Chapter NLP:I

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Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy

Jeopardy!

- American television quiz show running since the 1960s
- several general knowledge topics (e.g. history, literature, popular culture) at different dollar values
- participants presented with *clues in the form of answers*
- must formulate their *responses in the form of questions*

- between the 1960s and 2011 several returning champions; among others, Rutter and Jennings
- 2011: Rutter and Jennings vs. 200 million pages of content + AI (structured and unstructured, including full 2011 Wikipedia; ca. 4Tb of storage)

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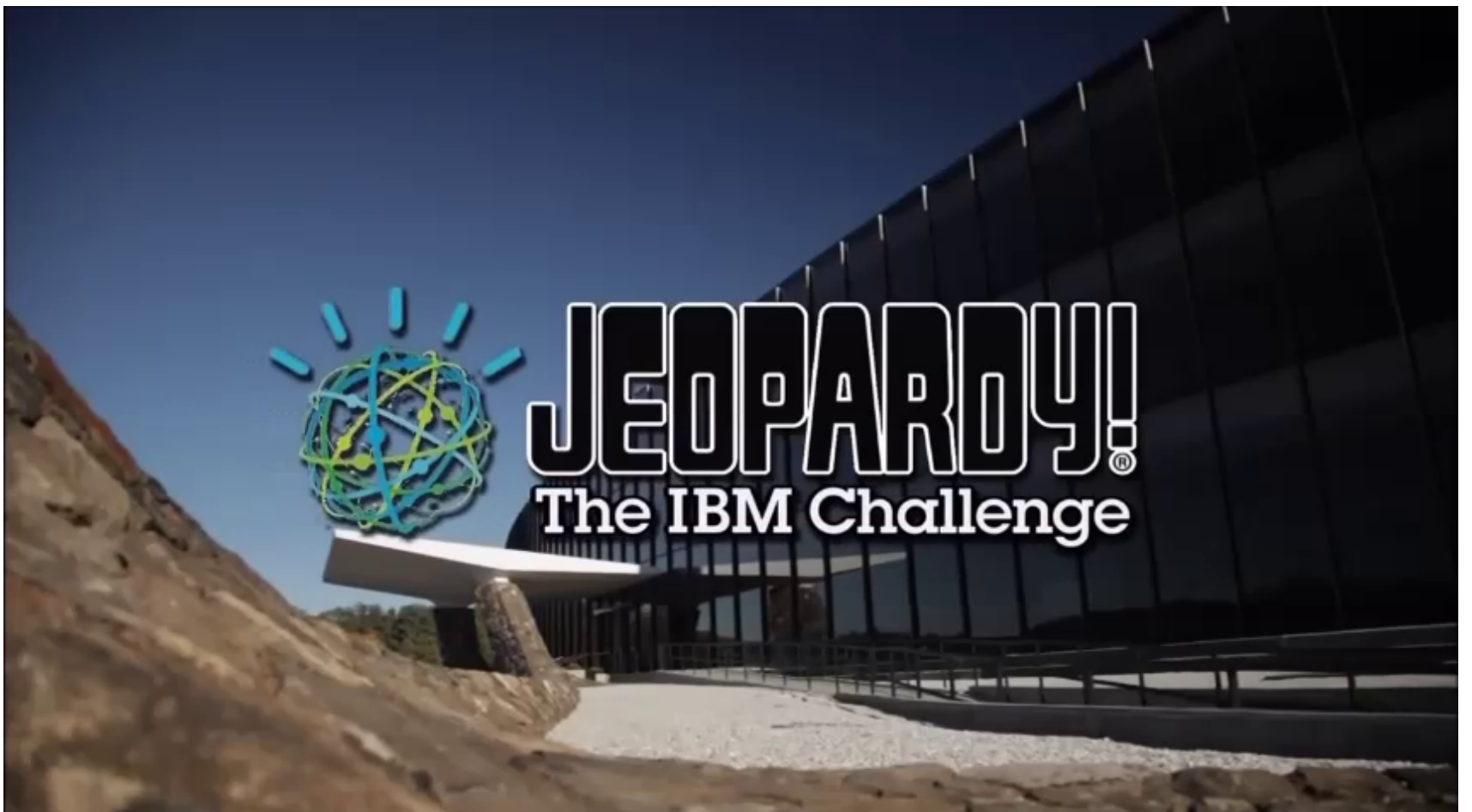
Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)



