

# Natural Language Processing ECS763P

Review on Formal Grammar  
Hints for Course Work (2)

20th of February 2017  
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# Advanced Noun Phrases

- ◆ So far we had NP's that were pronouns, proper nouns, noun compounds, or started with determiners:
- ◆ Examples: I, Baltimore, morning flight, a ticket
- ◆ However, there other classes of words that can appear before the head noun of a nominal to produce an NP, e.g:
  - ◆ Cardinals: one, two, ..., hundred, ...
  - ◆ Ordinals: first, second, ..., next, past, other, ...
  - ◆ Quantifiers: many, a few, all, several, some, ...
  - ◆ Adjectival phrases: long, longest, good old

# Rules for parsing advanced noun phrases

- ◆ A simplified general rule for parsing these:
- ◆ **NP -> (Det) (Card) (Ord) (Quant) (AP) Nominal**
- ◆ This rule has a flat structure, developed for simplicity
- ◆ The brackets “(..)” mark optional constituents. A rule with one set of brackets is a shorthand for two rules.
  - ◆ **NP -> (Det) Nominal** is a short hand for
  - ◆ **NP -> Det Nominal**              and              **NP -> Nominal**
  - ◆ **NP -> (Det) (Card) Nom** is short hand for:
    - ◆ **NP -> Det Nom | Card Nom | Det Card Nom | Nom**
  - ◆ How many rules is our new NP rule shorthanding?

- **NP -> (Det) (Card) (Ord) (Quant) (AP) Nominal**
  - ◆ How many rules is our new NP rule shorthanding?
  - ◆ (6: each of brackets with Nom on their own + Nom on its own: Det Nom, Card Nom, Ord Nom, ...) +
  - ◆ (10: two brackets together and with Nom: e.g. Det with Card and Nom, with Ord and Nom,...) +
  - ◆ (3: three brackets together and with Nom: Det with Card and Ord and Nom, ...) +
  - ◆ (2: four brackets together and with Nom: Det with Card and Ord and quant and Nom, ...) +
  - ◆ 1 for all brackets and Nom

# Examples of Parses

- NP -> (Det) (Card) (Ord) (Quant) (AP) Nominal

Card -> one, two, ten, ...

Ord -> first, second, next, past, other, another, ...

Quant -> many, few, several, all, some, every, ...

AP -> Adj AP | Adj

Adj -> old, good, cheap, least, most, ...

- one friend: (NP ((Card two) (Nom friends)))

