

Chapter NLP:I

I. Introduction to Linguistics

- ❑ Examples of NLP Systems
- ❑ Terminology
- ❑ Historical Background
- ❑ NLP Problems

Examples of NLP Systems

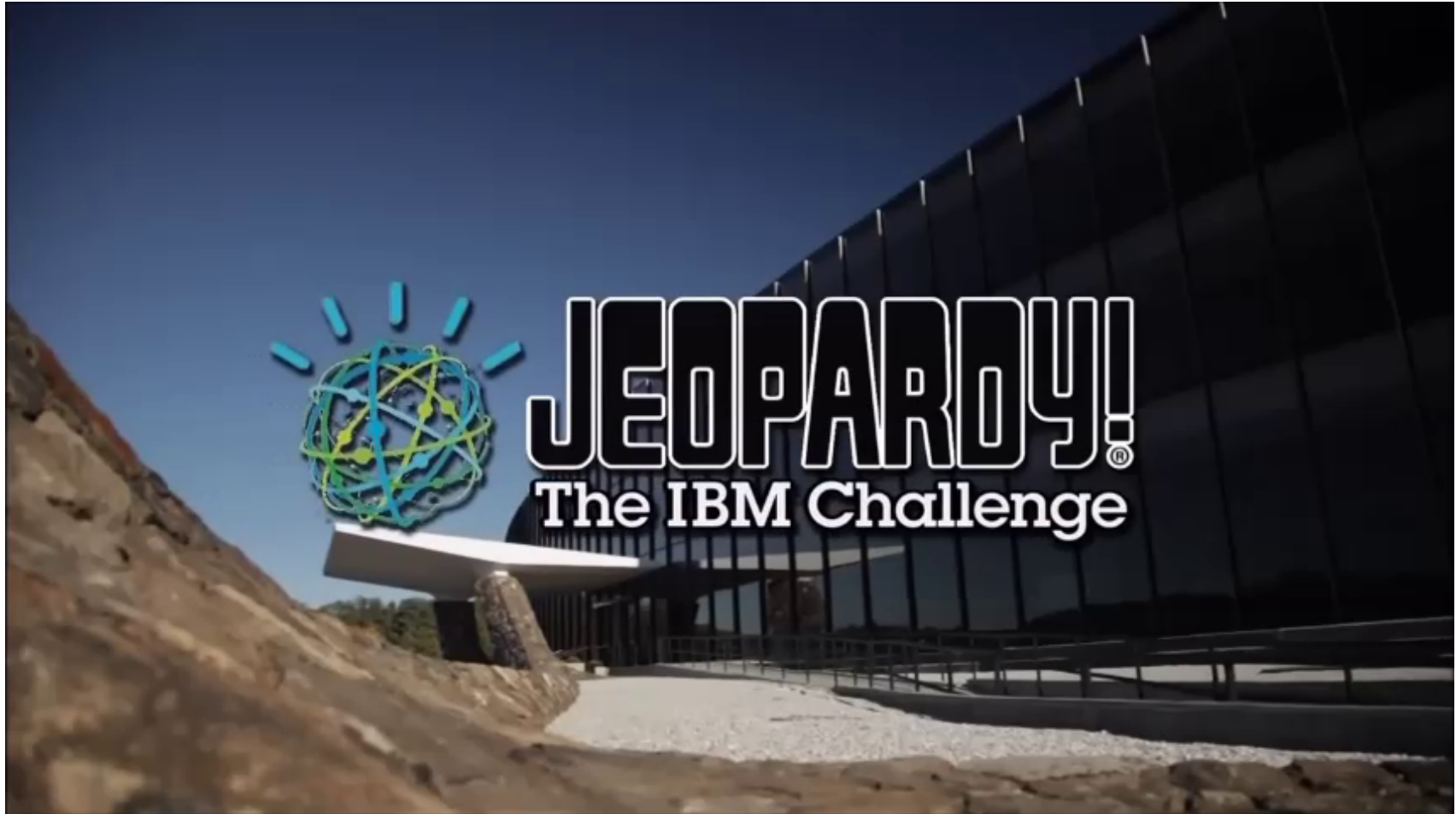
Question Answering: IBM Watson at Jeopardy