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Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)

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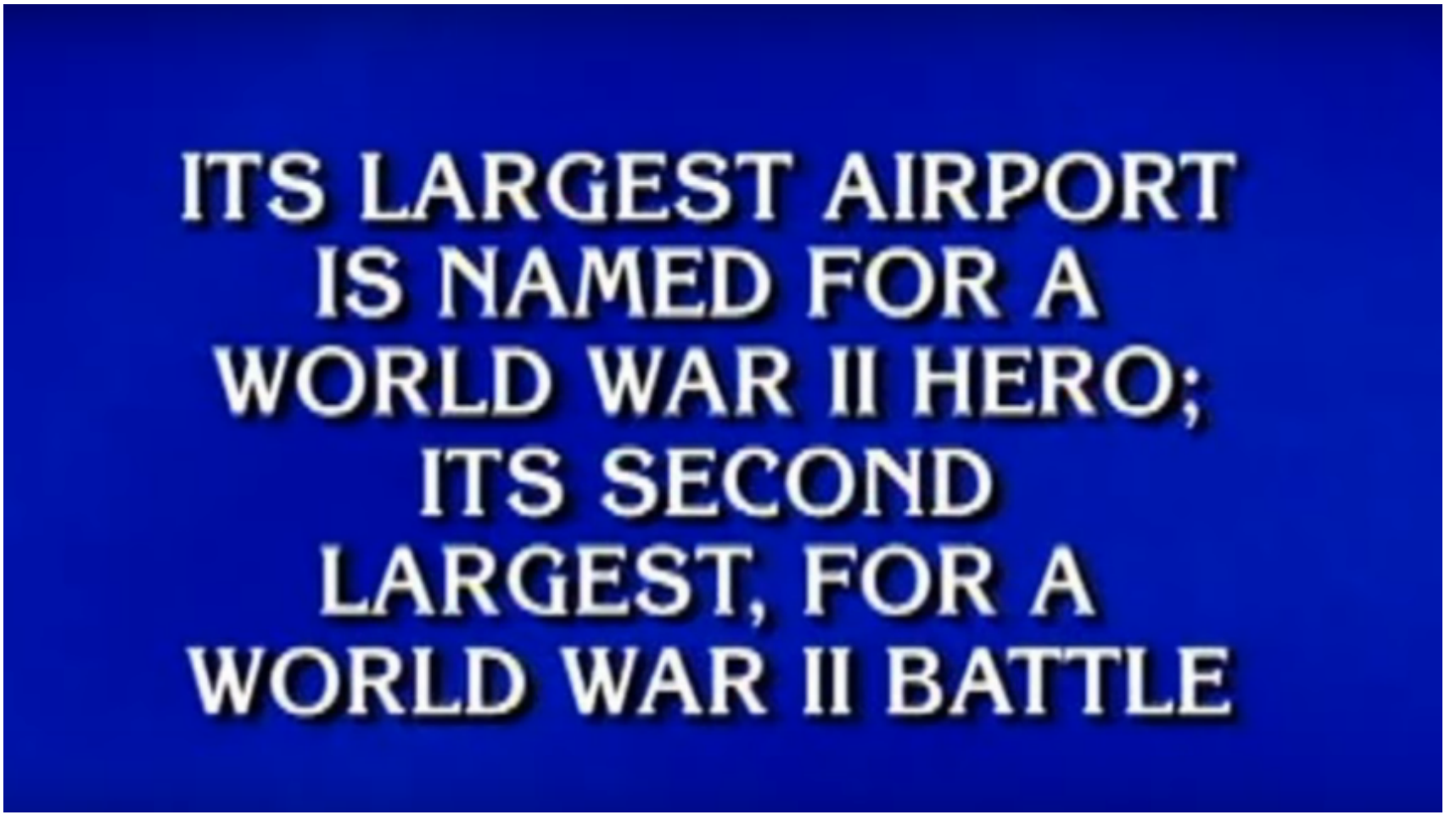