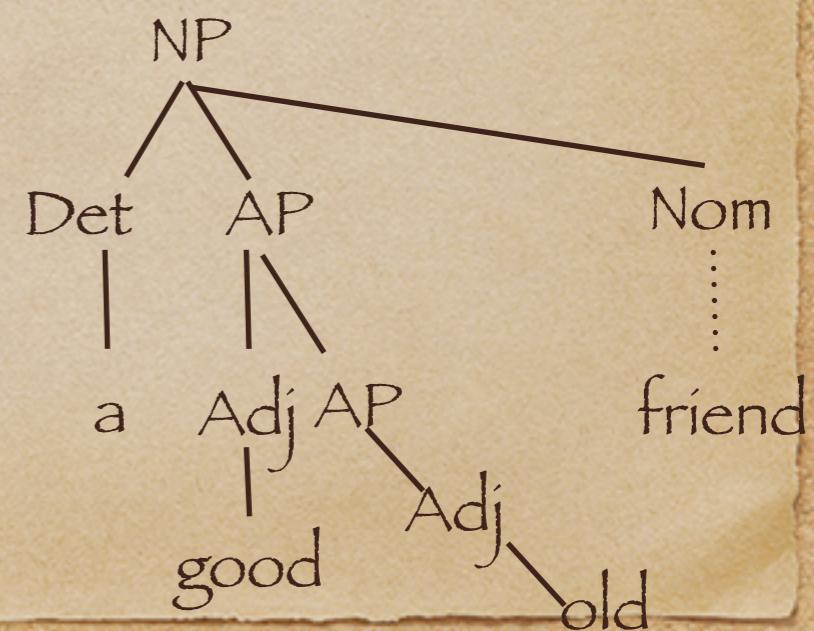
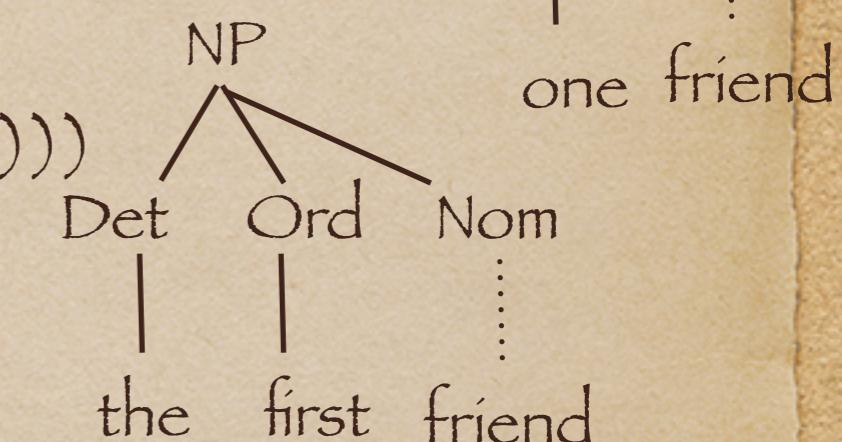
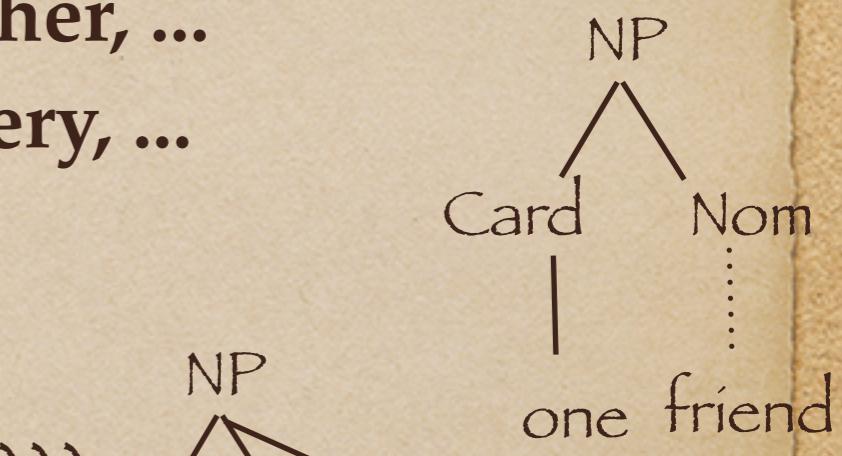
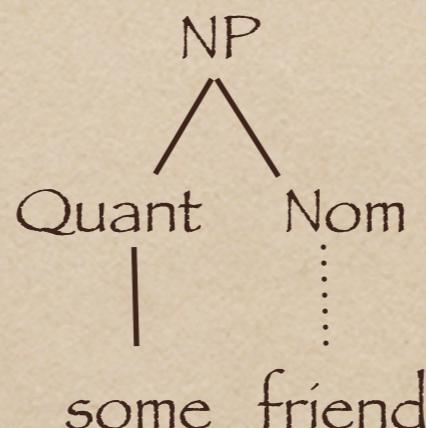
- the first friend

