Lecture 11:
Parts of speech

Intro to NLP, CS585, Fall 2014

http://people.cs.umass.edu/~brenocon/inlp2014/

Brendan O'Connor (http://brenocon.com)

Some material borrowed from Chris Manning, Jurafsky&Martin, and student exercises

- Review Next Tues. Which?
    - 12-1:30pm ?
    - 5:30-7pm ?

What's a part-of-speech (POS)?

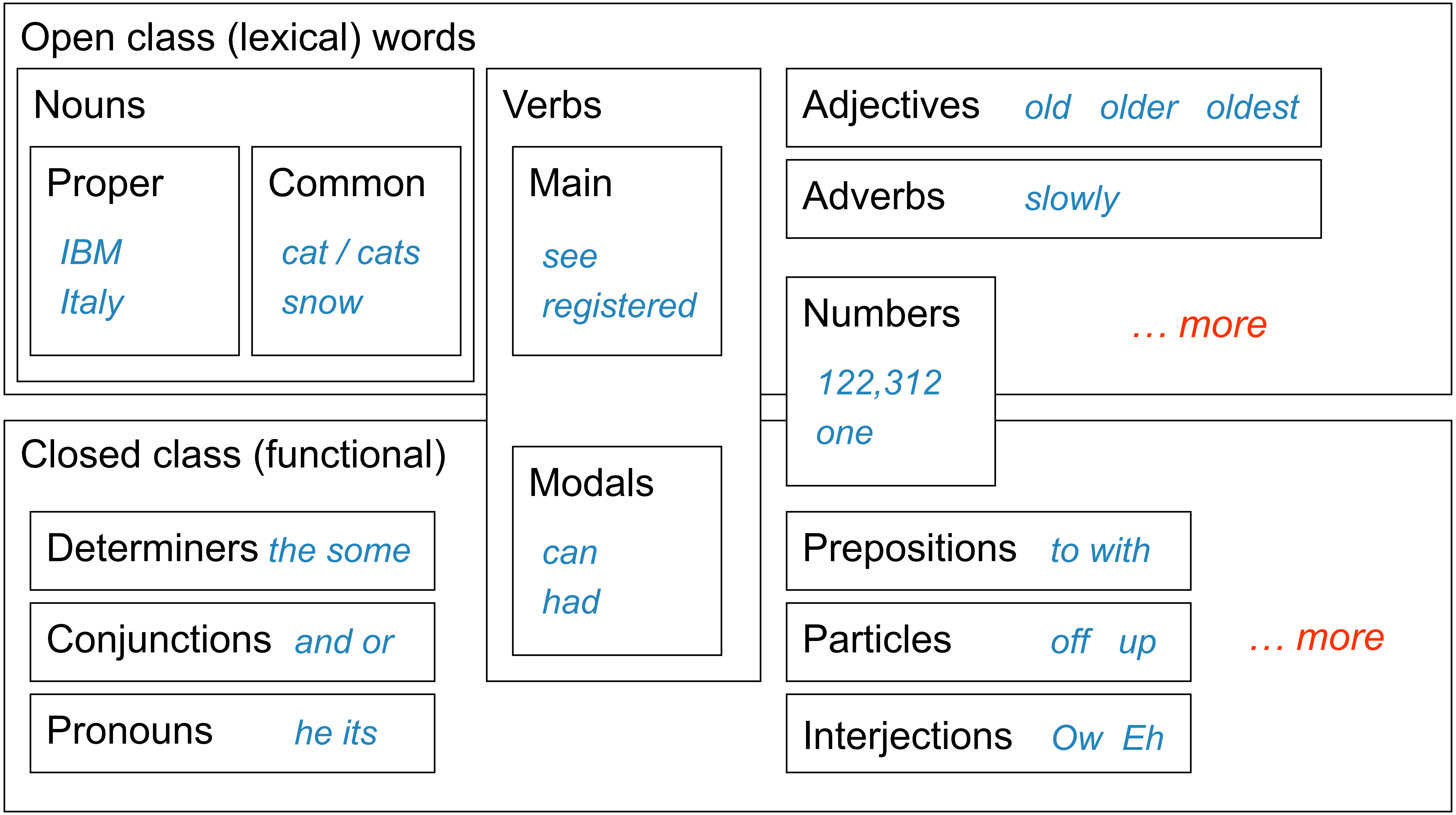
- Syntactic categories / word classes
  - You could substitute words within a class and have a syntactically valid sentence.
  - Give information how words can combine.