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Examples of NLP Systems

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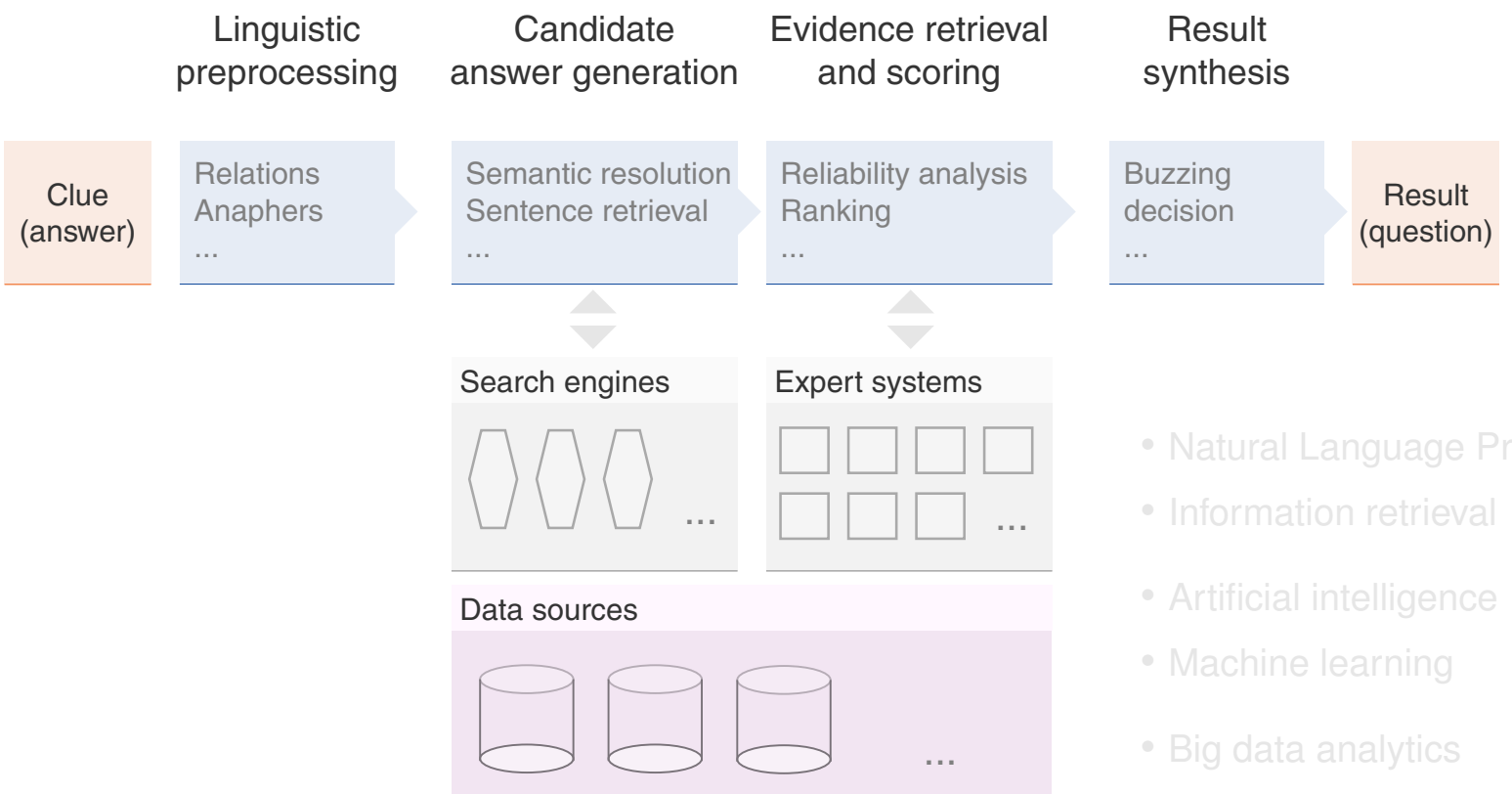

