code to run a parser on grammar g2.txt:

```
$ python
```

```
>>> import nltk
```

```
>>> parser2 = nltk.ChartParser(nltk.CFG.fromstring(open('g2.txt').read()))
```

```
>>> for parse in parser2.parse(nltk.word_tokenize("a boy saw the man with a  
telescope")):
```

```
...     parse.draw()
```

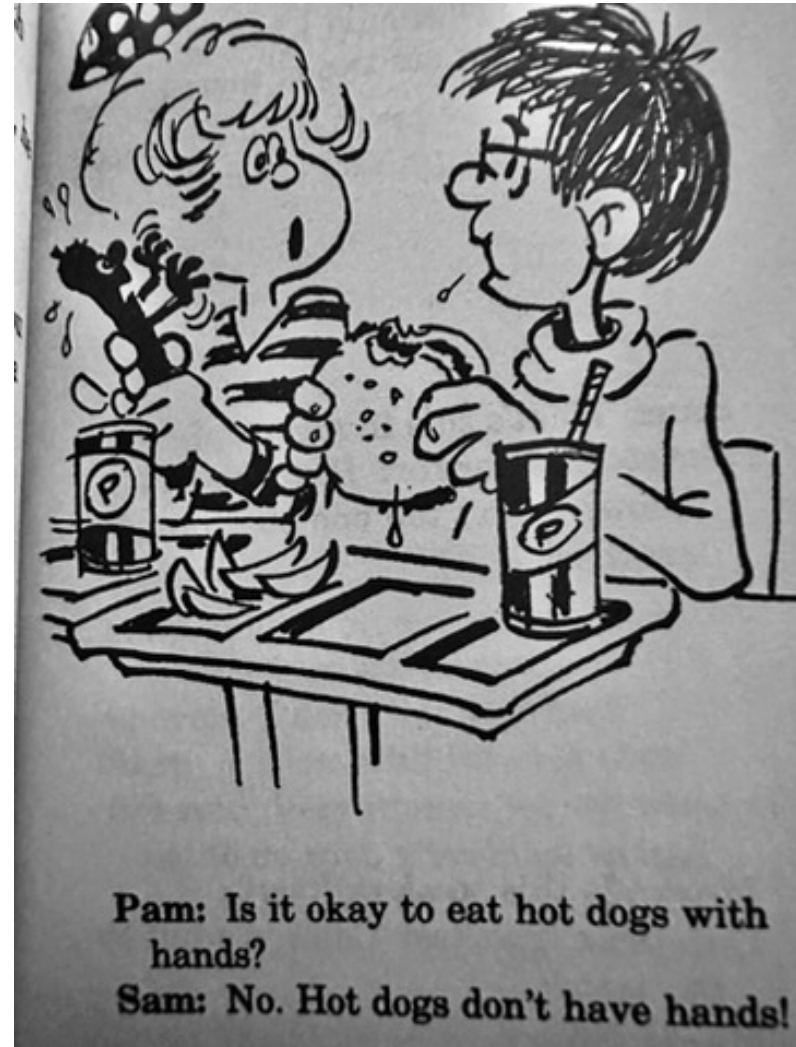
```
...
```

Senses of preposition *with*

Sense disambiguation is obviously important and humans do it reflexively.

- Source: <https://www.merriam-webster.com/dictionary/with>
 1. ...
 6. means/cause/agent/instrumentality: hit him *with* a rock
 7. ...
 8. possession: came *with* good news; person *with* a sharp nose
 9. ...

Senses of
preposition
with



ChatGPT: senses of preposition *with*



ChatGPT 3.5 ▾

SA

You

Is it okay to eat hot dogs with hands?



ChatGPT

Absolutely! Hot dogs are commonly eaten with hands. In fact, they're often designed to be handheld for convenience. Just grab the bun and hot dog and enjoy! However, if you prefer to eat them with utensils for any reason, that's perfectly fine too. It's all about personal preference and what feels comfortable for you.

ChatGPT: senses of preposition *with*

SA

You

Is it okay to eat hot dogs with hands? Why is this a funny sentence?



ChatGPT

The humor in the sentence "Is it okay to eat hot dogs with hands?" lies in its simplicity and the implicit question of whether it's socially acceptable to eat hot dogs in such a casual manner. It's funny because it's a question that seems unnecessary or obvious to many people; eating hot dogs with hands is the norm and widely accepted. The sentence might evoke amusement because it highlights a mundane aspect of everyday life in a way that seems almost absurd to question.