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)

Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)



Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy! (continued)



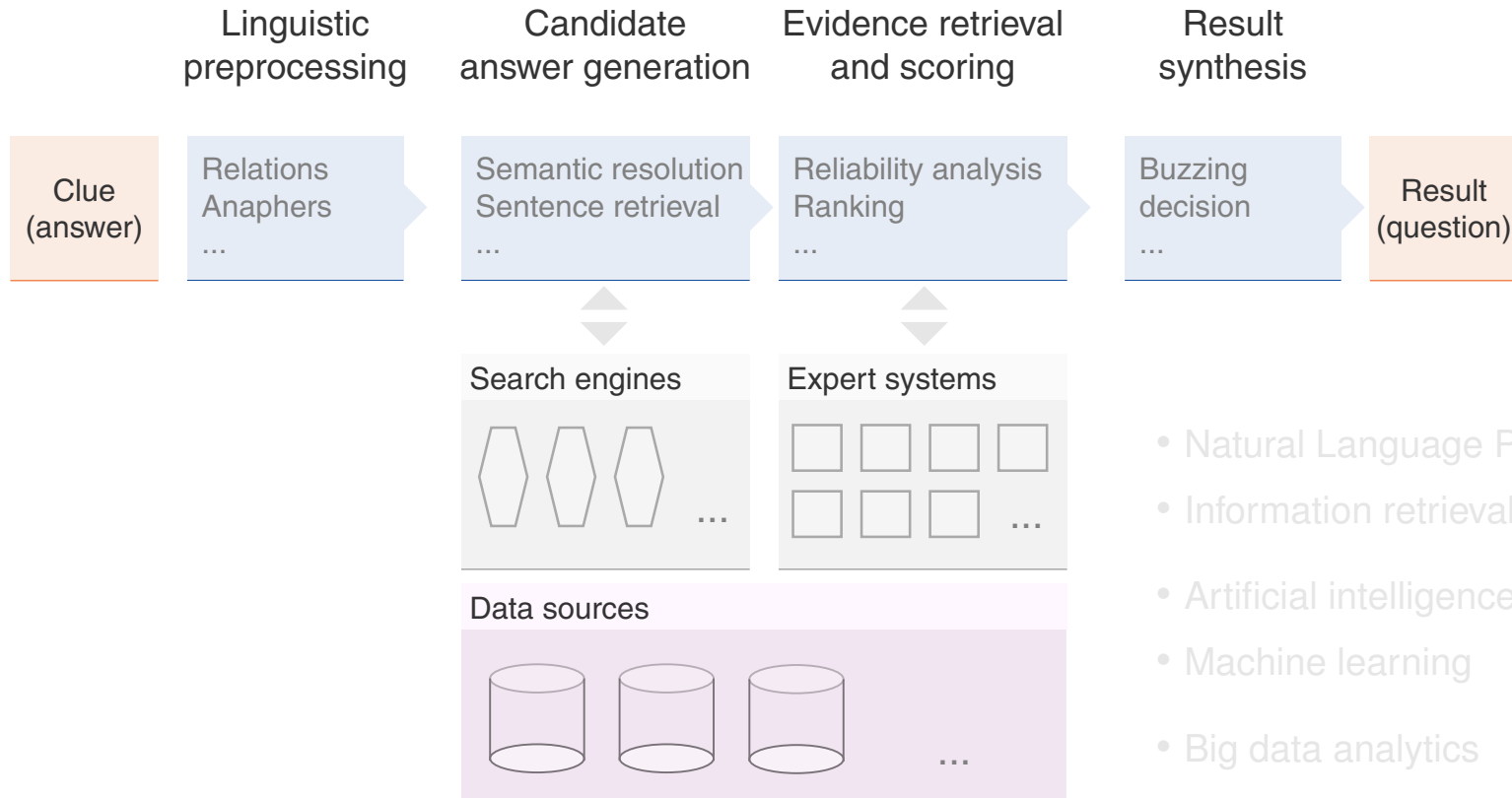
Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)