- Natural Language Processing
- Information retrieval
- Artificial intelligence
- Machine learning
- Big data analytics

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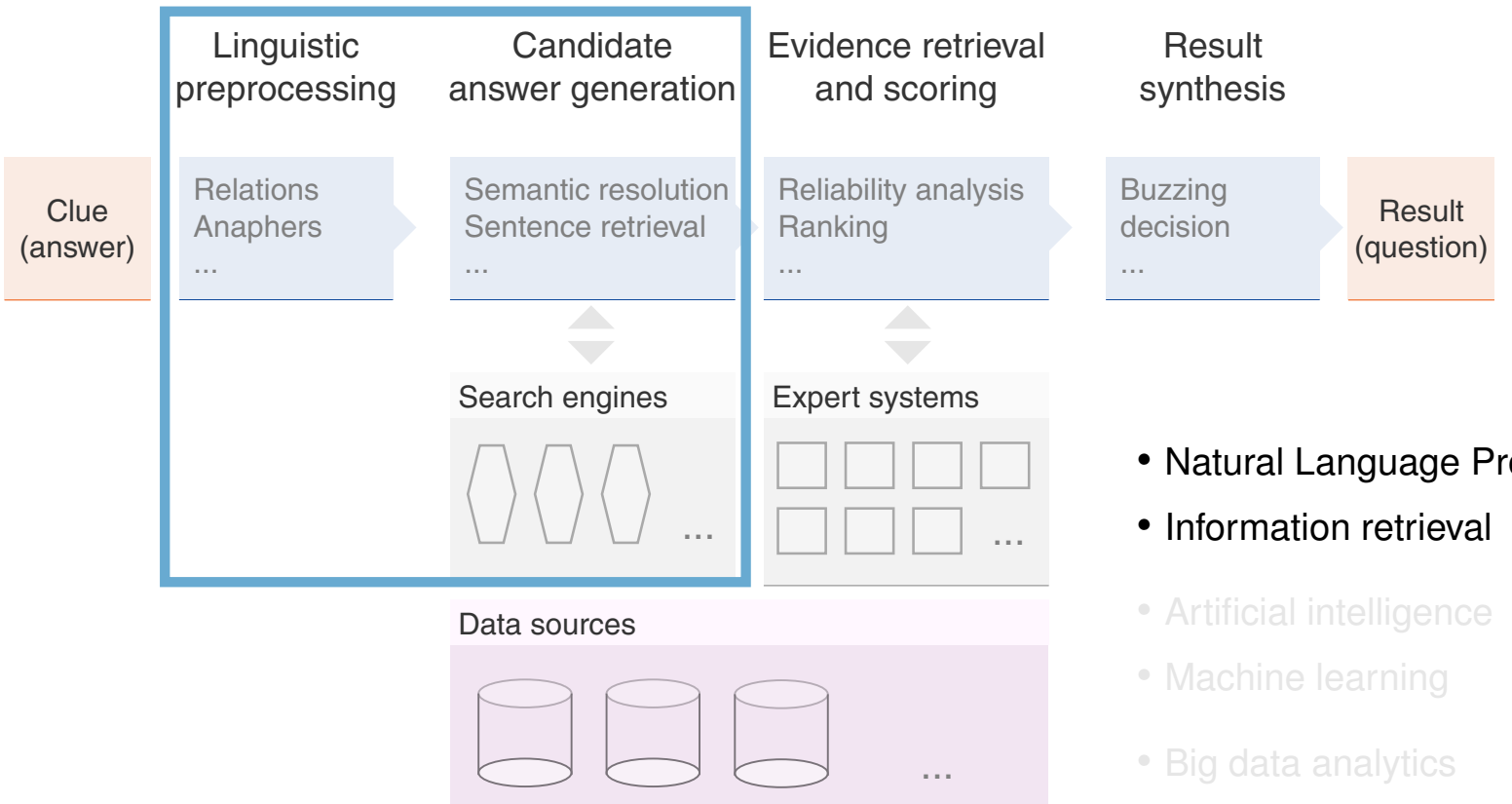