ChatGPT: senses of preposition *with*

SA

You

Is it okay to eat hot dogs with hands? No. Hot dogs don't have hands! What's funny about this?

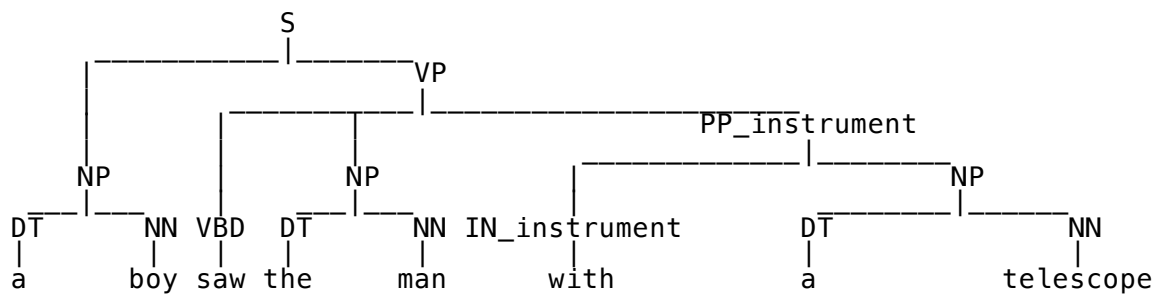
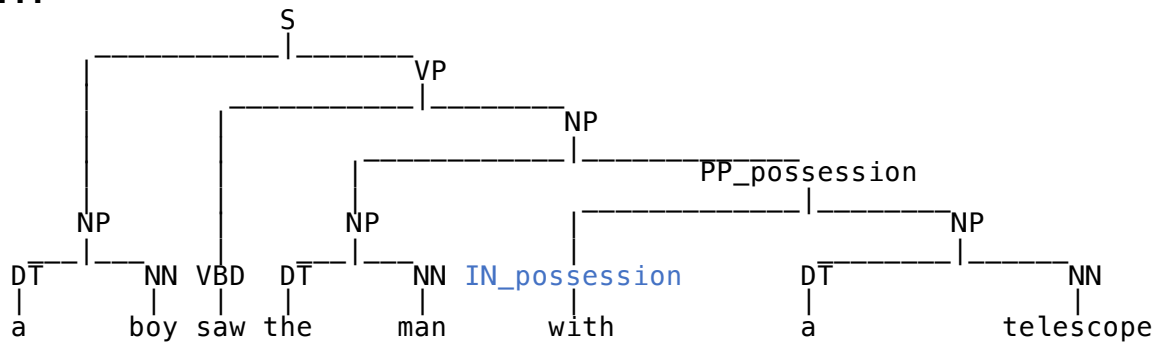


ChatGPT

The humor in the response "No. Hot dogs don't have hands!" comes from the unexpected twist in the interpretation of the question. Instead of addressing whether it's socially acceptable for humans to eat hot dogs with their hands, the response takes the question literally and humorously points out that hot dogs themselves don't possess hands to eat with. This unexpected and literal interpretation creates a humorous moment by subverting the original question in a clever and playful way.

g2.txt

```
>>> for parse in parser2.parse(nltk.word_tokenize("a boy saw the man with a telescope")):  
...     parse.pretty_print()  
...
```