  - I saw the dog
  - I saw the cat
  - I saw the {table, sky, dream, school, anger, ...}

POS is an old idea

- Dionysius Thrax of Alexandria (100 BCE): 8 parts of speech
- Common in grammar classes today: noun, verb, adjective, preposition, conjunction, pronoun, interjection
- Many other more fine-grained possibilities

https://www.youtube.com/watch?v=ODGA7ssL-6g&index=1&list=PL6795522EAD6CE2F7



Open class (lexical) words

Nouns

Proper

IBM
Italy

Common

cat / cats
snow

Verbs

Main

see
registered

Modals

can
had

Adjectives *old older oldest*

Adverbs *slowly*

Numbers

122,312
one

… more

Closed class (functional)

Determiners *the some*

Conjunctions *and or*

Pronouns *he its*

Prepositions *to with*

Particles *off up*

Interjections *Ow Eh*

… more

Open vs closed classes

- Closed
    - Determiners: a, an, the
    - Pronouns: he, she, it, they ...
    - Prepositions: on, over, under, of, ...
    - Why "closed"?
    - Many are "grammatical function words."
- Open
    - Nouns, verbs, adjectives, adverbs

Many tagging standards

- Brown corpus (85 tags)
- Penn Treebank (45 tags) ... *the most common one*
- Coarse tagsets
    - Petrov et al. "Universal" tagset (12 tags)
        - http://code.google.com/p/universal-pos-tags/
        - Motivation: cross-linguistic regularities
            - e.g. adposition: pre- and postpositions
        - For English, collapsing of PTB tags
    - Gimpel et al. tagset for Twitter (25 tags)
        - Motivation: easier for humans to annotate
        - We collapsed PTB, added new things that were necessary for Twitter

Coarse tags, Twitter

```
D: It's
D: a
A: great
N: show
V: catch
O: it
P: on
D: the
^: Sundance
N: channel
#: #SMSAUDIO
U: http://instagram.com/p/trHejUML3X/
```

Proper or common? Does it matter?

Grammatical category??

Not really a grammatical category, but perhaps an important word class

Why do we want POS?

- Useful for many syntactic and other NLP tasks.
  - Phrase identification (“chunking”)
  - Named entity recognition
  - Full parsing
  - Sentiment

