

Dr. Watsonson: The Entailment Machine

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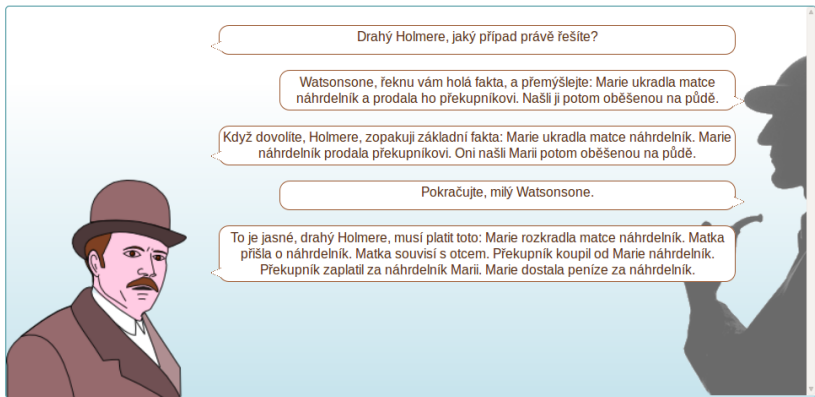
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IB030 Introduction to Computational Linguistics
May 11, 2015

Outline

- 1 Dr. Watsonson: The Entailment Machine
- 2 Paraphrases and Entailments
- 3 The Entailment Machine
- 4 Textual Entailment in NLP

Dr. Watsonson: The Entailment Machine



Dr. Watsonson: The Entailment Machine

Drahý Holmere, jaký případ právě řešíte?

Watsonsoně, řeknu vám holá fakta, a přemýšlejte: Marie ukradla matce náhrdelník a prodala ho překupníkovi. Našli ji potom oběšenou na půdě.

Když Marie sebrala matce náhrdelník. ✓ 😞

Marie střílela překupníku náhrdelník. ✓ 😞

Oni našli potom oběšenou na zemině Marii. ✓ 😞

Žena přišla o šperk. ✓ 😞

Matka ztratila náhrdelník. ✓ 😞

Pokračovat

Dr. Watsonson: The Entailment Machine

- annotation game (GWAP – game with a purpose)
- Sherlock Holmer: human player, dr. Watsonson: computer player
- Sherlock Holmer tells a (criminal) story, dr. Watsonson says what the story *implies*
- Sherlock Holmer *annotates* dr. Watsonson's reasoning

entailment & paraphrases

Paraphrases and Entailments

Textual Entailment

A text t entails a hypothesis h ($t \Rightarrow h$) if humans reading t will infer that h is most likely true. (Dagan et al., 2007)

Paraphrase

Paraphrase s' of sentence s is a mutual textual entailment:
($s \Rightarrow s' \wedge s' \Rightarrow s$)

Paraphrases and Entailments

textual entailment \neq entailment
paraphrase \neq equivalence

- (1) Wonderworks Ltd. constructed the new bridge.
- (2) The new bridge was constructed by Wonderworks Ltd.
- (3) Wonderworks Ltd. is the constructor of the new bridge.

Paraphrases and Entailments: practical aspects

Mary bought a car. Mary purchased a convertible. What is your job? I work as a NLP specialist. The coffee in this café is awful. I didn't like their latte. IBM is an IT company. IBM is an IT enterprise. I bought a car. It was a waste of money. Buying means spending money. Thus, I wasted money for the car.

- plagiarism detection
- more natural chatbots answers
- text aggregation (useful in text summarization, opinion mining etc.)
- better machine translation
- (probably) logical analysis of texts

Paraphrases and Entailments: other aspects

- if someone **understands** something, s/he can **paraphrase** it
- the ability can be tested (reading comprehension tests)

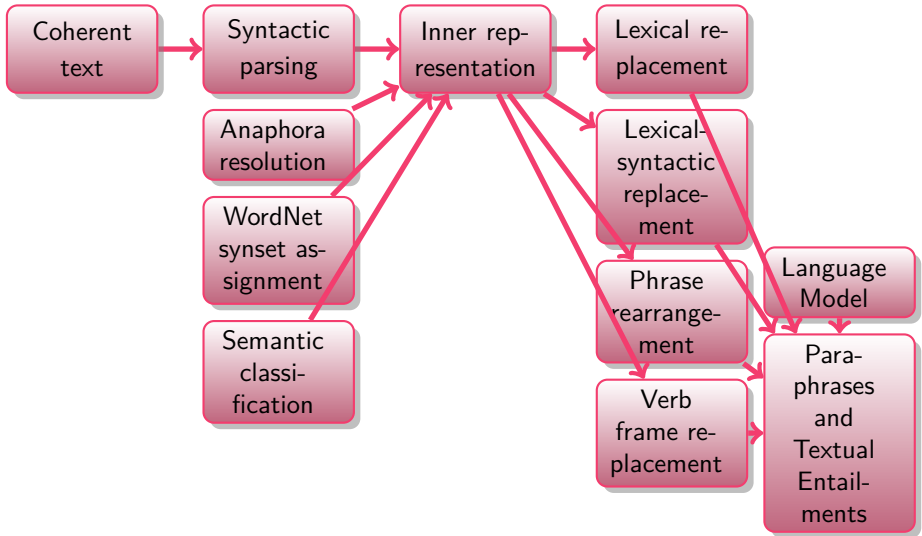
In the 16th century, an age of great marine and terrestrial exploration, Ferdinand Magellan led the first expedition to sail around the world. ...¹

The 16th century was an age of great exploration.

- A. cosmic
- B. land
- C. mental
- D. None of the above

¹<http://www.testprepreview.com/modules/reading1.htm>

The Entailment Machine



The Entailment Machine: Modules

- syntactic parsing: SET
- anaphora resolution: Aara
- semantic classification: Sholva
- inner representation: list of set of phrases
- word order rearrangement
- synonym/hypernym replacement: Czech WordNet
- free associations (X-plain associative network)
- verb frame replacement: VerbaLex
- naturalness scoring: language model
- learning from previous annotations

Textual Entailment State-of-the-art

- generating textual entailment
- recognizing textual entailment

techniques:

- edit distance
- bag of words
- parse tree edit distance
- bootstrapping (replacement patterns)
- logical form (near-)equivalence (theorem prover) ...

Textual Entailment State-of-the-art

- generating textual entailment
- recognizing textual entailment

state-of-the art projects:

- VENSES, Venice Semantic Evaluation System
- BIUTEE, Bar Ilan University Textual Entailment Engine, EXCITEMENT Open Platform
- EDITS, Edit Distance Textual Entailment Suite
- Nutcracker

Textual Entailment Test Data

- PASCAL RTE Evaluation Task, SemEval-2013
- SciEntsBank, the science entailments corpus
- BPI, Boeing-Princeton-ISI Corpus
- Microsoft Research Paraphrase Corpus
- EVALITA, Evaluation of NLP and Speech Tools for Italian
- dr. Watsonson

Conclusion

Try: dr. Watsonson Entailment Machine

<http://nlp.fi.muni.cz/projects/watsonson>

Bhagat, R. and Hovy, E. (2013). What is a paraphrase?
Computational Linguistics, 39(3):463–472.

Dagan, I., Roth, D., and Zanzotto, F. M. (2007). Tutorial notes.
In *45th Annual Meeting of the Association of Computational Linguistics*, Prague, Czech Republic. The Association of Computational Linguistics.

and names, ...
but I think both approaches ...
We can only see a short distance ahead, but we can see plenty
to be done.
Alan Turing