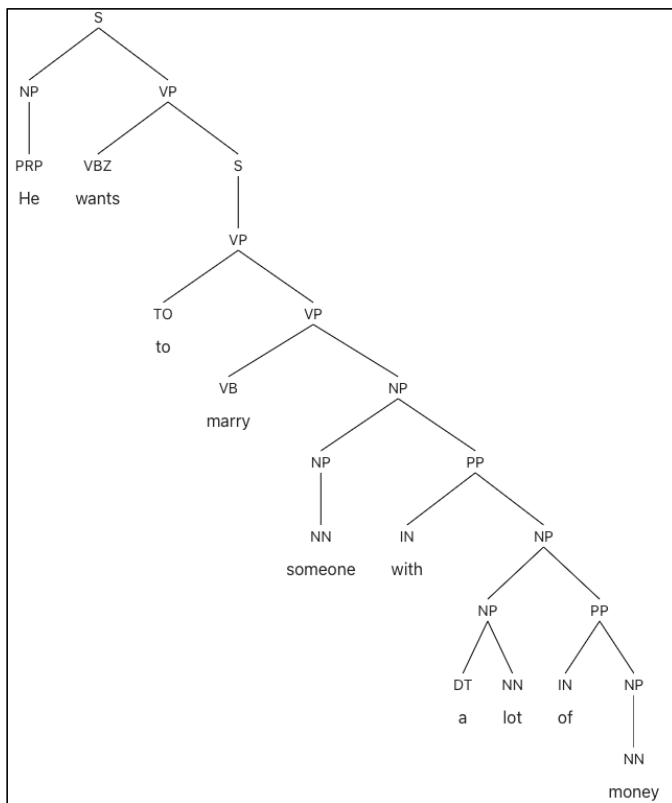
g2.txt

- Consider:
 - a man with a telescope saw the boy
 - a man with a telescope saw the boy with a telescope
- How many parses and which sense(s) of *with*?

Preposition senses

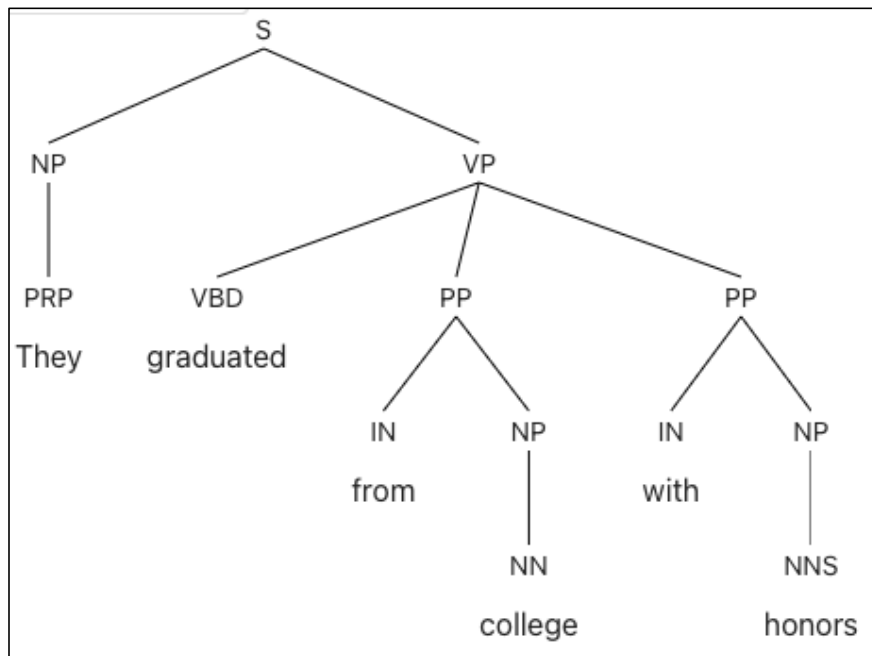
- also depends on the verb (predicate)
- Examples (from dictionary):
 - He wants to marry someone *with* a lot of money.
 - They graduated from college *with* honors.
- How many parses and which senses of *with*?

Preposition senses



- Grammar (in principle) should allow us to attach the PP at:
 1. NP (*someone*)
 2. VP (*marry*)
 3. VP (*to*)
 4. VP (*wants*)
- Question:
 - which attachment points are possible here?

Preposition senses



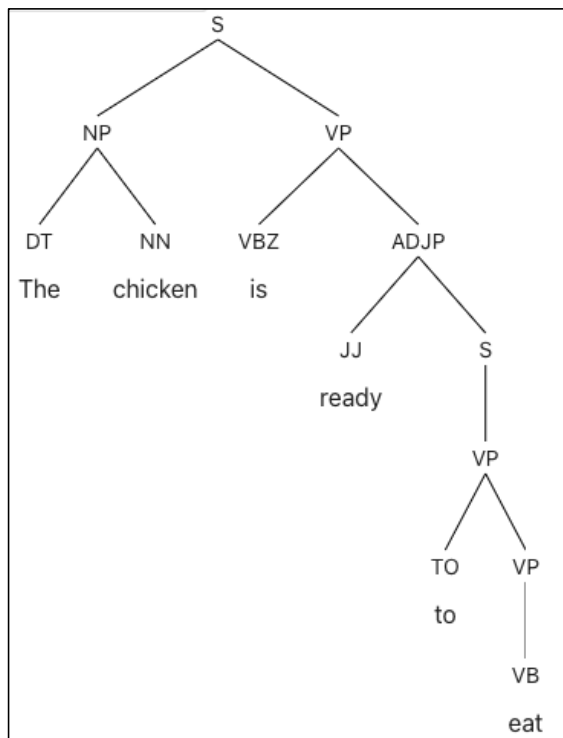
- Grammar (in principle) should allow us to attach the PP at:
 1. NP (*college*)
 2. VP (*graduated*)
- Question:
 - which attachment points are possible here?