POS patterns: sentiment

- Turney (2002): identify bigram phrases useful for sentiment analysis

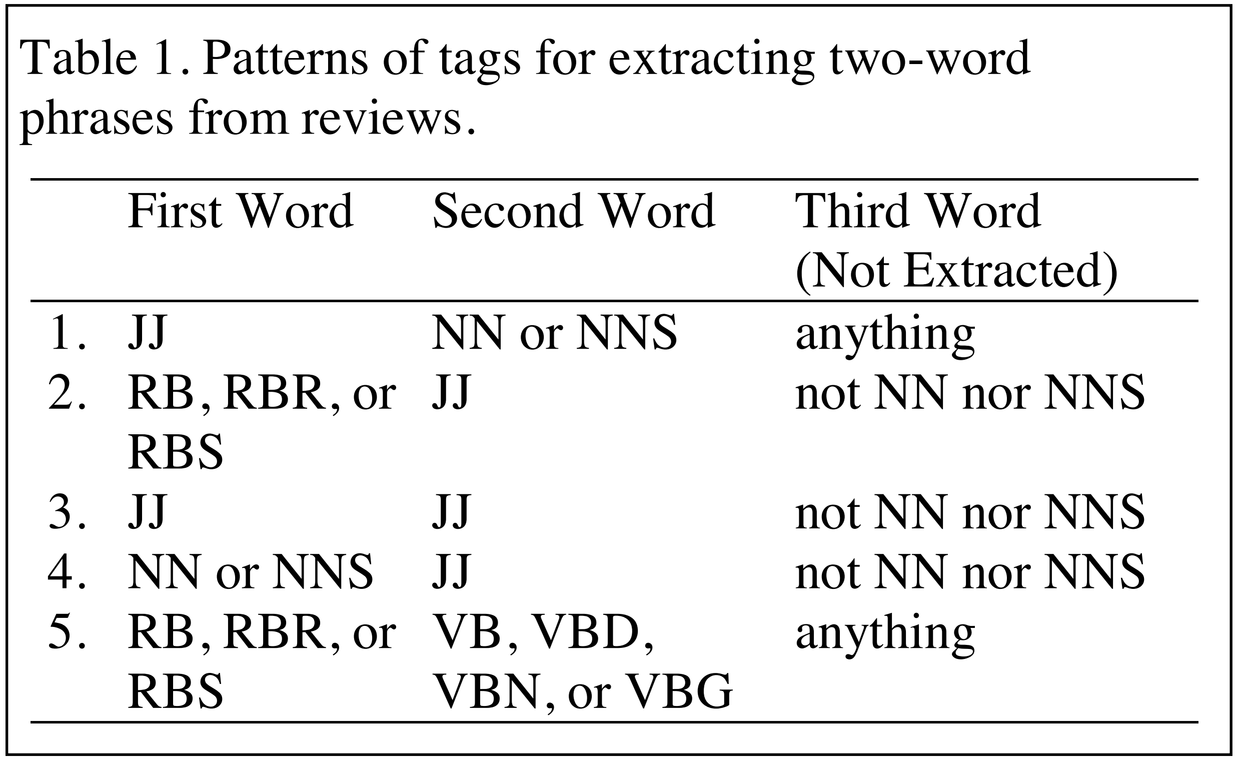


Table 1. Patterns of tags for extracting two-word phrases from reviews.

	First Word	Second Word	Third Word (Not Extracted)
1.	JJ	NN or NNS	anything
2.	RB, RBR, or RBS	JJ	not NN nor NNS
3.	JJ	JJ	not NN nor NNS
4.	NN or NNS	JJ	not NN nor NNS
5.	RB, RBR, or RBS	VB, VBD, VBN, or VBG	anything