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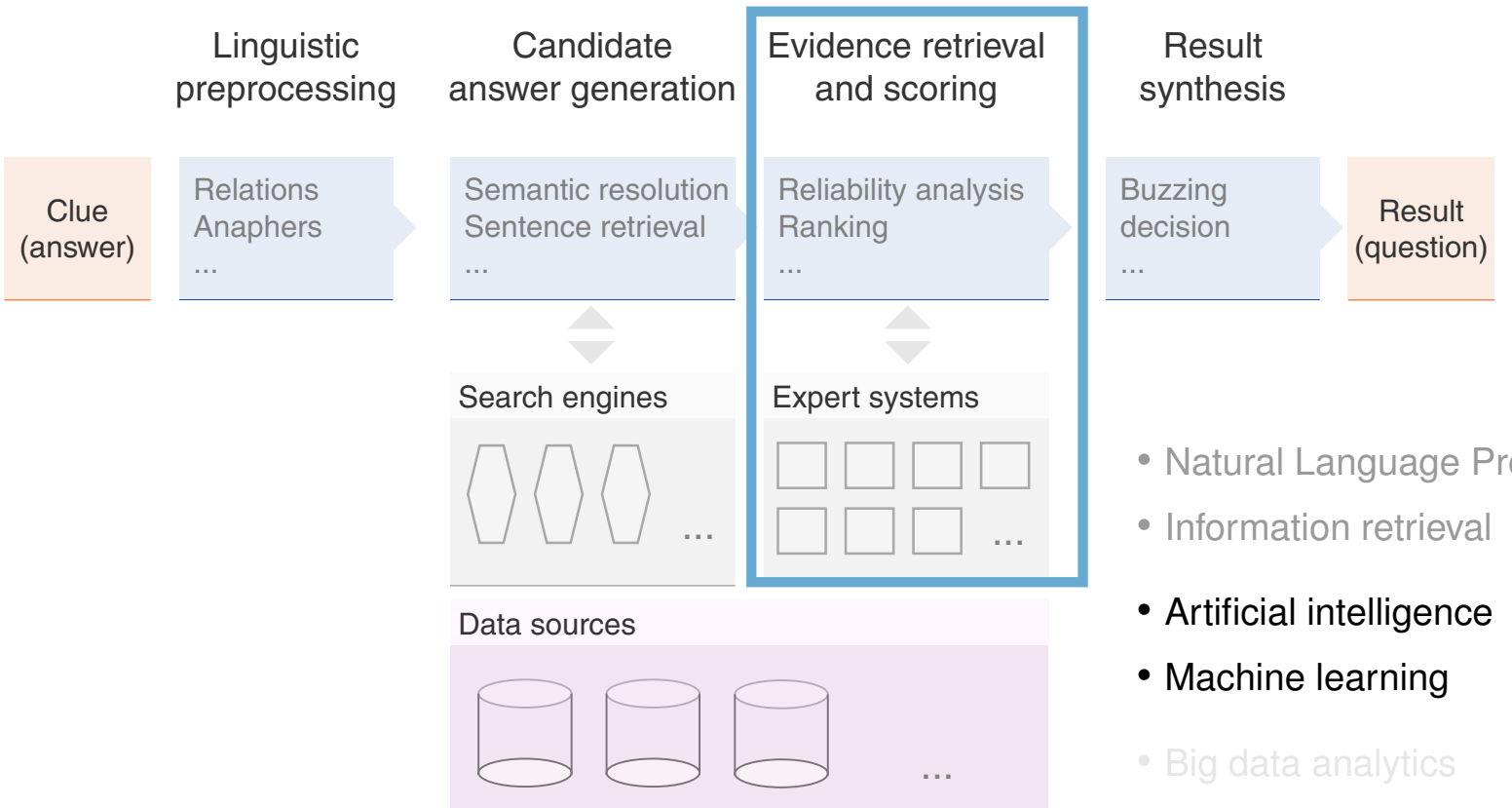

