

## 3. Semantic Inference for Question Answering

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The AQUAINT QA program has provided solid evidence that potential users of QA systems appear to have limited need for factoid question answering, but rather much more need to have systems that can deal with complex reasoning about causes, effects, chains of hypotheses and so on – capabilities that current systems do not adequately support. Approaching this goal requires combining sophisticated systems for knowledge representation and inference with methods to extract such deep semantic relations from linguistic input. We believe that recent important advances in knowledge representation and inference, the widespread availability of semantically motivated resources such as WordNet, FrameNet, and successful recent efforts at textual analysis including predicate-argument extraction point the way to building the next generation of semantically rich QA systems. This tutorial will serve as a survey of important recent progress on semantically-based QA articulating connections and highlighting efforts that have brought one or more of these techniques to bear on QA system design and development.

### 3.1. Tutorial Outline

1. Methods to extract semantic relations from text.
  1. Statistical techniques.
  2. Knowledge intensive techniques.
  3. Supervised and unsupervised learning techniques.
2. Knowledge representation and inference techniques for QA.
  1. Logical inference Methods.
  2. Structured Probabilistic Methods.
    1. Probabilistic Relational Models for inference with uncertainty.
    2. Models of Event Structure.
3. Ontologies and Linguistic resources for QA.
  1. Linguistic resources.
    1. WordNet.
    2. FrameNet.
    3. PropBank.
  2. Ontologies and resources on the SemanticWeb.
    1. OpenCYC.
    2. OWL.
    3. OWL-S.

### 3.2. Target Audience

This tutorial is designed for computer scientists and linguistics alike. Acquaintance with statistical techniques and Knowledge Representation will be useful, but not mandatory.

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