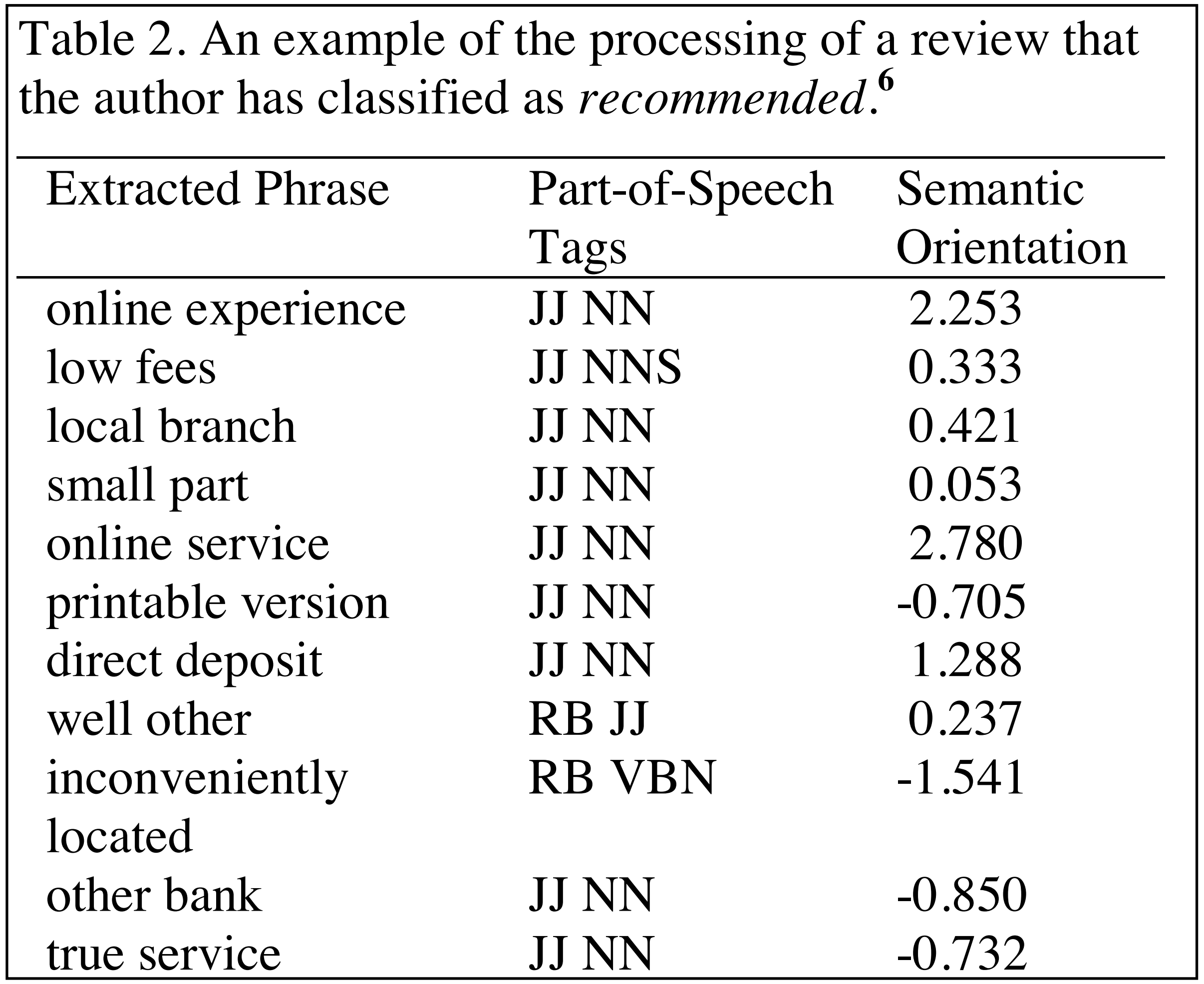


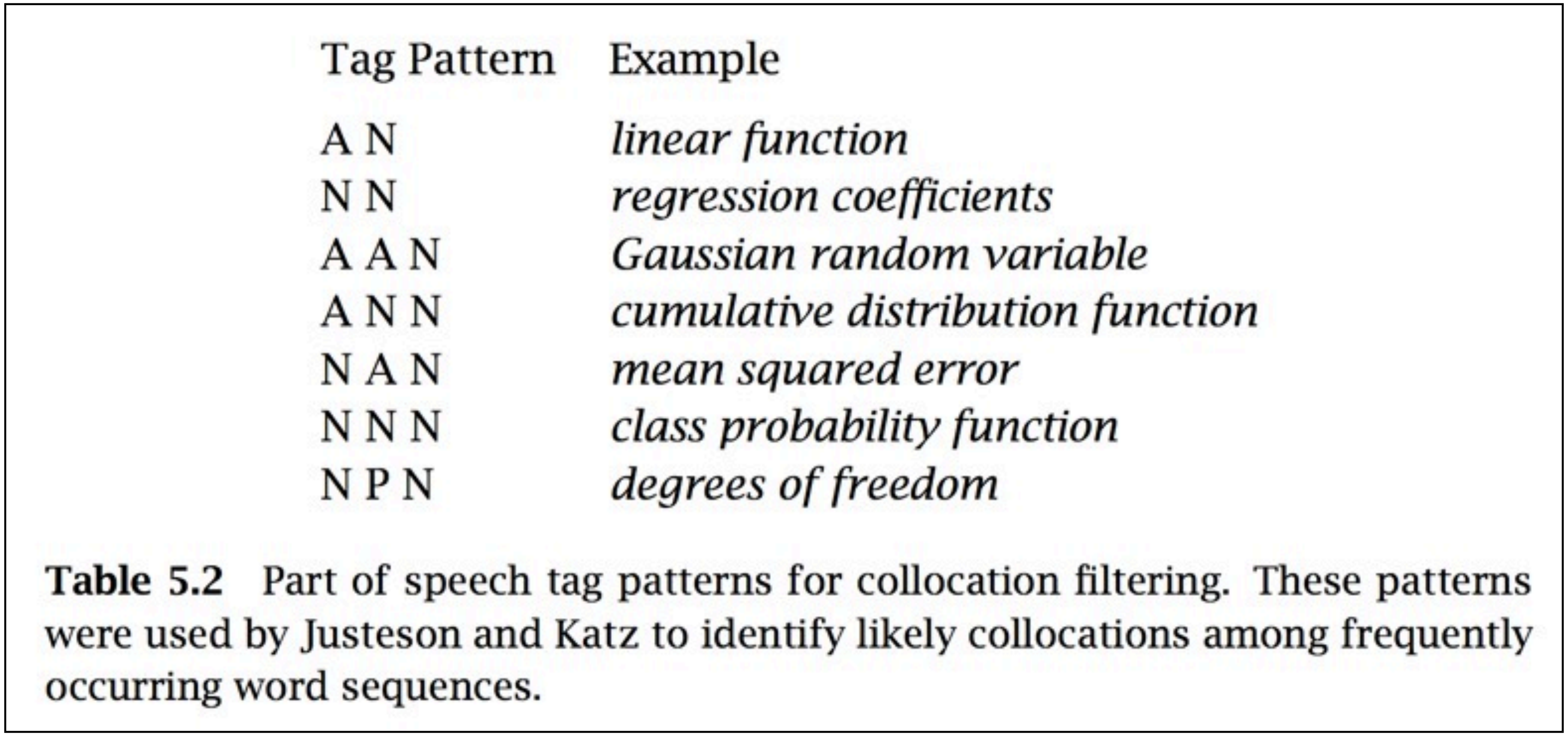
Table 2. An example of the processing of a review that the author has classified as *recommended*.[6]

