

# Computation and Linguistic Analysis

L545

Dept. of Linguistics, Indiana University  
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# Computation and Linguistic Analysis

From a practical perspective, computational linguistics provides the computational means to deal with spoken & written natural language:

- ▶ information extraction
- ▶ automatic translation
- ▶ natural language frontends to databases
- ▶ message generation
- ▶ spelling correction
- ▶ ...

From a linguistic perspective, computational linguistics provides a possibility to :

- ▶ formalize & computationally test linguistic theories
- ▶ obtain example data relevant to linguistic theorizing

In other words: Why are you here?

- ▶ Human language is interesting and challenging
  - ▶ NLP offers insight into properties of language
  - ▶ Combines different thinking: ling, CS, psych, math, etc.
- ▶ Language is the medium of the web
- ▶ CL analysis can help in communication
- ▶ The field is ambitious yet practical
  - ▶ e.g., Machine Translation (MT) is enormously difficult, but MT is useful (e.g., google's "Translate this page")

This course will focus more on so-called **symbolic CL**, or theory-driven computational linguistics

- ▶ When possible, we will connect the material to theoretical insights
- ▶ Although we'll touch on some statistical methods, those are largely left for L645

This course will focus on what we need to know in order to represent language

- ▶ i.e., a focus on the underlying machinery more than the applications
- ▶ If you know how to use FSAs for morphology, you can learn how to use them for information extraction

Some themes that will recur this semester:

- ▶ Language is highly ambiguous
- ▶ Language processing must therefore be efficient
- ▶ Language can be treated as a formal system

In dealing with language this semester, we will emphasize the following three aspects:

- ▶ data structures
- ▶ formalisms for expressing grammars using these data structures
- ▶ (parsing) algorithms for processing with those grammars

# What you need to know (1)

As we focus on theory, it helps to know about the following:

- ▶ Morphology: what are the components of words?
- ▶ Syntax: what are the relevant types of constructions in language?
  - ▶ Arguments/Adjuncts, Control/raising, UDCs, Anaphora
- ▶ Semantics: how do word meanings compositionally form sentential meanings?

We'll focus a lot on parsing this semester, so some basic knowledge of syntax will help

- ▶ If you lack this, let me know, and I'll give you some readings ...

# What you need to know (2)

We will treat language as a formal system, meaning:

- ▶ Language is a set of strings
- ▶ A language model recognizes or generates a set of strings

I want you to be comfortable with the idea of representing things formally (mathematically)

- ▶ We will deal with **set theory**
- ▶ We will also discuss this relatively soon