**ITS LARGEST AIRPORT
IS NAMED FOR A
WORLD WAR II HERO;
ITS SECOND
LARGEST, FOR A
WORLD WAR II BATTLE**

Examples of NLP Systems

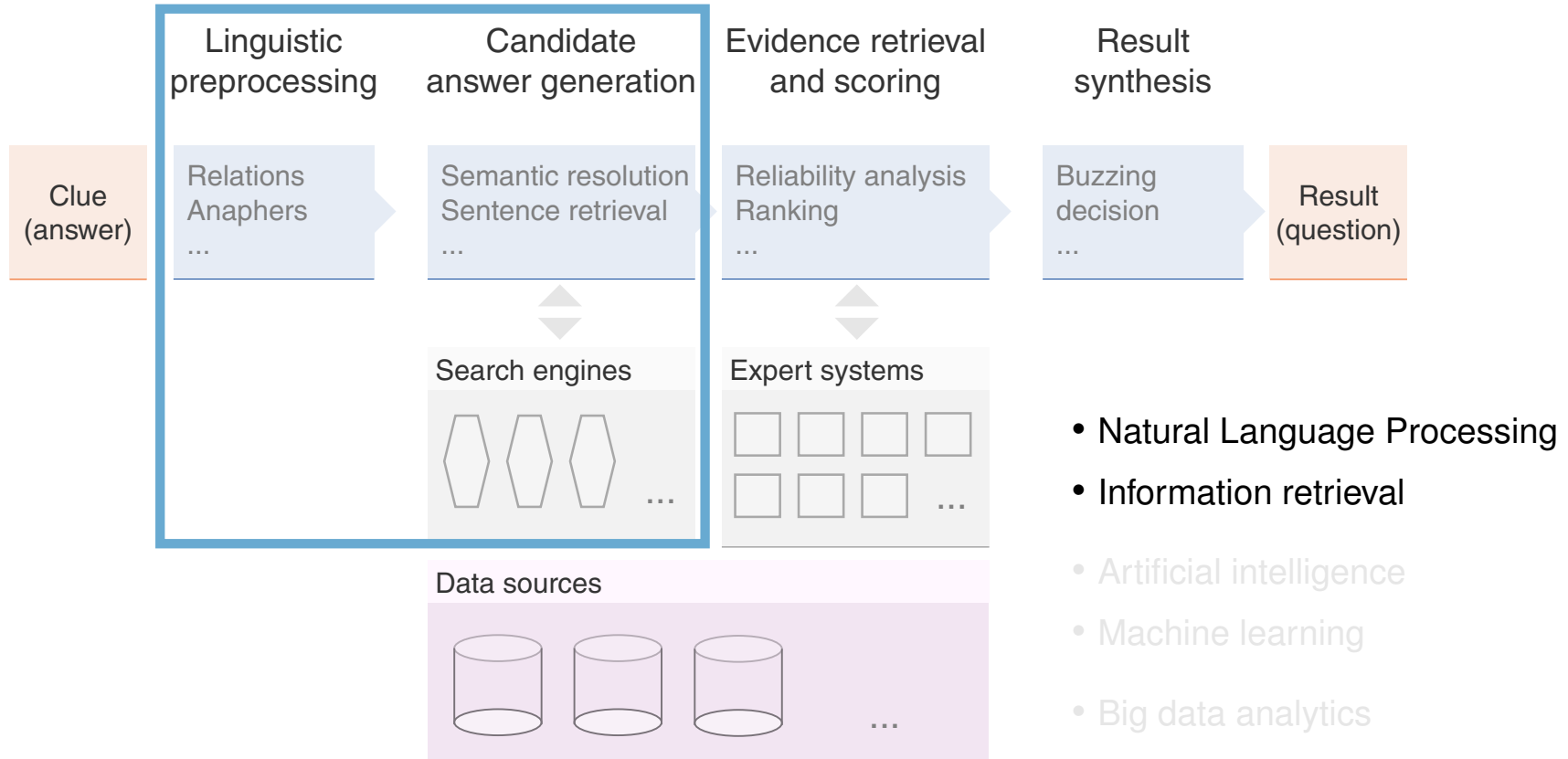
Question Answering: IBM Watson at Jeopardy (continued)