Extracted Phrase	Part-of-Speech Tags	Semantic Orientation
online experience	JJ NN	2.253
low fees	JJ NNS	0.333
local branch	JJ NN	0.421
small part	JJ NN	0.053
online service	JJ NN	2.780
printable version	JJ NN	-0.705
direct deposit	JJ NN	1.288
well other	RB JJ	0.237
inconveniently located	RB VBN	-1.541
other bank	JJ NN	-0.850
true service	JJ NN	-0.732

(plus other sentiment stuff)

POS patterns: simple noun phrases

- Quick and dirty noun phrase identification



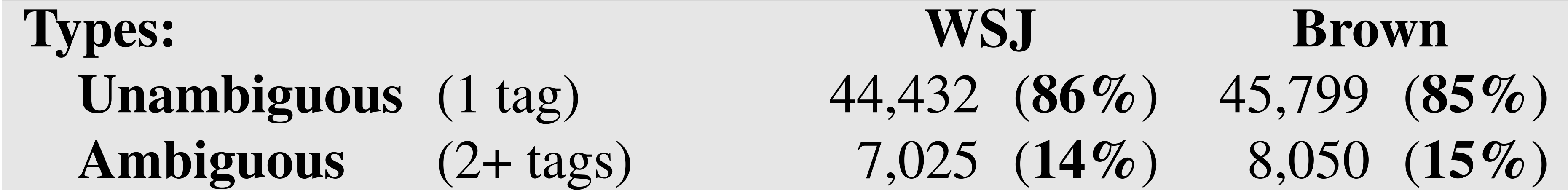
Tag Pattern	Example
A N	*linear function*
N N	*regression coefficients*
A A N	*Gaussian random variable*
A N N	*cumulative distribution function*
N A N	*mean squared error*
N N N	*class probability function*
N P N	*degrees of freedom*

Table 5.2 Part of speech tag patterns for collocation filtering. These patterns were used by Justeson and Katz to identify likely collocations among frequently occurring word sequences.

- Exercises

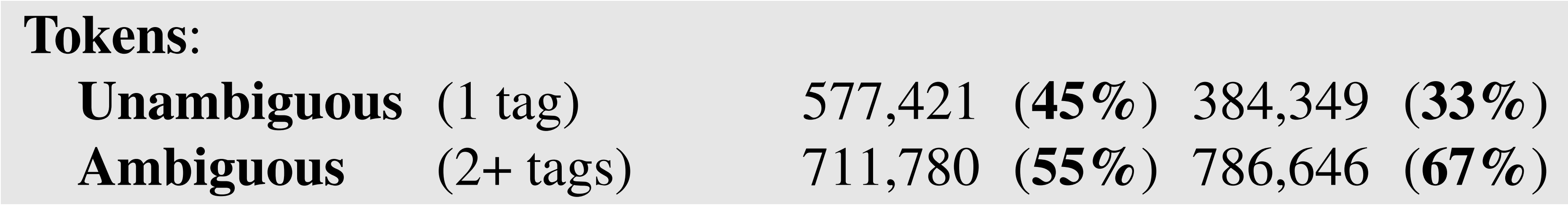
POS Tagging: lexical ambiguity

Can we just use a tag dictionary
(one tag per word type)?