Prepositions are polysemous

1 a	→ used as a function word to indicate a starting point of a physical movement or a starting point in measuring or reckoning or in a statement of limits
	came here <i>from</i> the city
	a week <i>from</i> today
	cost <i>from</i> \$5 to \$10
b	→ used as a function word to indicate the starting or focal point of an activity
	called me <i>from</i> a pay phone
	ran a business <i>from</i> her home
2	→ used as a function word to indicate physical separation or an act or condition of removal, abstention, exclusion, release, subtraction, or differentiation
	protection <i>from</i> the sun
	relief <i>from</i> anxiety
3	→ used as a function word to indicate the source, cause, agent, or basis
	we conclude <i>from</i> this
	a call <i>from</i> my lawyer
	inherited a love of music <i>from</i> his father
	worked hard <i>from</i> necessity

- Generally speaking ...
 - But the number of senses vary
 - Example: the Merriam Webster entry for *from*

Empty categories



- Consider:
 - The chicken is ready to eat
- Do you spot the ambiguity?
- Predicate *eat*:
 - x eat y (*part of its meaning*)
 - both of which are missing in the parse
- Grammar:
 - $S \rightarrow VP$ should be $S \rightarrow NP VP$ (*encode x*)
 - $VP \rightarrow VB$ should be $VP \rightarrow VB NP$ (*encode y*)

Empty categories

- But NP arguments of *eat* aren't spelled out here.
- **Note:** empty category rules are permitted under nltk CFG:
 - Example:
 - NP →
 - (*appearing on its own line*)
- Let's create a new grammar g3.txt to incorporate this

g3.txt

- Input via `.split()` from the Terminal:

```
>>> import nltk
>>> parser =
nltk.ChartParser(nltk.CFG.fromstring(open('gchicken.txt').read()))
>>> for tree in parser.parse(input().split()):
...     tree.draw()
...
the chicken is ready to eat
>>>
```

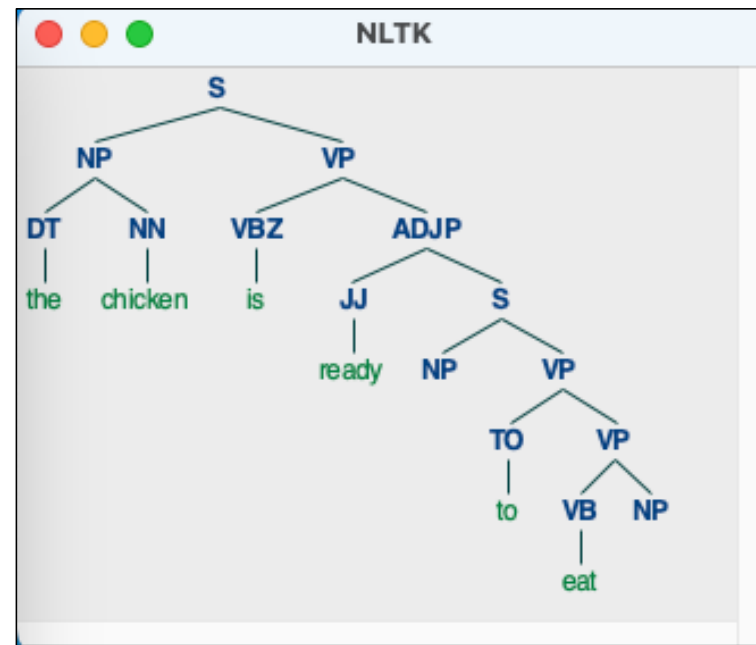
g3.txt

We haven't limited PRO to occur only in nonfinite clauses.

