

AnswerFinder – Question Answering by Combining Lexical, Syntactic and Semantic Information

Diego Mollá-Aliod
Mary Gardiner
8 December 2004

Outline

- Question Answering and TREC
- AnswerFinder
- Grammatical Relations
- Flat Logical Form Patterns
- Lessons Learnt and What's Next

TREC QA 2004

- Factoid, lists, definitions
 - 231 factoid questions
 - 62 list questions
 - 66 “other”
- Questions grouped in topics
 - handling of context
- Combined evaluation
 - ½ factoid
 - ¼ list
 - ¼ “other”

Target 2 : “Fred Durst”

Q 2.1 FACTOID:

What is the name of Durst's group

Q 2.2 FACTOID:

What record company is he with?

Q 2.3 LIST:

What are titles of the group's releases?

Q 2.4 FACTOID:

Where was Durst born?

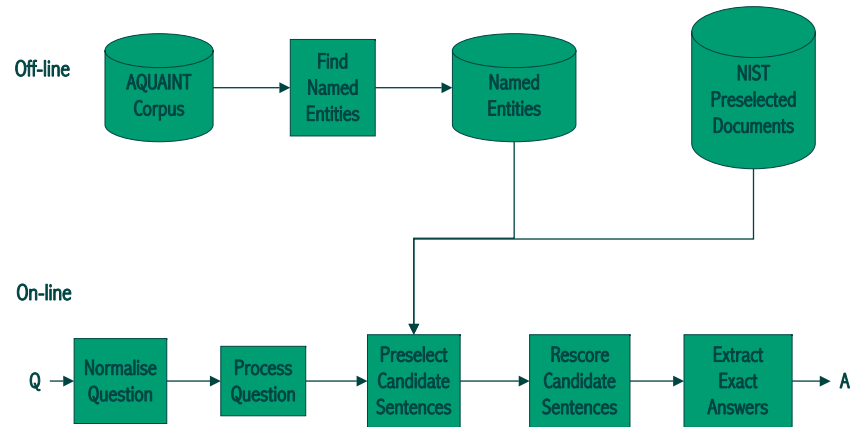
Q 2.5 OTHER:

Other

Outline

- Question Answering and TREC
- AnswerFinder
- Grammatical Relations
- Flat Logical Form Patterns
- Lessons Learnt and What's Next

AnswerFinder



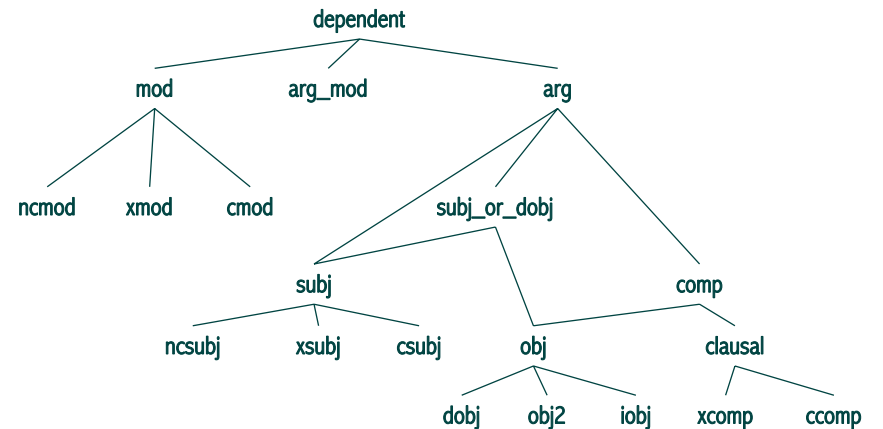
Outline

- Question Answering and TREC
- AnswerFinder
- Grammatical Relations
- Flat Logical Form Patterns
- Lessons Learnt and What's Next

Grammatical Relations

Relation	Description
CONJ(type,head+)	Conjunction
MOD(type,head,dependent)	Modifier
CMOD(type,head,dependent)	Clausal modifier
NCMOD(type,head,dependent)	Non-clausal modifier
DETMOD(type,head,dependent)	Determiner
SUBJ(head,dependent,initial gr)	Subject
OBJ(head,dependent,initial gr)	Object
DOBJ(head,dependent,initial gr)	Direct object
XCOMP(head,dependent)	Clausal complement without an overt subject