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

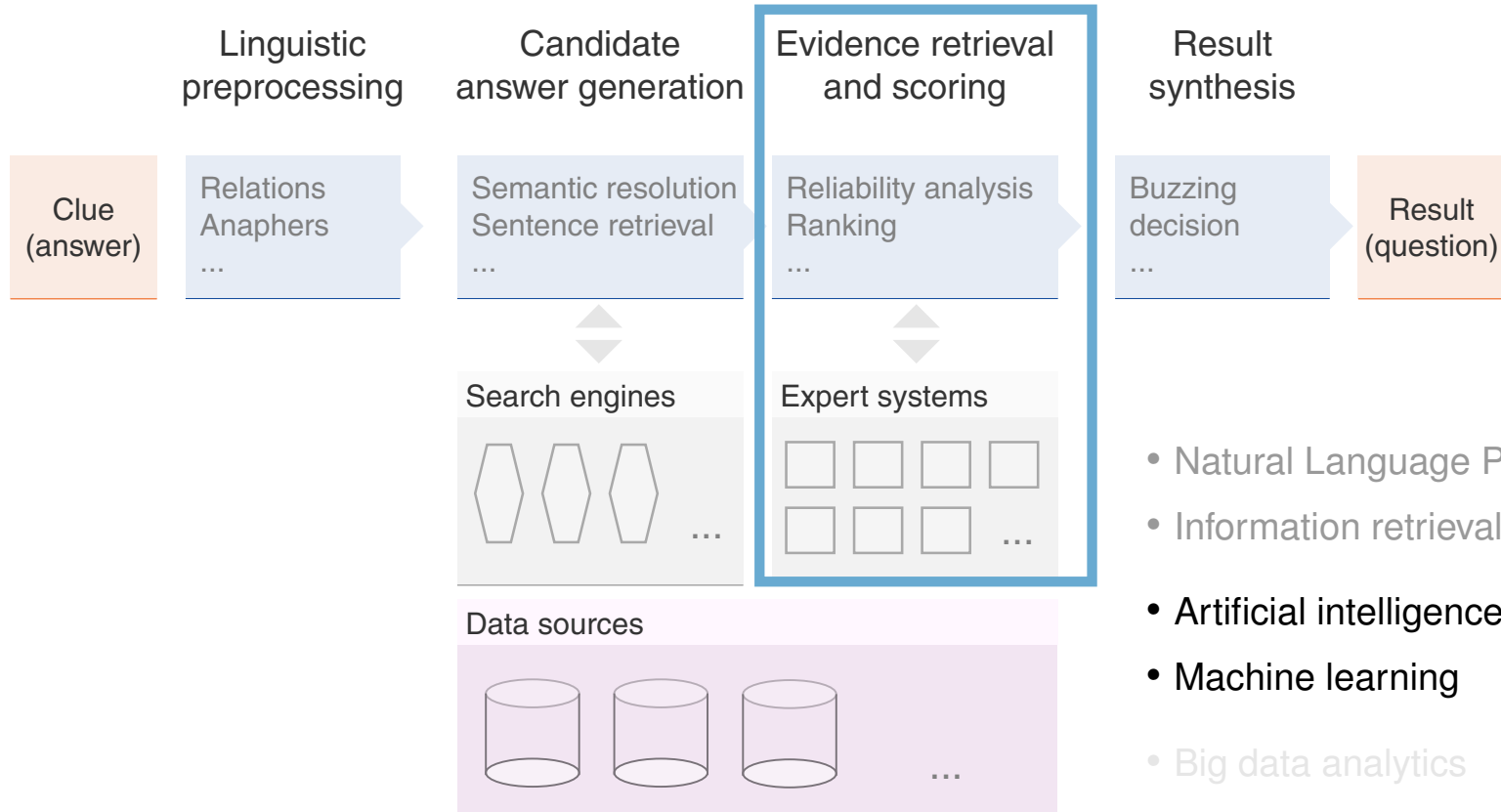
Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)