- We can modify the grammar to only permit:
 - PRO to eat fish
 - *the chicken is ready to eat fish*
- and exclude:
 - PRO eat fish
 - **the chicken is ready eat fish*

g3.txt

- Using empty category rule:
 - NP →
- we should be able to generate this parse.
- Question:
 - How do we interpret the empty NPs?



g3.txt

- Notation:

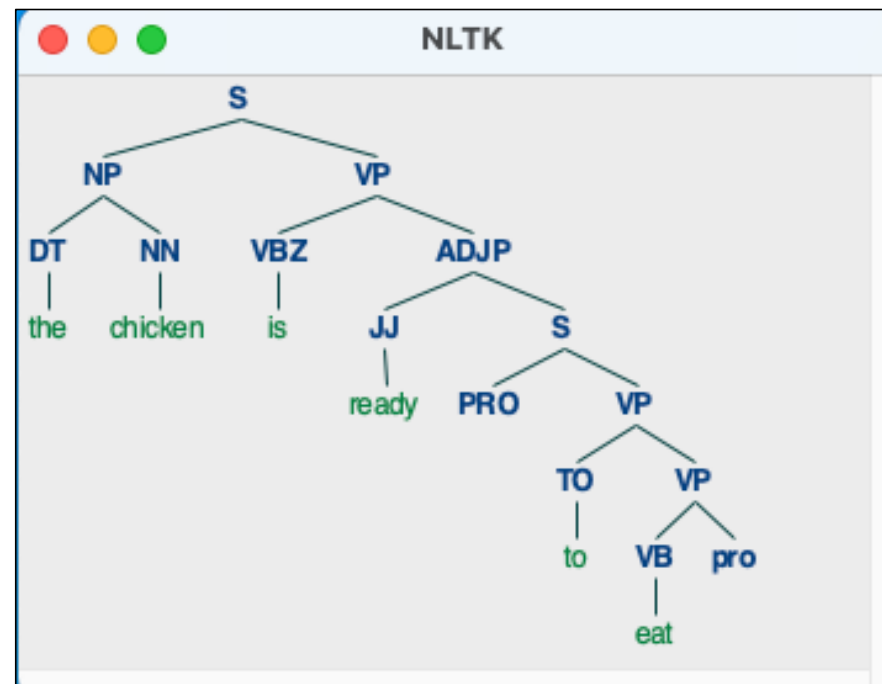
- Let PRO stand for an empty subject of a nonfinite clause.
- Use pro stand for an empty object (pro and PRO are pronouns)
- Use indices (subscript _{*i*} below) to indicate coreference.
- Use subscript _{*arb*} to stand for arbitrary reference.

- Interpretations:

1. *the chicken*_{*i*} is ready PRO_{*i*} to eat (pro)
2. *the chicken*_{*i*} is ready PRO_{*arb*} to eat *pro*_{*i*}

g3.txt

- Let's modify the grammar to incorporate PRO and pro...



ChatGPT and the chicken sentence

the chicken is ready to eat

- *the chicken*_i is ready PRO_i to eat
- *the chicken*_i is ready PRO_{arb} to eat *pro*_i

SA

Is The chicken is ready to eat an ambiguous sentence?




"The chicken is ready to eat" is not an ambiguous sentence. It is a simple declarative sentence that describes a state of the chicken, that it is ready to be eaten. The sentence is clear and not subject to multiple interpretations.



ChatGPT and the chicken sentence

SA Is The children are ready to eat an ambiguous sentence?

 The sentence "The children are ready to eat" could be ambiguous as it could be interpreted in two ways. 👍 🗨




The first interpretation is that the children are ready to begin eating a meal.


The second interpretation is that the children are ready to be eaten, which would be a very disturbing context.




It is important to note that the sentence is not inherently ambiguous, but that the ambiguity arises from the lack of context, and additional information is needed to disambiguate the sentence.

ChatGPT and the chicken sentence

SA The chicken is ready to eat. Who's eating?

 It is not specified who is eating the chicken.  

SA The chicken is ready to eat. It's hungry.  A different way to elicit a response

 The statement "the chicken is ready to eat and it's hungry" is a non-sensical statement as chickens are not capable of feeling hunger. Chickens are usually the ones being eaten, not the ones eating.  

ChatGPT and the chicken sentence

the pizza is ready to eat

- the pizza_i is ready PRO_i to eat
- *the pizza*_i is ready PRO_{arb} to eat *pro*_i

