Computational Argumentation — Part IV

Applications of Computational Argumentation

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Outline

I. Introduction to computational argumentation
II. Basics of natural language processing
III. Basics of argumentation
IV. Applications of computational argumentation
V. Resources for computational argumentation
VI. Mining of argumentative units
VII. Mining of supporting and objecting units
VIII. Mining of argumentative structure
IX. Assessment of the structure of argumentation
X. Assessment of the reasoning of argumentation
XI. Assessment of the quality of argumentation
XII. Generation of argumentation
XIII. Development of an argument search engine
XIV. Conclusion

- Introduction
- Argument search
- Intelligent personal assistants
- Writing support
- Conclusion

Learning goals

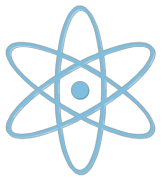
- **Concepts**
  - Get an overview of applications of computational argumentation.

https://commons.wikimedia.org

- **Methods**
  - Get an idea of what works well and what not.
  - See ”tricks“ that can be done in practice.

https://pixabay.com

- **Associated research fields**
  - Computational linguistics
  - Information retrieval



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- **Within this course**
  - Understand what can be done with computational argumentation.

Introduction

Applications of computational argumentation (recap)

Argument search
(Wachsmuth et al., 2017e)

Intelligent personal assistants
(Rinott et al., 2015)

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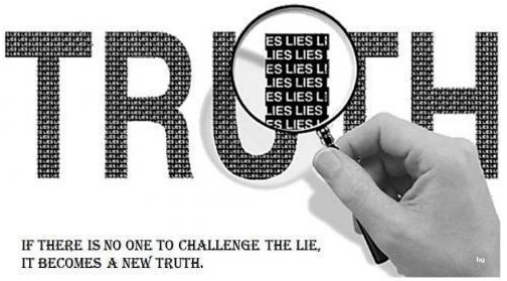
Fact checking
(Samadi et al., 2016)



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Argument summarization
(Wang and Ling, 2016)

https://maxpixel.net

Automated decision making
(Bench-Capon et al., 2009)

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Writing support
(Stab, 2017)

https://www.publicdomainpictures.net

Argument search

Argument search in academia and industry

- **args.me** (Bauhaus-Universität Weimar, Paderborn University)
  - Pro and con arguments on arbitrary issues.
  - Indexes *arguments*, and retrieves relevant arguments in response to queries.

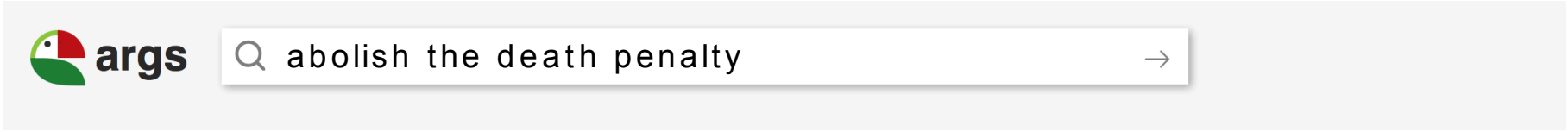
- **ArgumenText** (TU Darmstadt)
  - Pro and con arguments on arbitrary issues.
  - Indexes *web pages*, and mines relevant arguments in response to queries.

- **Bing Multi-Perspective Answers** (Microsoft)
  - A pro and a con perspective on selected issues.
  - So far, included in US version only, see example here:

blogs.bing.com/search-quality-insights/february-2018/Toward-a-More-Intelligent-Search-Bing-Multi-Perspective-Answers

- **Project Debater** (IBM)
  - Actually, a system that debates humans (see below).
  - Main tasks very similar to argument search.

Example: args.me



Page 1 of 639 arguments, 326 pro, 313 con (retrieved in 0.4s)

Pro

#1 No execution of the innocent
http://www.bbc.co.uk (81 other sources...)
As long as human justice remains fallible, the risk of executing the innocent can never be eliminated.

#2 Everyone has a right to live
http://www.amnesty.org (102 other sources...)
Everyone has an inalienable human right to live, even those who commit murder.

#3 Death penalty fails to deter
http://www.procon.org (24 other sources...)
There is no scientific proof that executions have a greater deterrent effect than life imprisonment.

