brmson (YodaQA)

An Open Question Answering Pipeline

Petr Baudiš ⟨pasky@ucw.cz⟩

Ailao, FEE CTU Prague,
brmlab hackerspace

Europen Fall 2015

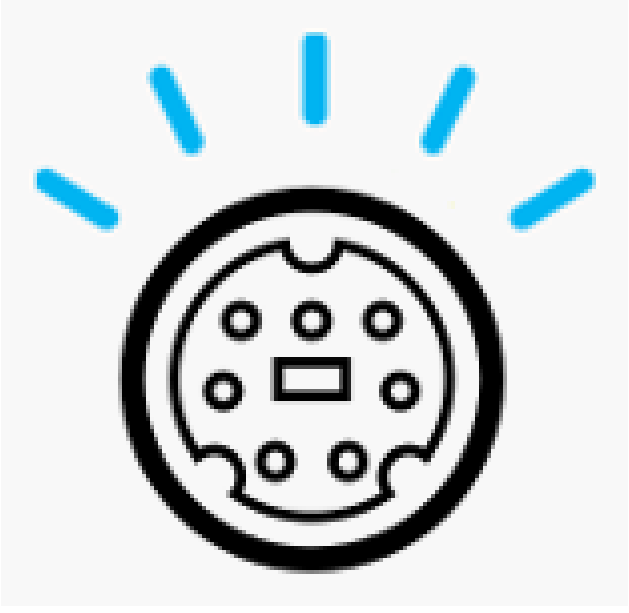
Outline

- Open systems for Artificial Intelligence
- Machine Learning basics
- The power of simple methods

Who here knows IBM Watson?

Won over two human Jeopardy! champions in 2011.
IBM's flagship in "Cognitive Computing".

brmson: Question Answering



A Question Answering system inspired by **IBM Watson**
and its DeepQA pipeline architecture.
A bit Do It Yourself style, but serious effort!

What questions do we look at?

Hi!

What's the time?

Do *you* dream of electric sheep?

Can you make me a program that prints all primes?

Can entropy ever be reversed?

How do you work?

誰があなたを作成しましたか？

What's the highest mountain in the world?

Only knowledge ("trivia", "factoid") questions.

Where to get the answer?