Examples of NLP Systems

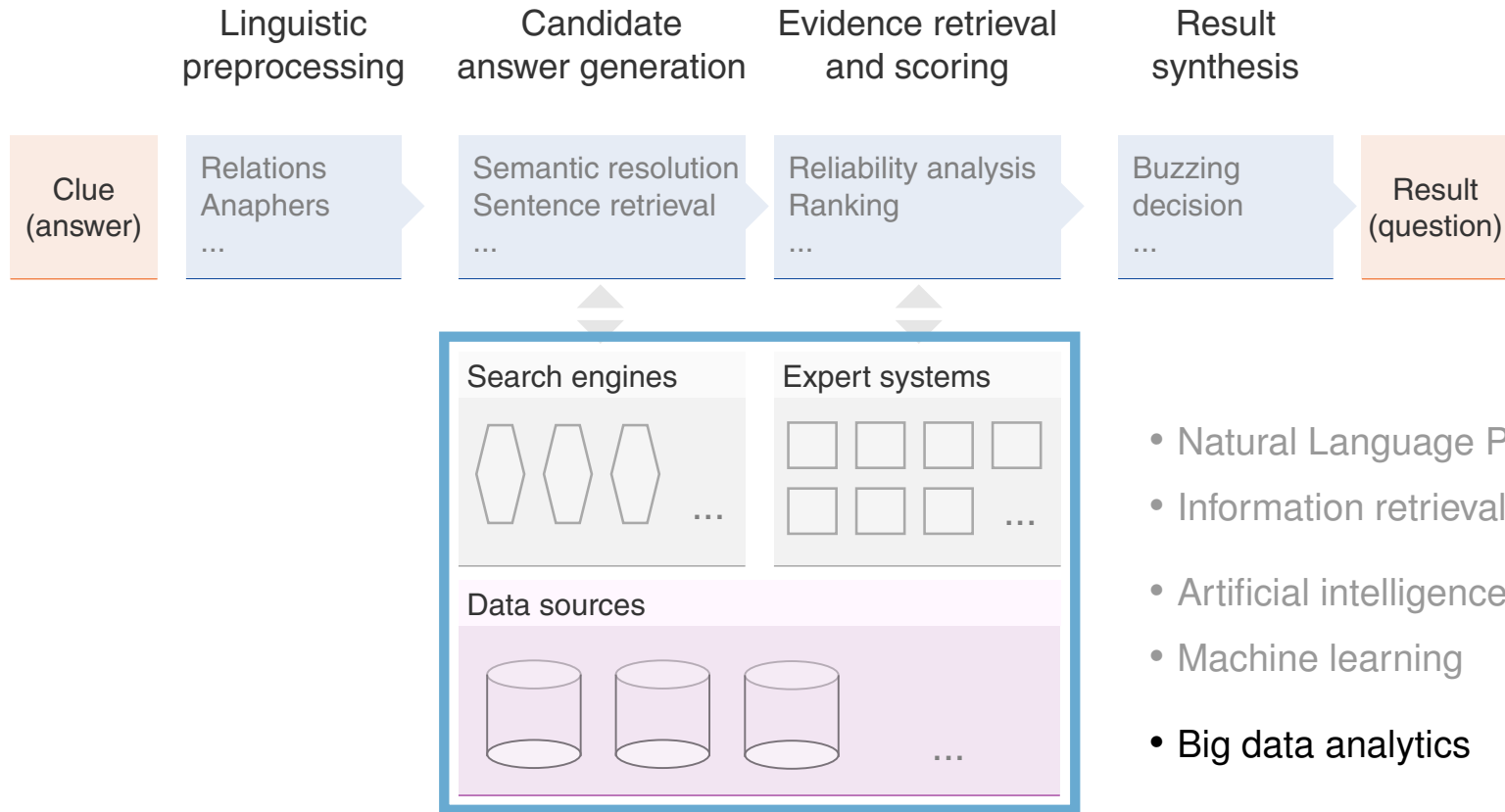
Question Answering: IBM Watson at Jeopardy (continued)



