

Bogazici linguistics

Ling 488

Exploring Natural Languages  
by Modeling

-Cem Bozsahin

## Kinds of Models

- 1 Scientific models (e.g. DNA, atom)
- 2 Engineering models (e.g. dams, thermostats)
- 3 business models (e.g. L2Ms)
- 4 Logic models (e.g. truth conditions)

## 1 Scientific models:

- Preparing a theory or idea for experiments (real experiment or thought experiment)
- Simplified representations of reality
- ∵ The theory or the idea must be explicit and formulable enough to be able to do that.
- Needs more than notational precision.

- One important question: Are linguistic theories modelable in this sense?
- The points of scientific modeling:
  - make the idea independently testable
  - gain a new understanding from the test.

## 2 Engineering models:

Preparing a system for deployment.

Basic concerns in developing a model:

- Reliability
  - Efficiency
  - Robustness
  - Effects on the environment
  - feasibility (doability, cost, ...)
- ∴ There has to be a design and system in the first place.

### 3 Business models:

- A system + financial concerns  
& legal [cost,  
revenue,  
profit,  
competition,  
liability]
- In terms of parameters,  
a business model does not have to  
be transparent (they may have  
hidden parameters)
- other kinds of models want  
to be transparent.

## 4 Models in logic

- To connect formulae to truth values.
- In general, connecting forms to values (true, false, degree of belief, probability, etc.).
- Recall proof theory and model theory in logic.
- We study scientific models in class
  - doesn't mean they have no engineering or logical aspects

let's assume that we have a  
linguistic theory which is modelable  
in sense 1 (i.e., scientifically modelable).

- what would we expect it to  
model?

- Morphology
  - Phonology
  - Syntax
  - Semantics
  - Information structure
  - Discourse
  - Variation (intra- and cross-linguistic)
- Language acquisition
- Interaction (self)  
 $\binom{1-n}{n-m}$
- The mind does it all!

- why do we study language at these levels ?
- One cognitive scientist, Herbert Simon, said that we study NATURE at levels because IT COMES TO US at levels.

Agree?

## Morphology x Phonology

ev-ler-e

Turkish

house-PLU-DAT

'to the houses'

ev-le-re

(syllables)

(morphemes and syllables)

## Morphology x Vocabulary (lexicon?)

ev-ler Turkish  
house -PLU  
'houses'

kiler  
cellar  
witness  
kiler ler ??  
cellar PLU  
'cellars'

How do we know kiler  
is not plural?

## Morphology x syntax

The boys like the video.

she likes the boys.

- Same morphology, different syntax:

- \* The boys likes the video.
- \* She like the boys.

## Phonology x Syntax x Morphology

The boys like the video.

She toys with the idea.

- Same phonological shape (/z/);  
different syntax and morphology.

## Syntax x Semantics

John promised / persuaded / expected  
Mary to study.

- Almost identical syntactic behavior ; altogether different semantics depending on the verb.

## Semantics x Information structure

I like this book.

This book I like.

- Same truth conditions, same referents,  
different packaging.

Morphology

Phonology

Syntax

Semantics

Information structure

Discourse

grammar



- Therefore, a grammar is by its very nature multi-dimensional.
- But there are empirical dimensions;
- Therefore, we need abstraction to put them together.  
⇒ REPRESENTATION

Put them together  
to do what? To study:

- Language acquisition
- Language variation
  - within a language
  - across languages
- Integration and interaction  
(recall: one mind can do all this.)
- Emergence of grammatical systems  
and constructions

- The linguistic dimensions can be interpreted very differently depending on one's views and biases.
- This is a challenge for MODELLING.
- Because we have to DEVELOP a representation language to allow modeling.
- A grammar model must be unambiguously interpretable by the modelers.

- One conception of dimensions  
(we use these in class)

**FORM** { Morphology: construction of reference.  
Syntax: structured transmission  
of reference.  
phonology: Medium of transmission  
(and its structure)

**CONTENT** { Semantics: Source of reference  
and structured representation  
of who does what to whom.  
Information Structure: Packaging of form and  
meaning (message)

Reference is

- participant reference
- event reference
- activities
- human conception  
of activities
- location, time, figure,  
ground reference
- view reference (e.g. aspect)