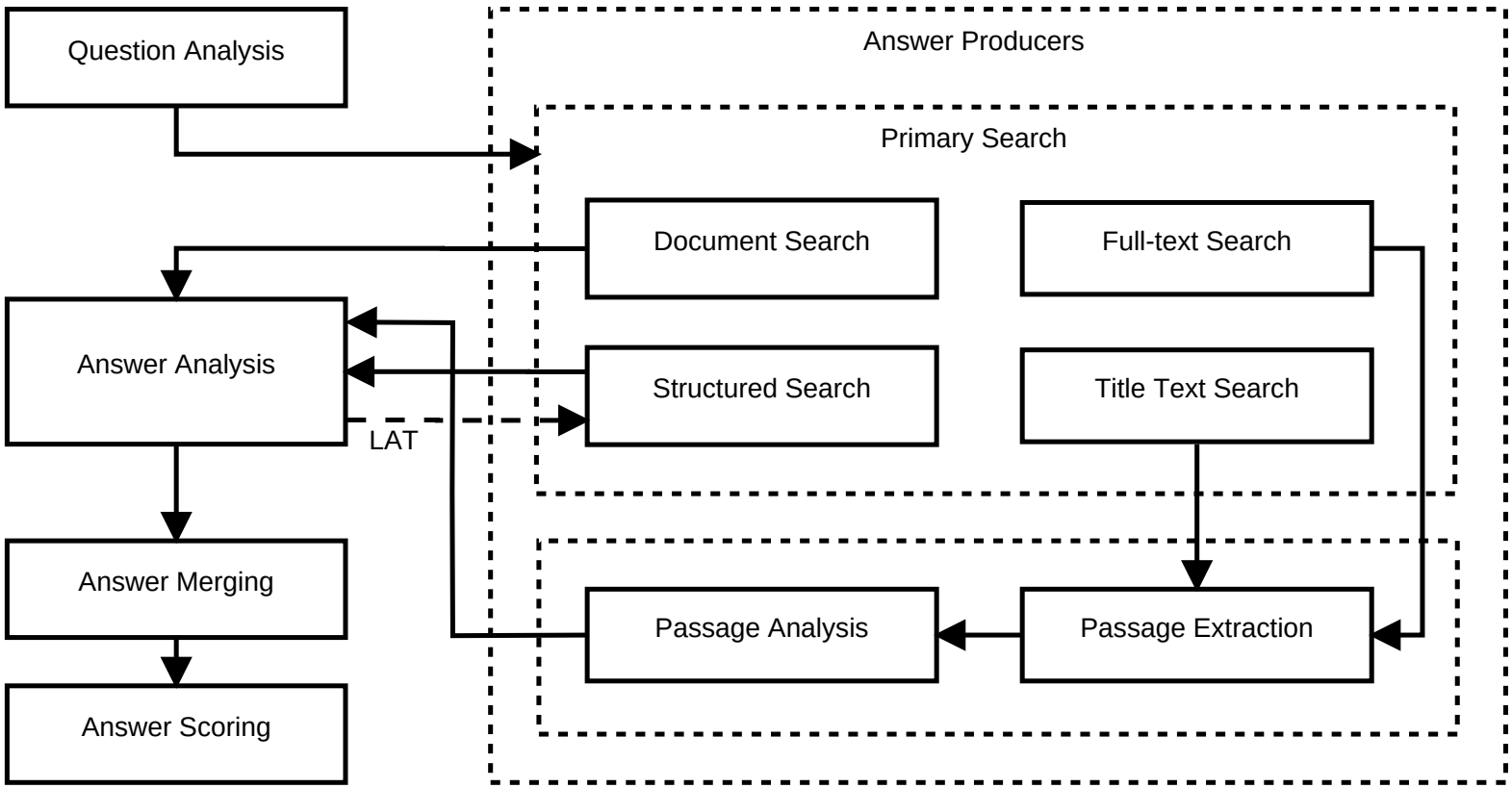
Unstructured knowledge bases (Wikipedia):

- Information Retrieval problem (fulltext search)
- Information Extraction problem
- Type checking

Structured knowledge bases (linked data):

- DBpedia, Freebase
- SPARQL query on RDF store

How Does It Work?



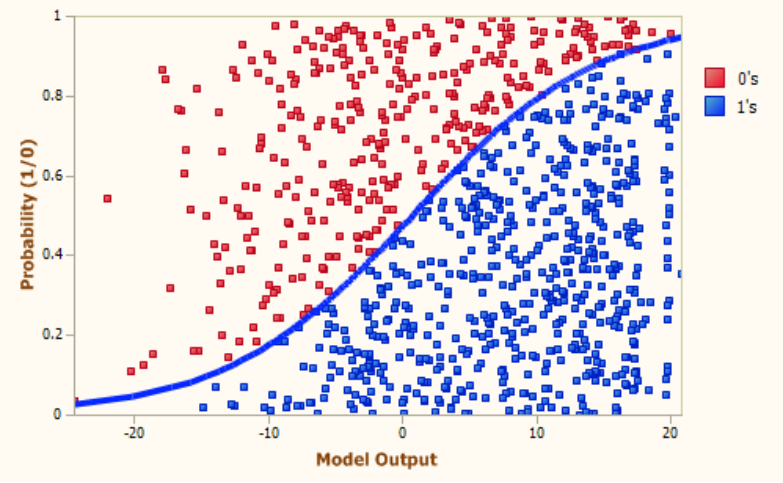
How Does It Work!