Types:		**WSJ**	**Brown**
Unambiguous	(1 tag)	44,432 (**86%**)	45,799 (**85%**)
Ambiguous	(2+ tags)	7,025 (**14%**)	8,050 (**15%**)

Most words types are unambiguous ...



Tokens:			
Unambiguous	(1 tag)	577,421 (**45%**)	384,349 (**33%**)
Ambiguous	(2+ tags)	711,780 (**55%**)	786,646 (**67%**)

But not so for *tokens*!

- Ambiguous wordtypes tend to be very common ones.
  - I know **that** he is honest = IN (relativizer)
  - Yes, **that** play was nice = DT (determiner)
  - You can't go **that** far = RB (adverb)

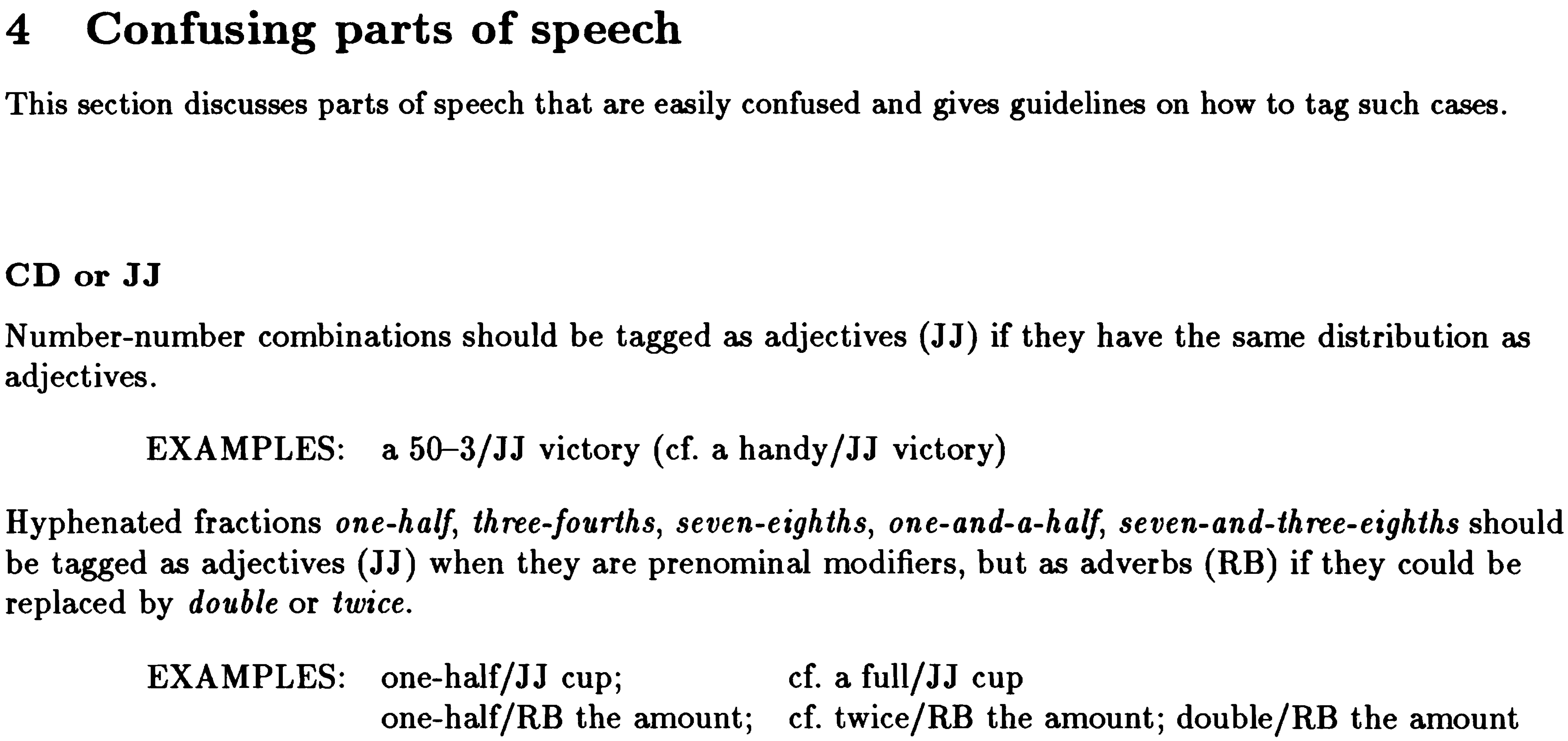
POS Tagging: baseline

- Baseline: most frequent tag. 92.7% accuracy
  - Simple baselines are very important to run!
- Why so high?
  - Many ambiguous words have a skewed distribution of tags
  - Credit for easy things like punctuation, "the", "a", etc.
- Is this actually that high?
  - I get 0.918 accuracy for token tagging
  - ...but, 0.186 whole-sentence accuracy (!)

POS tagging can be hard for humans

- Mrs/NNP Shaefer/NNP never/RB got/VBD **around/RP** to/TO joining/VBG
- All/DT we/PRP gola/VBN do/VB is/VBZ go/VB **around/IN** the/DT corner/NN
- Chateau/NNP Petrus/NNP costs/VBZ **around/RB** 250/CD

Need careful guidelines (and do annotators always follow them?)
PTB POS guidelines, Santorini (1990)



4 Confusing parts of speech