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Examples of NLP Systems

Question Answering: IBM Watson at Jeopardy (continued)



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NLP Problems

Information Extraction (IE)

Subject: curriculum meeting

Date: January 15, 2012

To: Dan Jura

Event: Curriculum mtg

Date: Jan-16-2012

Start: 10:00am

End: 11:30am

Where: Gates 159

Hi Dan, we've now scheduled the curriculum meeting.

It will be in Gates 159 tomorrow from 10:00-11:30.

-Chris

Create new Calendar entry

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

NLP Problems

Machine Translation (MT)

The screenshot shows the Google Translate web interface. At the top, there is a hamburger menu, the Google Translate logo, a grid icon, and a 'Sign in' button. Below the header, there are two tabs: 'Text' (selected) and 'Documents'. The language selection bar shows 'GERMAN - DETECTED' as the source language and 'ENGLISH' as the target language. The source text is: 'Die Volkswirtschaftslehre (auch Nationalökonomie oder wirtschaftliche Staatswissenschaften kurz VWL) ist ein Teilgebiet der Wirtschaftswissenschaft.' The translated text is: 'Economics (also economics or economics for short, economics) is a sub-area of economics.' The interface includes icons for voice input, a character count (148/5000), a copy icon, and a feedback link.

Google Translate

Text Documents

GERMAN - DETECTED YORUBA ENGLISH SPANISH AFRIKAANS **ENGLISH** SPANISH

Die Volkswirtschaftslehre (auch Nationalökonomie oder wirtschaftliche Staatswissenschaften kurz VWL) ist ein Teilgebiet der Wirtschaftswissenschaft.

Economics (also economics or economics for short, economics) is a sub-area of economics.

148/5000

Send feedback

First sentence of the Wikipedia article on “Volkswirtschaftslehre”.

See also twitter.com/hashtag/googletranslatefails

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**.

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**.

NLP Problems

State of Affairs: Making Good Progress (continued)

- ❑ Machine translation.

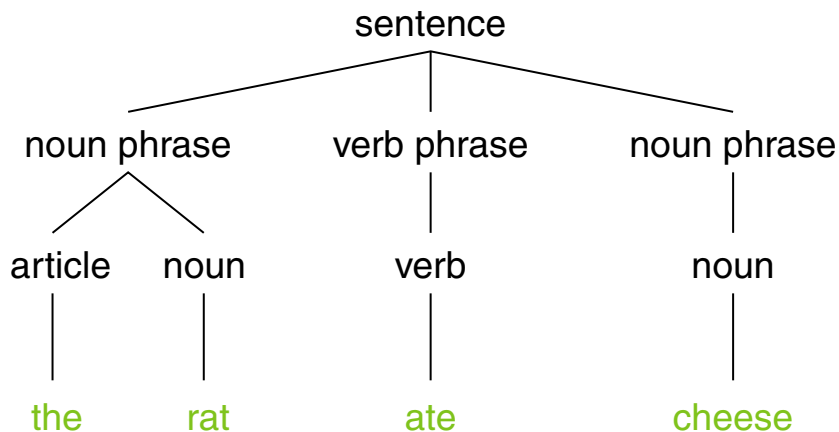
Is getting better and better. → Wird immer besser.

- ❑ Information extraction.

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

- ❑ Parsing.

The rat ate cheese. →



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 → Economy is good

- ❑ Dialogue.

User: Best pizza around?

Echo/Siri/Now: Antonio's. Want a table tonight?

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?