Workshop on Inference from Text

Larry Moss, Indiana University

NASSLLI, June 2010

Welcome to the workshop!

The purpose of our workshop is to establish a meeting between two research communities:

- people working on textual entailment tasks and using formal tools of any kind
- people working on logical systems for natural language reasoning

The overarching goal is to present current work in order to see whether the time is right for joint work.

Plan for the workshop

Day 1 lecture on natural logic: syllogistic-type systems

Day 2 lectures on natural logic: beyond syllogistic systems

Day 3 Generalized Syllogistic Inference System based on Inclusion and Exclusion Relations, presented by Koji Mineshima (joint work with Mitsushiro Okada and Ryo Takemura).
Also, Cleo Condoravdi starts on PARC group's work, including especially implicatives.

Day 4 Cleo Condoravdi, Computing Textual Inference

Day 5 Mehwish Riaz, Another Look at Textual Entailment: Discovering Scenario-Specic Causal Relationships with No Supervision (joint with Roxana Girju)
End with a group discussion.

- How can we build computational tools to automatically decide inferences such as

$$\frac{\text{The Watergate burglars acted illegally in destroying the tape}}{\text{The Watergate burglars acted destroyed the tape}}$$

- What does logic for NL look like when it is done with a minimum of translation?

- Can we build formal tools to simultaneously
  — handle inference in interesting fragments
  — remain on the "good side" of various logical borders: decidability, complexity.

- And will ths be of any interest in semantics?

A fairly standard view of these matters

- Why does logic enter in to semantics in the first place?

We want to account for natural language inferences such as

$$\frac{\text{Frege's favorite food was sushi}}{\text{Frege ate sushi at least once}}$$

A fairly standard view of these matters

- Why does logic enter in to semantics in the first place?

We want to account for natural language inferences such as

$$\frac{\text{Frege's favorite food was sushi}}{\text{Frege ate sushi at least once}}$$

The hypothesis and conclusion would be
rendered in some logical system or other.
There would be a background theory ($\approx$ common sense),
and then the inference would be modeled either as a semantic fact:

Common sense+Frege's favorite food was sushi $\models$ Frege ate sushi at least once

or a via a formal deduction:

Common sense+Frege's favorite food was sushi $\vdash$ Frege ate sushi at least once

Either way, it's all in one and the same language.

Furthermore

- To carry our this program, it would be advisable to take as expressive a logical system as possible.
- First-order logic (FOL) is a good starting point, but for many phenomena we'll need to go further.
- In this regard, FOL is vastly superior to traditional (term) logic.
- Various properties of FOL are interest in this discussion, but only secondarily so.

And anyways, what choice to we really have?

One can easily object to the whole enterprise of using FOL in connection with NL inference, on the grounds that FOL cannot handle

- vague words
- intentions of speakers
- ellipsis
- anaphora
- poetic language

⋮

In other words, FOL is too small for the job.

Comparsion of RTE and Natural logic work

A contrary view: FOL is also too big!

The point is that for "everyday inference",
a small fragment of FOL should be sufficient.

Also, there is a long tradition in linguistics of dissatisfaction with models which are "complete r.e."
and in favor of ones with much less expressive power.

This was once decisive in syntax: the Peters-Ritchie Theorem.

A contrary view: FOL is also too big!

The point is that for "everyday inference",
a small fragment of FOL should be sufficient.

Also, there is a long tradition in linguistics of dissatisfaction with models which are "complete r.e."
and in favor of ones with much less expressive power.

This was once decisive in syntax: the Peters-Ritchie Theorem.

You decide

Consider three activites:

- A mathematics: prove the Pythagorean Theorem $a^2 + b^2 = c^2$.
- B syntax: parse John knows his mother saw him at her house.
- C semantics: tell whether a hearer of the sentence above should infer that John's mother lives in a house.

A: mathematics B: syntax

Where would you put C: semantics?

Program

Show that significant parts of NL inference can be carried out in decidable logical systems.

Raise the question of how much semantics can be done in decidable fragments.

To axiomatize as much as possible,
because the resulting logical systems are likely to be interesting.

To ask how much of language could have been done if the traditional logicians
had the mathematical tools to go further than they were able to.

Contrasting Emphases of Natural Logic and RTE

Natural Logic	RTE
use fragments bottom-up	no fragments at all
likes completeness	doesn't care about it
computation is secondary	computation is primary
negation is desirable	negation is probably not needed much
deep	shallow
based on formal $\models$ and $\vdash$	based on intuitions only