NLP

Introduction to NLP

Parts of speech

Syntactic Categories

- Substitution test:

Nathalie likes	{ *black* *Persian* *tabby* *small* }	*cats.*

- Open (lexical) and closed (functional) categories:

No-fly-zone *twerk*

the *in*

Example

The dog chased the yellow bird.

- Parts of speech
  - eight (or so) general types
  - nouns, verbs, adjectives…

Nouns

- Examples
  - *dog, tree, computer, idea*
- Nouns vary in
  - number (singular, plural)
  - gender (masculine, feminine, neuter)
  - case (nominative, genitive, accusative, dative)
- Case example in Latin
  - *Singular: puer (nominative), puerum (accusative), puerī (genitive)*
  - *Plural: puerī (nominative), puerōs (accusative), puerōrum (genitive)*
- Gender example in German
  - *Mädchen* (neuter gender)

Jabberwocky (Lewis Carroll)

`Twas **brillig**, and the **slithy toves**
Did gyre and gimble in the **wabe**:
All **mimsy** were the borogoves,
And the **mome raths outgrabe**.

- What are the parts of speech for the words in bold?

Answers

`Twas **brillig**, and the **slithy toves**
Did gyre and gimble in the **wabe**:
All **mimsy** were the borogoves,
And the **mome raths outgrabe**.

- Wabe, borogoves
  - Nouns (after "the")
- brillig
  - adjective?
  - noun? ("noon")
- mimsy
  - adjective
- slighty toves
  - adjective+noun?
  - noun+verb? ("the bell tolls")
- mome raths outgrabe
  - Adjective+noun+verb?
  - Noun+verb+adverb? ("birds fly outside")

Why is this an Important Example?

- Computers see text that they don't really understand.

- They have to use some prior knowledge.

- They reason probabilistically.

- They use context.

- The can be wrong.

Pronouns

- Examples
  - *she, ourselves, mine*
- Pronouns vary in
  - person
  - gender
  - number
  - case (in English: nominative, accusative, possessive, 2nd possessive)
- Reflexive and anaphoric forms
  - *herself, each other*

> *Samantha gave <u>her </u>a haircut.*
> *Samantha gave <u>herself </u>a haircut.*

Determiners and Adjectives

- Determiners
  - Articles
    - *the, a*
  - Demonstratives
    - *this, that*

- Adjectives
  - describe properties
  - attributive and predicative adjectives
  - agreement
    - in gender, number
  - comparative and superlative forms
    - derivative and periphrastic
  - positive form

Verbs

- Describe
  - actions, activities, and states (*throw, walk, have*)
- English
  - four verb forms
- tense
  - present, past, future
- other inflection
  - number, person
- gerunds and infinitive
- aspect
  - progressive, perfective
- Voice
  - active, passive

Verbs

- Participles, auxiliaries
- Arguments:
    - The dog sleeps   (intransitive)
    - The dog chased the cat (transitive)
    - Mary gave the dog a bone (ditransitive)
- Irregular verbs
- Richer inflections
    - E.g., French, Latin, and Finnish

Verb Conjugation in French

Present
je vais *I go*
tu vas *you go*
il va *he goes*
nous allons *we go*
vous allez *you go*
ils vont *they go*

Conditional
j'irais *I would go*
tu irais *you would go*
il irait *he would go*
nous irions *we would go*
vous iriez *you would go*
ils iraient *they would go*

Past
je suis allé(e) *I went*
tu es allé(e) *you went*
il est allé(e) *he went*
nous sommes allé(e)s *we went*
vous êtes allé(e)s *you went*
ils sont allé(e)s *they went*

Future
j'irai *I will go*
tu iras *you will go*
il ira *he will go*
nous irons *we will go*
vous irez *you will go*
ils iront *they will go*

Imperfect
j'allais *I used to go*
tu allais *you used to go*
il allait *he used to go*
nous allions *we used to go*
vous alliez *you used to go*
ils allaient *they used to go*

Subjunctive
que j'aille *that I go*
que tu ailles *that you go*
qu'il aille *that he go*
que nous allions *that we go*
que vous alliez *that you go*
qu'ils aillent *that they go*

Other Parts of Speech

- Adverbs
  - happily, here, never
- Prepositions
  - of, through, in
- Particles
  - Phrasal verbs
  - the plane took off, take it off
- Particles vs. prepositions
  - *She ran up a bill/hill*

Other Parts of Speech

- Coordinating conjunctions
  - *and, or, but*
- Subordinating conjunctions
  - *if, because, that, although*
- Interjections
  - *Ouch*!

Part of Speech Tags

```
NN     /* singular noun */
IN     /* preposition */
AT     /* article */
NP     /* proper noun */
JJ     /* adjective */
,      /* comma */
NNS    /* plural noun */
CC     /* conjunction */
RB     /* adverb */
VB     /* un-inflected verb */
VBN    /* verb +en (taken, looked (passive,perfect)) */
VBD    /* verb +ed (took, looked (past tense)) */
CS     /* subordinating conjunction */
```

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