Grammatical Relations



Grammatical Relation Overlap – GRO

Q: *How far is it from Mars to Earth?*

(nmod how be far)

(subj be it _)

(nmod from be mars)

(nmod to be earth)

A: *It is 416 million miles from Mars to Earth.*

(subj be it _)

(obj be mile)

(nmod _ million 416)

(nmod _ mile million)

(nmod from be mars)

(nmod to be earth)

Grammatical Relation Overlap – GRO

Q: *How far is it from Mars to Earth?*

(subj be it _)

(xcomp from be mars)

(nmod _ be far)

(nmod _ far how)

(nmod earth from to)

A: *It is 416 million miles from Mars to Earth.*

(nmod earth from to)

(subj be it _)

(nmod from be mars)

(xcomp _ be mile)

(nmod _ million 416)

(nmod _ mile million)

Grammatical Relation Overlap – GRO

Q: *What is the Population of Iceland?*

(subj be what _)

(obj be population _)

(nmod of population iceland)

(detmod _ population the)

A: *Iceland has a population of 270000.*

(subj have iceland _)

(obj have population _)

(detmod _ population a)

(nmod of population 270000)

Outline

- Question Answering and TREC

- AnswerFinder

- Grammatical Relations

- Flat Logical Form Patterns

- Lessons Learnt and What's Next

Flat Logical Forms

- Avoid the use of nested expressions
 - Conjunction of predicates with all variables existentially bounded
 - Reify objects, events, and properties
- Also called minimal logical forms because they encode minimal information for the task of question answering
 - Incremental extensibility

Logical Form Overlap – LFO

Q: *What is the population of Iceland?*

object(iceland, O6, [X6])
object(population, O4, [X1])
object(what, O1, [X1])
prop(of, P5, [X1, X6])

Unification:

O4 = o4 X1 = x4

P5 = p5 X6 = x6

A: *Iceland has a population of 270000*

dep(270000, d6, [x6])
object(population,o4,[x4])
object(iceland,o1,[x1])
evt(have,e2,[x1,x4])
prop(of,p5,[x4,x6])

Flat Logical Form Patterns

What is X of Y?

object(ObjY,VobjY,[VeY]),
object(what,_,[VeWHAT]),
object(ObjX,VobjX,[VeWHAT]),
prop(of,_,[VeWHAT,VeY])

Y has a X of ANSWER

dep(ANSWER,ANSW,[VeANSW]),
prop(of,_,[VeX,VeANSW]),
object(ObjY,VobjY,[VeY]),
evt(have,_,[VeY,VeWHAT]),
object(ObjX,VobjX,[VeWHAT])

QA with FLF Patterns

Q: *What is the population of Iceland?*

dep(ANSWER,ANSW,[VeANSW])
prop(of,_,[VeY,VeANSW])
object(iceland,O6,[X6])
evt(have,_,[X6,X1])
object(population,O4,[VeY])

A: *Iceland has a population of 270000*

dep(270000, d6, [x6])
object(population,o4,[x4])
object(iceland,o1,[x1])
evt(have,e2,[x1,x4])
prop(of,p5,[x4,x6])

Sentence Rescoring

- **3gro+lfo**
3 times the grammatical relation overlap score added to the flat logical form pattern overlap score.
- **lfo**
The flat logical form pattern overlap score.

Exact Answer Extraction

- Use information from the FLF patterns and the named entities
 - Use the score of the sentence an answer candidate is found in
 - Double the score if from an FLF pattern and NE
 - Merge (add up) scores of repeated answers

Outline

- Question Answering and TREC
- AnswerFinder
- Grammatical Relations
- Flat Logical Form Patterns
- Lessons Learnt and What's Next

TREC Evaluation

- Our preliminary evaluation:
 - Correct top-ranking sentence: 20%
 - Correct and exact answer: 5%
- TREC evaluation:
 - Correct and exact answer: 10%
 - List F-score: 0.08
 - “Other” F-score: 0.09

Lessons Learnt

- The development of FLF patterns is time-consuming
 - Difficult for humans to understand logical forms
 - Consider methods to help development of patterns
 - Learning methods
- The similarity measures are still very crude
 - Look at the structure inside GRs and LF terms

To Do

- Refine sentence scoring
 - Assign weights to the FLF terms
 - Use graph-based comparison
- Improve exact answer scoring
 - Development of FLF patterns
 - Machine learning of FLF patterns
- Enhance readability of FLFs
 - Use of graph structures