This section discusses parts of speech that are easily confused and gives guidelines on how to tag such cases.

CD or JJ

Number-number combinations should be tagged as adjectives (JJ) if they have the same distribution as adjectives.

EXAMPLES: a 50–3/JJ victory (cf. a handy/JJ victory)

Hyphenated fractions ***one-half***, ***three-fourths***, ***seven-eighths***, ***one-and-a-half***, ***seven-and-three-eighths*** should be tagged as adjectives (JJ) when they are prenominal modifiers, but as adverbs (RB) if they could be replaced by ***double*** or ***twice***.

EXAMPLES: one-half/JJ cup; cf. a full/JJ cup
one-half/RB the amount; cf. twice/RB the amount; double/RB the amount

Some other lexical ambiguities

- Prepositions versus verb particles
  - turn into/P a monster
  - take out/T the trash
  - check it out/T, what's going on/T, shout out/T

Test:
turn slowly into a monster
*take slowly out the trash

- this,that -- pronouns versus determiners
  - i just orgasmed over this/O
  - this/D wind is serious

Careful annotator guidelines are necessary to define what to do in many cases.

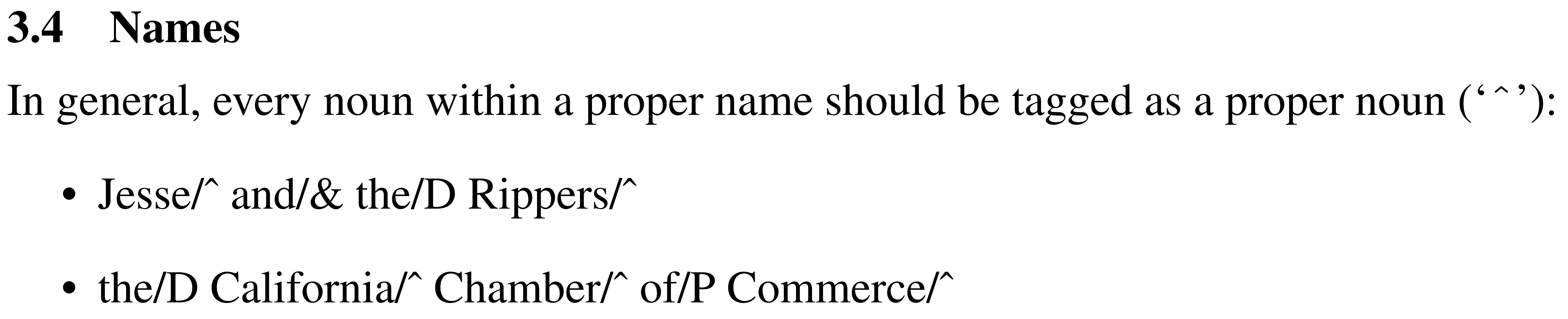
- http://repository.upenn.edu/cgi/viewcontent.cgi?article=1603&context=cis_reports
- http://www.ark.cs.cmu.edu/TweetNLP/annot_guidelines.pdf