- Question is analyzed, clues and lexical answer type extracted
- Fulltext search for clues (we use English Wikipedia)
- *Hundreds* of candidate answers are generated from matching passages, introduction passages and document titles
- Candidate answers are scored based on various features
- Important features: Type coercion
  "Is the answer a color?"
  "Is the answer an inventor, or at least a person?"
- Top scored answer is yielded

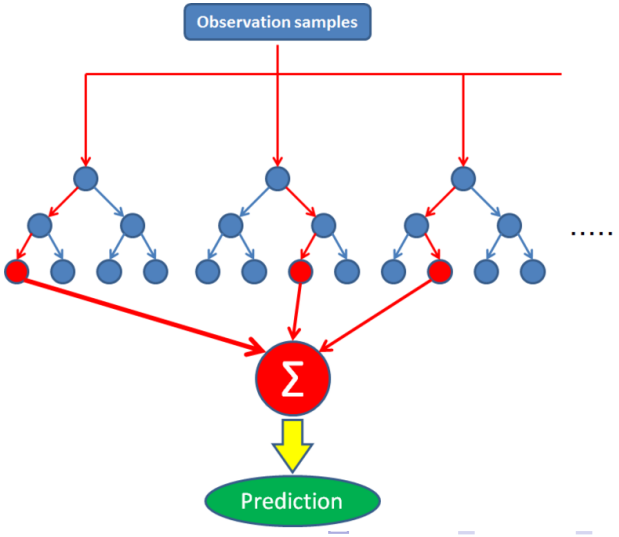
Machine Learning Basics

- Gold standard (training / testing set) — few hundred questions with correct answers
- Each answer is decorated by many features

- Logistic Regression: We look for the right combination of feature weights



- Decision Forest: Many decision trees for specific feature combinations



brmson: YodaQA Implementation

- **YodaQA:** "Yet anOther Deep Answering pipeline"
- Designed and implemented from scratch
- Java, UIMA framework
- Architecture based on simplified IBM DeepQA (as published)
- NLP analysis: Third-party UIMA annotators via DKPro
- **Open Source!** Everything is on `github.com/brmson`, including documentation
- Looking for contributors, collaborators, commercial ideas...

Current State

Current performance (TREC):

32.6% accuracy-at-one

79.3% recall

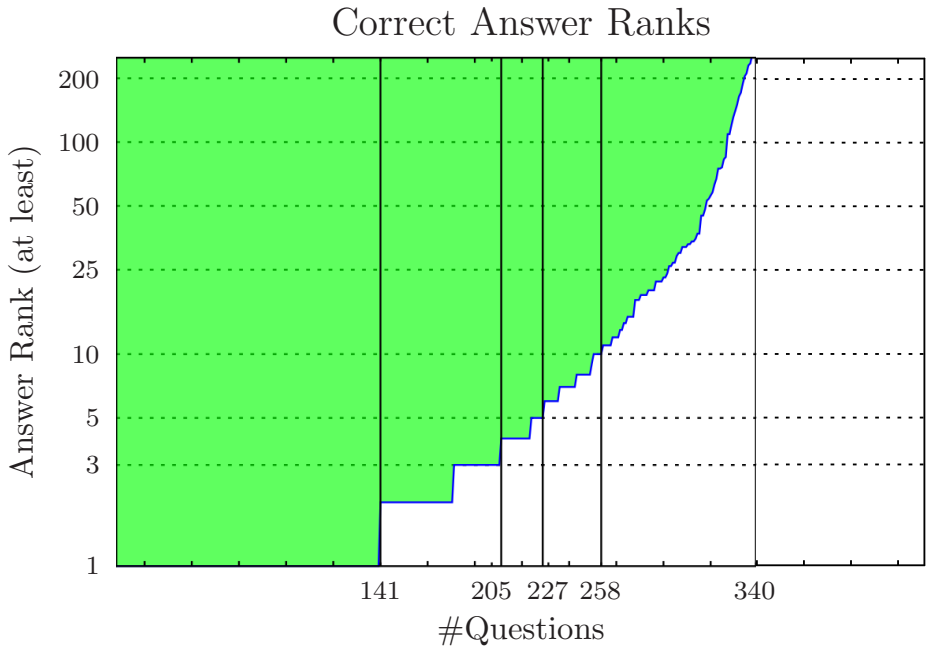
Current performance (Movies):

45% accuracy-at-one

75.5% recall

Work in progress:

Advanced semantic methods,
multi-constraint questions.



Conclusion

- Practical, open source QA system
- Clean architecture, very modular system
- Reasonably documented!
- Long term:
  - Closed domain QA with powerful user interface
  - Bleeding edge NLP research (PhD)
  - Startup aims

pasky@ucw.cz
petr.baudis@gmail.com

Thank you for your attention!