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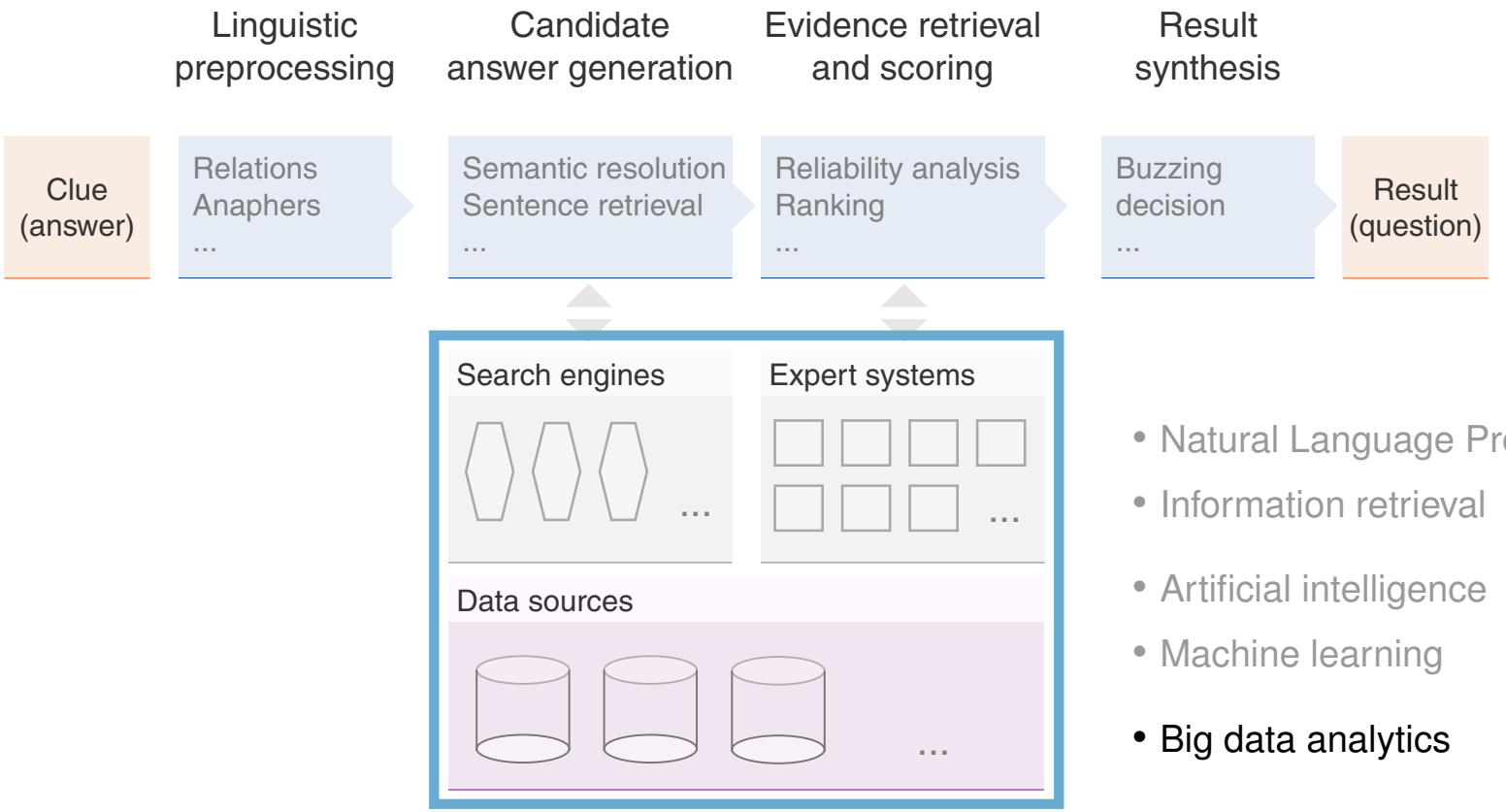