Proper nouns

- Common nouns vs. proper nouns on Twitter

Convinced$_{A}$ that$_{O}$ Monty$_{\wedge}$ **python**$_{\wedge}$ doing$_{V\text{-}VBG}$ a$_{D}$ completely$_{R}$ straight$_{A}$ faced$_{A}$ Shakespeare$_{\wedge}$ adaption$_{N}$ would$_{V\text{-}VBD}$ be$_{V\text{-}VB}$ among$_{P}$ the$_{D}$ most$_{A}$ Monty$_{\wedge}$ **python**$_{\wedge}$ things$_{N}$ ever$_{R}$

- Names are multiwords. Their tokens are not always nouns. Many people in the exercises didn't want to do this. Token-level tagging is a weird abstraction here.



3.4 Names

In general, every noun within a proper name should be tagged as a proper noun ('^'):

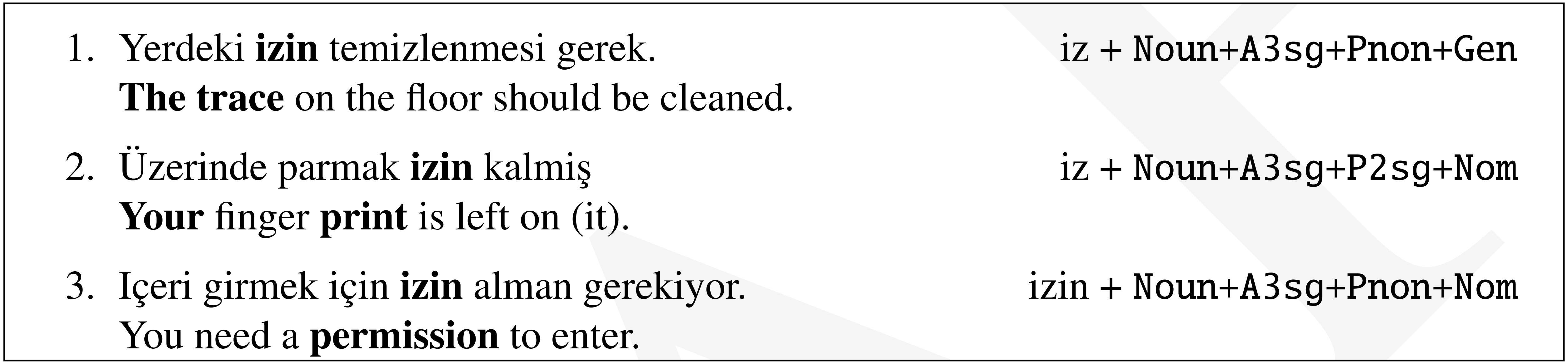
- Jesse/^ and/& the/D Rippers/^
- the/D California/^ Chamber/^ of/P Commerce/^

Are your tokens too big for tags?

- PTB tokenization of clitics leads to easy tagging
  - I’m ==> I/*PRP* 'm/*VBP*
- Twitter: is this splitting feasible? Real examples:
  - hes i’m im ill http://search.twitter.com
  - Imma bout to do some body shots
- Gimpel et al.’s strategy: introduce compound tags (I'm = *PRONOUN+VERB*)

Are your tokens too big for tags?

- Other example: highly inflected languages, e.g. Turkish, have case, gender etc. built into the “tag”



1. Yerdeki **izin** temizlenmesi gerek. iz + `Noun+A3sg+Pnon+Gen`
   The trace on the floor should be cleaned.
2. Üzerinde parmak **izin** kalmiş iz + `Noun+A3sg+P2sg+Nom`
   Your finger **print** is left on (it).
3. Içeri girmek için **izin** alman gerekiyor. izin + `Noun+A3sg+Pnon+Nom`
   You need a **permission** to enter.

- Our approach for Twitter was to simply treat each compound tag as a separate tag. Is this feasible here?

How to build a POS tagger?

- Key sources of information:
  - 1. The word itself
  - 2. Morphology or orthography of word
  - 3. POS tags of surrounding words: syntactic positions