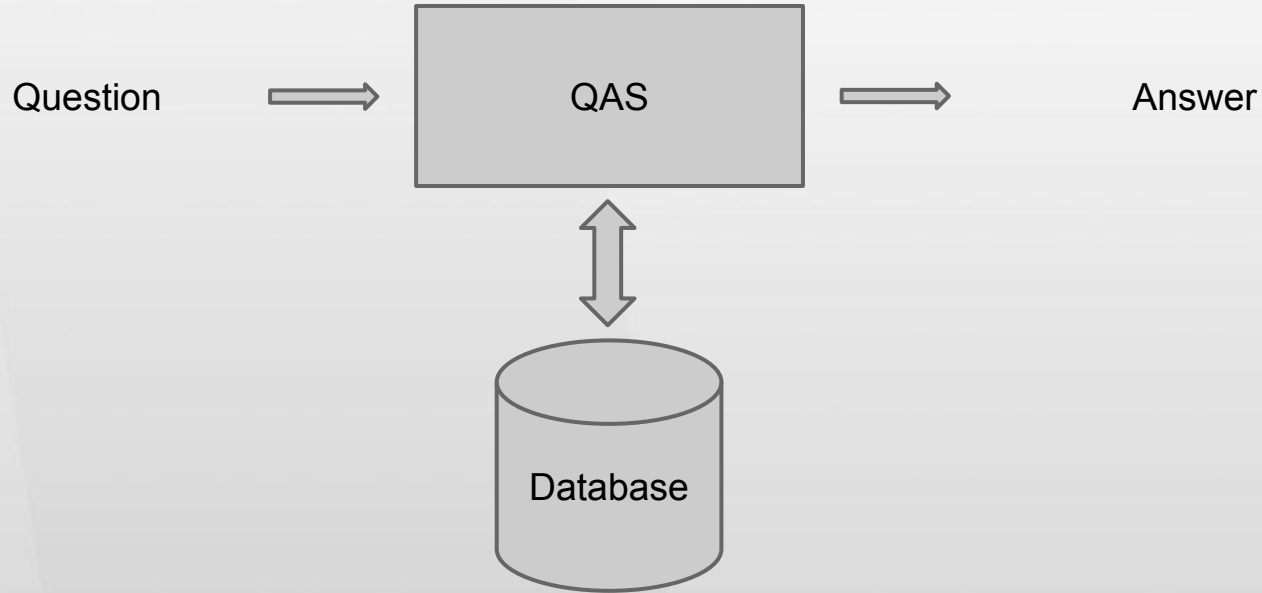# Semantic Parsing with CCGs

Sherzod Hakimov

Outline

- Introduction
- Semantic Parsing
- Learning Algorithm
- Results on QALD-4

Question Answering System

Question ⟹ QAS ⟹ Answer

Database

Semantic Parser

- bottom-up parser (CYK)
- CCG for syntax [1,2]
- λ-calculus for semantics [3]
- probabilistic log-linear model [4]

1. Steedman, M. (1996). *Surface structure and interpretation*

2. Steedman, M. (2000). *The syntactic process* (Vol. 35). Cambridge: MIT press.

3. Barendregt, H. P. (1984). *The lambda calculus* (Vol. 3). Amsterdam: North-Holland

4. Zettlemoyer, L. S., & Collins, M. (2005). *Learning to map sentences to logical form: Structured classification with probabilistic categorial grammars*

CCG - Semantic Parser

Combinatory Categorial Grammar (Steedman, 1996, 2000)

- expressive grammar formalism
- based on combinatory logic
- primitive syntactic types : S (sentence), N (noun), NP (noun phrase)
- complex syntactic types : S/NP

Combinatory rules:

1) *A/B : f   B:g => A : f(g)*

2) *B : f   A\B : g => A: g(f)*

3) *A/B : f   B/C : g => A/C :* $\lambda x.f(g(x))$

ZC-05 - Semantic Parser

Data => Learning Algorithm => Model (chart)

- structured perceptron
- inducing grammar from text-query pairs

Learning Algorithm

here would be the chart for learning algorithm

or

parsing example

Results on QALD-4

Log-linear model includes:

- lexica from training set (200 questions)
- DBpedia Ontology predicates
- DBpedia Ontology categories
- DBpedia Ontology resources

Results on QALD-4

Log-linear model on test set (selected 31 out of 50)

Precision	Recall	F1
1.0	0.06	0.11

Results on QALD-4

Log-linear model on test set (selected 31 out of 50)

Precision	Recall	F1
1.0	0.06	0.11

Log-linear model (19k lexicon) + manually constructed lexica (83 lexicon)

Precision	Recall	F1
0.94	0.51	0.66

Future Work

Test with automatic constructed lexica

Thanks