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NLP Problems

Information Extraction (IE)

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NLP Problems

Review Analysis

Attributes: zoom, affordability, size and weight, flash, ease of use

Size and weight:

- ✓ Nice and compact to carry!
- ✓ Since the camera is small and light, I won't need to carry around those heavy, bulky professional cameras either!
- ✗ The camera feels flimsy, is plastic and very light in weight you have to be very delicate in the handling of this camera

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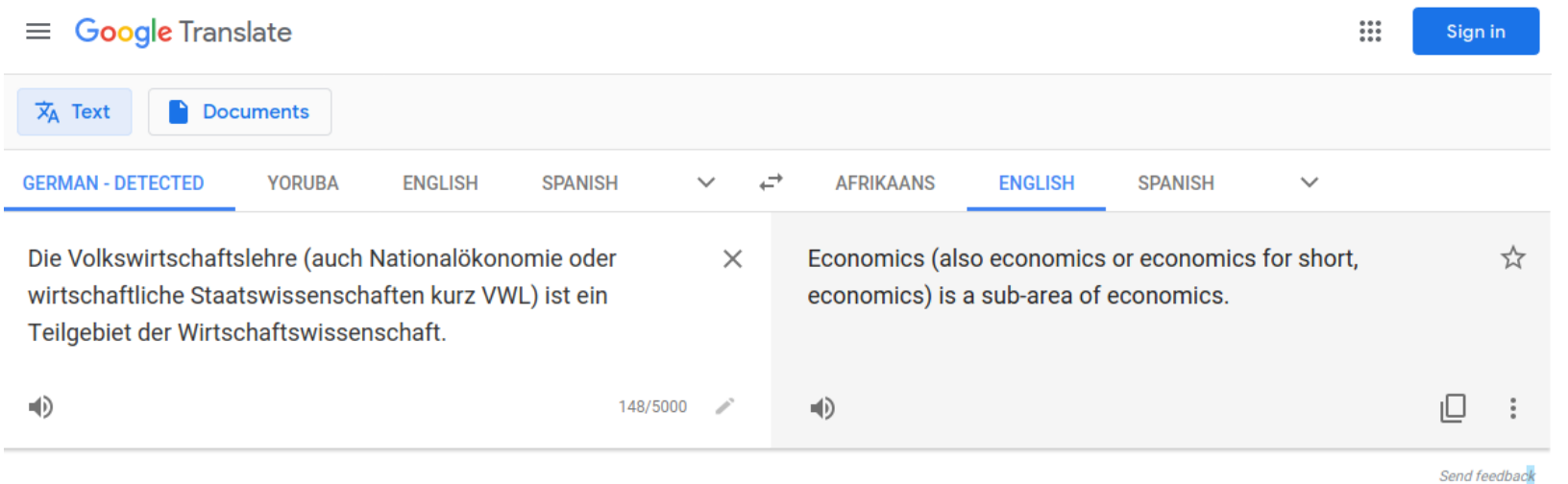
NLP Problems

Machine Translation (MT)



First sentence of the Wikipedia article on “Volkswirtschaftslehre”.