- some friend

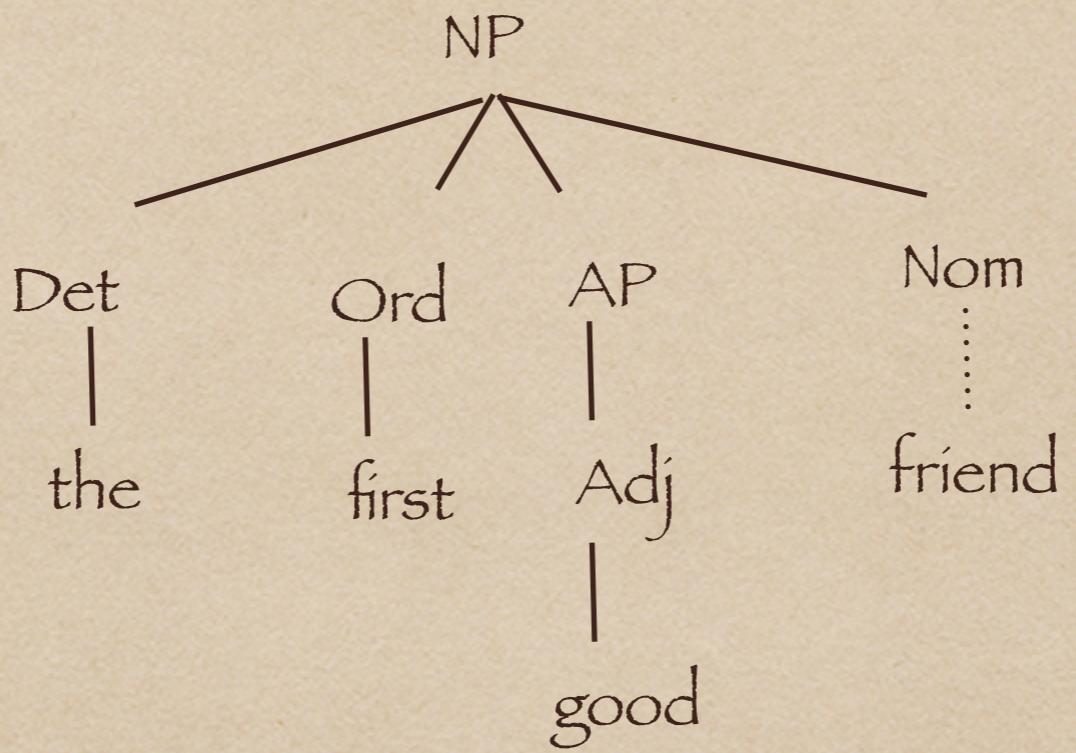
- a good friend

- a good old friend

- the first good friend



# Examples

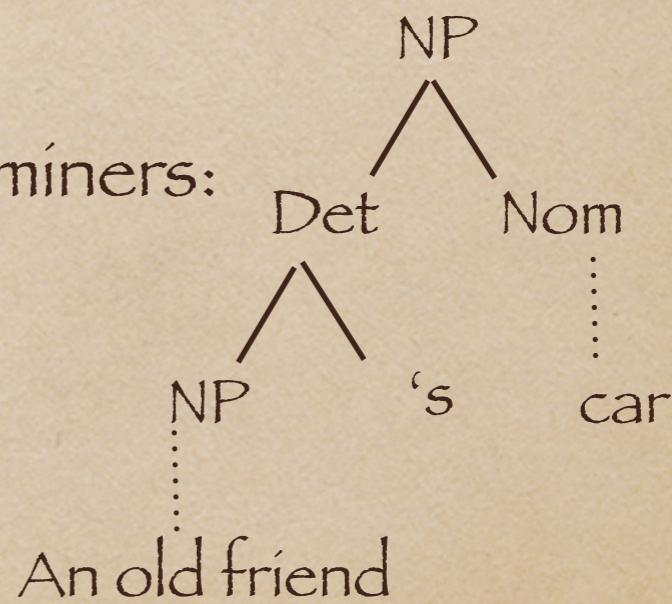


## Recap: determiner or not?

- ◆ In the miniature grammar of English given in the coursework:
  - ◆ NP -> Pronoun | Proper-Noun | Det Nominal
  - ◆ Nominal -> Noun | Nominal Noun | Nominal PP
  - ◆ Noun -> flight | friend | book | morning
- ◆ Not all nouns need a determiner. Examples:
  - ◆ mass nouns: water, snow (one can say: I want water)
  - ◆ plural nouns: flights, friends
  - ◆ Possessives: London's mayor

# Recap: determiner or not?

- ◆ The general rule helps parse some of these
  - ◆  $NP \rightarrow (\text{Det}) \dots (\text{Nom})$
- ◆ Now we can say “water” is an NP. But we need to add
- ◆  $NP \rightarrow \text{Pronoun} \mid \text{Mass-Noun} \mid \text{Proper-Noun} \mid \text{Det Nominal}$
- ◆ **Mass-Noun**  $\rightarrow \text{water} \mid \text{snow} \mid \dots$
- ◆ The possessives can be treated as determiners:
- ◆  $\text{Det} \rightarrow \text{NP}'s$
- ◆ An old friend's car



# Another Possibility

- ◆ One can also add the mass nouns to Nom's:
  - ◆ Nominal -> **Mass-Noun** | Noun | Nominal Noun | ...
- ◆ When encoding mass nouns, why not add them to Nom's:
  - ◆ NP -> (Det) Nom -> Mass-Noun -> water

# Parsing Plural Nouns

- ◆ Plurals nouns can occur without determiners: old friends
- ◆ Using these insights, all from the online Ch. 11 of Jurafsky and Martin, try to encode plural nouns.
- ◆ Test your encoding by parsing the NP: old friends.
- ◆ Some of the examples of course work do have directly given rules in the online Ch.11 of J&M. Some, however, need some minor analysis, very similar to the one done here.
- ◆ In the lab on Wed, we will spend 45 min's on the first two questions, the rest on the rest of questions, aiming to finish the current set of questions, since there will be a new question added for statistical parsing, next week.