

Practical Natural Language Processing

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Assignment 3

Due February 9

Please submit your solutions using Canvas / Gradescope. This assignment should require no coding and can be submitted as a PDF or a text file. This assignment is based on [this assignment](#) from NLP at NYU Courant by Prof. Grishman.

We will use this grammar, from Jurafsky & Martin section 12.3:

```
sentence      := np vp | vp | aux np vp;
np             := pronoun | proper-noun | det nominal | nominal;
nominal        := noun | nominal noun | nominal pp | nominal pp pp | nominal rel-clause;
vp             := verb | verb np | verb np pp | verb pp | verb inf-marker vp;
rel-clause     := rel-pro vp;
pp             := prep np;
```

We will use this lexicon:

```
a,,           cat=det;
an,,          cat=det;
dinner,,      cat=noun;
do,,          cat=aux;
does,,        cat=aux;
eat,,         cat=verb;
eats,,        cat=verb;
Fred,,        cat=proper-noun;
gave,,        cat=verb;
he,,          cat=pronoun;
her,,         cat=pronoun;
him,,         cat=pronoun;
I,,           cat=pronoun;
it,,          cat=pronoun;
letter,,      cat=noun;
me,,          cat=pronoun;
met,,         cat=verb;
she,,         cat=pronoun;
the,,         cat=det;
them,,        cat=pronoun;
they,,        cat=pronoun;
that,,        cat=rel-pro;
to,,          cat=inf-marker;
to,,          cat=prep;
waiter,,      cat=noun;
waiters,,     cat=noun;
want,,        cat=verb;
wants,,       cat=verb;
with,,        cat=prep;
you,,         cat=pronoun;
```

Part 1

Determine the constituent structures of these sentences.

1. Show the airlines with flights to Boston.
2. Show the airlines that fly to Boston.
3. I need to know the flight number.
4. Do you prefer to go to Boston?

You can choose to use parenthesis notation or to draw parse trees.

Part 2

Modify the given grammar and lexicon to handle **pronouns**. Make sure that in your rules, the pronoun's **person**, **number**, and **case** match the verb's person, number, and case (i.e. make sure you don't allow "he eat" or "him eats").

These are the pronouns by person, number, and case:

	Singular		Plural	
	Nominative	Accusative	Nominative	Accusative
1st person	I	me	we	us
2nd person	you	you	you	you
3rd person	he, she, it	him, her, it	they	them

Present tense verbs have two forms: singular ("eats") and plural ("eat"). The only exception is the verb "be", which has a third form ("am") when the subject is "I". For this exercise, you do not have to account for this special behavior of "I am".

Ignoring the "I am" case, it is sufficient for **person/number agreement** to lump together 1st person singular ("I"), 2nd person singular ("you"), and all the plural pronouns ("we", "you", "they"), and distinguish them from 3rd person singular pronouns ("he", "she", "it"). So, we have two categories: "pronoun-singular" (for 3rd person singular) and "pronoun-plural" (for all other pronouns).

For **case agreement**, you must distinguish nominative ("I", "he", "she") from accusative ("me", "him", "her"). Keep in mind that some ("you", "it") can fill either case.

If you have constructed your grammar properly, you will have captured four constraints:

- 3rd person singular pronouns in subject position occur with singular verb forms.
- Other pronouns in subject position occur with plural verb forms.
- Nominative pronouns occur in subject position.
- Accusative pronouns occur in object position and in PP's.

For the lexicon, the only change should be for pronouns, verbs, and aux, which will need to be divided into finer categories.

