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-Specific 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:

- The Watergate burglars acted illegally in destroying the tape
- 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 this be of any interest in semantics?
A fairly standard view of these matters

Why does logic enter into semantics in the first place?

We want to account for **natural language inferences** such as

Frege’s favorite food was sushi

Frege ate sushi at least once
Why does logic enter into semantics in the first place?

We want to account for natural language inferences such as

\[
\text{Frege's favorite food was sushi} \\
\underline{\text{Frege ate sushi at least once}}
\]

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

\[
\text{Common sense} \vdash \text{Frege's favorite food was sushi} \models \text{Frege ate sushi at least once}
\]

or a via a formal deduction:

\[
\text{Common sense} \vdash \text{Frege's favorite food was sushi} \vdash \text{Frege ate sushi at least once}
\]

Either way, it’s all in one and the same language.
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.
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.
Comparison 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.
The point is that for “everyday inference”,
a small fragment of FOL should be sufficient.

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**You decide**

Consider three activities:

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*.

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

<table>
<thead>
<tr>
<th>Natural Logic</th>
<th>RTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>use fragments bottom-up</td>
<td>no fragments at all</td>
</tr>
<tr>
<td>likes completeness</td>
<td>doesn’t care about it</td>
</tr>
<tr>
<td>computation is secondary</td>
<td>computation is primary</td>
</tr>
<tr>
<td>negation is desirable</td>
<td>negation is probably not needed much</td>
</tr>
<tr>
<td>deep</td>
<td>shallow</td>
</tr>
<tr>
<td>based on formal $\models$ and $\vdash$</td>
<td>based on intuitions only</td>
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