See also twitter.com/hashtag/googletranslatefails

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NLP Problems

State of Affairs: Mostly Solved

- Spam detection.
  Let's go to Agra vs. Buy V1Agra

- Part-of-speech (POS) tagging.
  Colorless/Adjective green/Adjective ideas/Noun sleep/Verb furiously/Adverb.

- Named entity recognition (NER).
  Einstein:Person met with UN:Organization officials in Princeton:Location.

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NLP Problems

State of Affairs: Making Good Progress

- Sentiment detection.
  Best pizza in town. vs. The waiter ignored us for 20 minutes.

- Coreference resolution.
  ?My trophy did not fit into ?the suitcase because it is too big.

- Word sense disambiguation (WSD)
  I need new batteries for my mouse.

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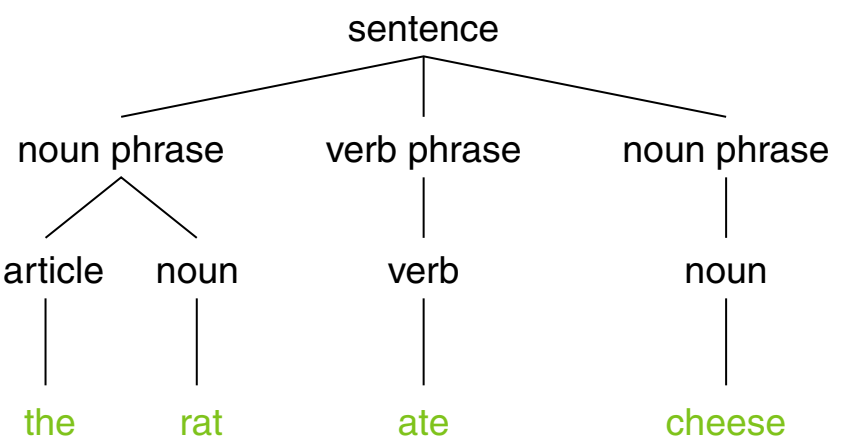
NLP Problems

State of Affairs: Making Good Progress (continued)

- Machine translation.
  Is getting better and better. → Wird immer besser.

- Information extraction.
  Come to our first lecture, April 3. → Calendar update: Lecture (April 3)

- Parsing.
  The rat ate cheese. →



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NLP Problems

State of Affairs: Still Challenging

- Question answering (QA).
  Is ibuprofen effective in reducing fever for patients with acute febrile illness?

- Paraphrasing.
  XYZ acquired ABC yesterday vs. ABC has been taken over by XYZ

- Summarization.
  Dow Jones is up + house prices rose $\rightarrow$ Economy is good

- Dialogue.
  User: Best pizza around?
  Echo/Siri/Now: Antonio's. Want a table tonight?

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Remarks:

- On referring to the field (roughly):
  - Natural Language Processing/Language Engineering: devising methods for processing specific language phenomena (e.g. resolving pronouns); operationalizing formal models of language (e.g. computational formal grammars)
  - Language Technology/Text Technology/Speech Technology: applications of NLP (various sub-areas: MT, Dialogue Systems, etc.)
  - Computational Linguistics: Linguistics/Language science research using computational means

  These terms are (unfortunately) often used interchangeably.

- For an overview of history of NLP see, for example, Karen Sparck Jones (1994) Natural Language Processing: A Historical Review

- Food for thought: 2019 IBM Project Debater held its first public live debate with Harish Natarajan who holds the world record for most debate competitions won; the event can be viewed here. Watch (parts of) the debate and then go back to the schema of Watson's architecture.
  - What kind of functionalities/functional components do you think are required for such a system?
  - Can you decompose the debating task into components, some of which require NLP?

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