

# QUESTION-ANSWERING

Chapter 3

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Question answering (QA) is a computer science discipline within the fields of information retrieval and natural language processing (NLP), which is concerned with building systems that automatically answer questions posed by humans in a natural language.

A QA implementation, usually a computer program, may construct its answers by querying a structured database of knowledge or information, usually a knowledge base.

More commonly, QA systems can pull answers from an unstructured collection of natural language documents.

# NATURAL LANGUAGE DOCUMENT COLLECTIONS USED FOR QA SYSTEMS

Some examples of natural language document collections used for QA systems include:

- a local collection of reference texts
- internal organization documents and web pages
- compiled newswire reports
- a set of Wikipedia pages
- a subset of World Wide Web pages

# TYPES OF QUESTIONS A QA SYSTEM DEALS WITH

QA research attempts to deal with a wide range of question types including: fact, list, definition, How, Why, hypothetical, semantically constrained, and cross-lingual questions.

- **Closed-domain question answering** deals with questions under a specific domain (for example, medicine or automotive maintenance), and can be seen as an easier task because NLP systems can exploit domain-specific knowledge frequently.
  - Alternatively, closed-domain might refer to a situation where only a limited type of questions are accepted, such as questions asking for descriptive rather than procedural information.
- **Open-domain question answering** deals with questions about nearly anything, and can only rely on general world knowledge.
  - On the other hand, these systems usually have much more data available from which to extract the answer.

# BASEBALL AND LUNAR

Two early QA systems were BASEBALL and LUNAR.

BASEBALL answered questions about the US baseball league over a period of one year.

LUNAR, in turn, answered questions about the geological analysis of rocks returned by the Apollo moon missions.

Both QA systems were very effective in their chosen domains.

In fact, LUNAR was demonstrated at a lunar science convention in 1971 and it was able to answer 90% of the questions in its domain posed by people untrained on the system.

# ASKMSR

The ASKMSR system (Banko *et al.*, 2002) is a typical Web-based question-answering system.

It is based on the intuition that most questions will be answered many times on the Web, so question answering should be thought of as a problem in precision, not recall.

We don't have to deal with all the different ways that an answer might be phrased—we only have to find one of them.

# ARCHITECTURE

As of 2001, QA systems typically included a question classifier module that determines the type of question and the type of answer.

A multiagent question-answering architecture has been proposed, where each domain is represented by an agent which tries to answer questions taking into account its specific knowledge; a meta-agent controls the cooperation between question answering agents and chooses the most relevant answer(s).

# EXAMPLE

For example, consider the query

[Who killed Abraham Lincoln?]

Suppose a system had to answer that question with access only to a single encyclopedia, whose entry on Lincoln said

John Wilkes Booth altered history with a bullet. He will forever be known as the man who ended Abraham Lincoln's life.

To use this passage to answer the question, the system would have to know that ending a life can be a killing, that “He” refers to Booth, and several other linguistic and semantic facts.



ASKMSR does not attempt this kind of sophistication—it knows nothing about pronoun reference, or about killing, or any other verb. It does know 15 different kinds of questions, and how they can be rewritten as queries to a search engine.

It knows that

[Who killed Abraham Lincoln]

can be rewritten as the query

[\* killed Abraham Lincoln] and as

[Abraham Lincoln was killed by \*].