Answering Multiple Questions on a Topic from Heterogeneous Resources

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Project Goals

Answering in Context

- Topic analysis: separating name from restrictive modifiers
  "philanthropist Alberto Vilar"
- Reference resolution in questions
  "What is Vilar's nationality?"
  "What is his nationality?"
  "What is the philanthropist's nationality?"
  ⟹ "What is Alberto Vilar's nationality?"
  "Name other famous Americans with Cuban ancestry."
  ⟹ use "Alberto Vilar" in retrieval
- Duplicate removal through diversity-based reranking

Expanding Knowledge Sources

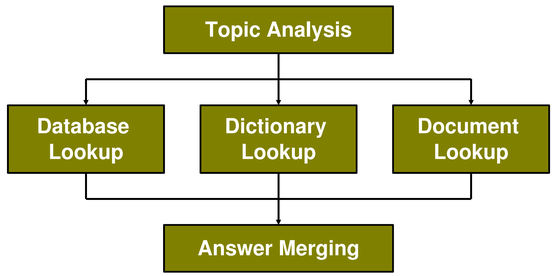
- Factoid: added Teoma search engine for Knowledge Mining
- List: 20 times more expected answer type lists than last year
- Definition:
  - new patterns give greater variety of information
  - can match multiple adjacent patterns
  - added simple anaphora resolution

Results

Task	best	CSAIL04-1	CSAIL04-2	median
Factoid	0.770	0.313	0.313	0.170
List	0.622	**0.119**	0.113	0.094
Definition	0.460	0.184	**0.186**	0.184
Total		0.232	0.231	

	CSAIL04-1	CSAIL04-2
List Questions:		
How reliable is answer type filtering? Include top 25% of guesses?	always guess	guess only if no list exists for answer type
Definition Questions:		
Reference Resolution:	none	names and personal pronouns

Definition Questions



Database Lookup

Using surface patterns, pre-compile every knowledge nugget about every entity into a database. Sample patterns:

copular: A **fractal** is a pattern that is irregular, but self-similar at all scales
appositive: The **Aga Khan**, Spiritual Leader of the Ismaili Muslims,
occupation: singer-choreographer **Fred Durst**
became: **Althea Gibson** became the first black tennis player to win Wimbledon

relative clause: **Dean**, who died at age 24 in a 1955 car crash, is...
such as: tested various nutrients such as **calcium**, **magnesium**, and **potassium**
also called: established a non-governmental organization called **Global Village**
age: **Adams**, 30, a convicted murderer, was fatally shot...

Multiple patterns: **Adams**, 30, a convicted murderer, was fatally shot...
Pronominal anaphora: **He [Franz Kafka]** *was* one of the best-known Czech authors

Answers are sentences containing matched patterns.

Dictionary Lookup

Project webster.com definition onto AQUAINT documents:

What is the vagus nerve?
Dictionary definition: either of the 10th pair of cranial nerves that arise from the medulla and supply chiefly the viscera…
Projected answer: The vagus nerve is sometimes called the 10th cranial nerve. It runs from the brain…

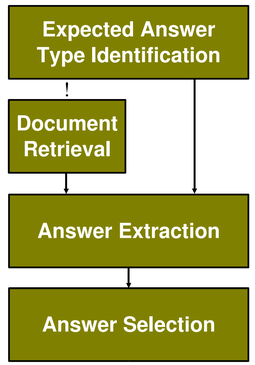
Document Lookup

Use topic as a search query, and retain sentences containing it, subject to passage-retrieval scoring

Answer Merging

Order nuggets by
- quality of **topic** match,
- quality of the definition's **source,**
- **novelty** of answer contents over previous definitions and all question answer pairs for the topic.

List Questions



Select known lists whose noun-phrase annotations match the question focus

Fetch relevant document chunks from the AQUAINT corpus

Extract exact answers from candidate document chunks

Remove near-duplicate answers

Select best answers and guesses

Expected Answer Types

Guess answer candidates are generic (named entity, noun phrase)
List answer candidates come from pre-compiled categories

A list is chosen if its noun-phrase annotation matches the question focus.

New List Sources

3300+ fixed lists with annotations, up from 150+ last year!

From AQUAINT+WordNet:
Category names are taken from "What *X*" context
WordNet hyponyms projected onto the corpus.
"Italian region": Abruzzi, {Basilicata,Lucania}, Calabria,...

From WorldBook Encyclopedia first sentence:
Sydney Hillman, an American labor leader, was the guiding spirit of the Amalgamated Clothing Workers of America.
"labor leader"/*"leader"*: Sidney Hillman, Leonard Woodcock,...

From online resources, manually compiled:
`http://www.wirelessadvisor.com/hardware.cfm`
"cell phone manufacturers": Nokia, Samsung, Motorola,...

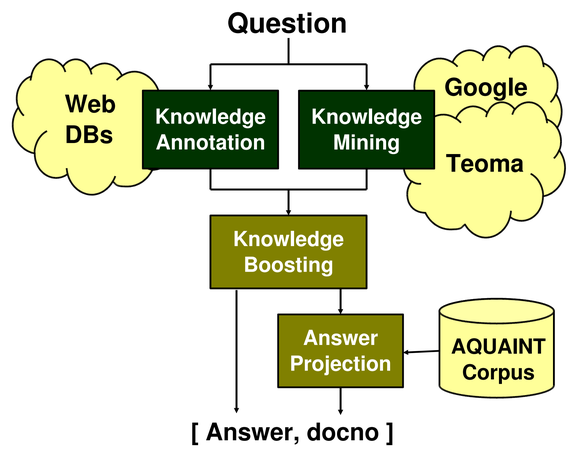
Answer Extraction

Select all List candidates from top-ranked retrieved passages

Condition 1:
Use top 25% of generic "guess" answers for every question

Condition 2:
Use top 25% "guess" answers only if no list answer type was identified.

Factoid Questions



The Aranea System

Knowledge Annotation: Make use of freely available structured and semi-structured knowledge on the Web using wrapper and database techniques.
"When was James Dean born?"
⟹ 8 February, 1931 (IMDB.com)

Knowledge Mining: Leverage the tremendous amount of free text available on the Web with redundancy-based statistical techniques.
Google top 100 document titles and snippets
New this year: Teoma top 100 titles and snippets
`http://www.teoma.com/`

Knowledge Boosting: Heuristics for filtering out bad answers and promoting good answers.

Answer Projection

- Retrieve candidate documents using the question.
- Score documents using the candidate answers in passage-retrieval techniques.
- Select the highest ranked document as the supporting document.