Con

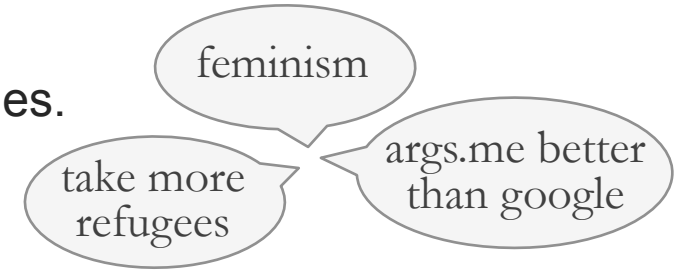
#1 Retribution
http://www.bbc.co.uk (36 other sources...)
Real justice requires people to suffer for their wrongdoing in a way adequate for the crime.

#2 Death penalty deters
http://www.debate.org (15 other sources...)
By executing convicted murderers, would-be murderers are deterred from killing people.

#3 Prevention of re-offending
http://www.bbc.co.uk (25 other sources...)
Those executed cannot commit further crimes. Imprisonment does not protect sufficiently.

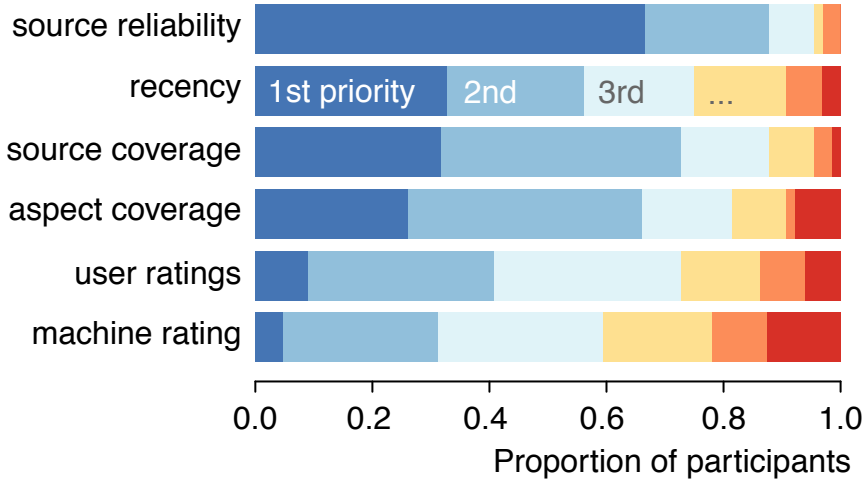
Our vision of argument search

- **Argument search should...**
  - Support forming opinions on controversial issues.
  - Make it easy to find relevant arguments.
  - Not be biased towards either stance.



- **Search results should...**
  - Rank the *best* arguments highest.
  - Cover various reliable sources.
  - Cover diverse aspects.
  - Be as recent as possible.

  ... and much more



- **Our argument search engine...**
  - Is improvable on all these criteria.
  - Currently indexes 300k debate portal arguments.
  - Defines a framework to work towards the vision.

args.me

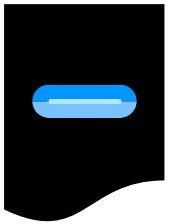
Demo: args.me

https://args.me

Intelligent personal assistants

Example: Project Debater

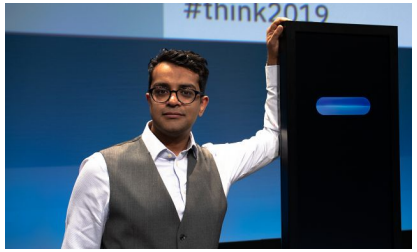
- **Project Debater**
  - A system that can debate humans on arbitrary issues.
  - The ultimate goal is to support better and more informed decisions.
  - Recently showcased on *intelligence²* against a top human debater.



- **Intelligence² debates**
  - Famous TV show where two parties debate against each other.
  - Three stages. Opening (~4 minutes each), rebuttal (4 min.), closing (2 min.).
  - Goal. Change stance of audience (which votes before and afterwards).
    Additional question in the given debate: Who better enriched your knowledge?

https://en.wikipedia.org

- **Showcase** https://www.research.ibm.com/artificial-intelligence/project-debater/live/
  - Issue. ”We should subsidize preschool“.
    Issue was chosen from curated list, but not trained on.
  - Stances. Project Debater is pro, Harish Natarajan is con.
  - Background. Parties are given 15 minutes for preparation.



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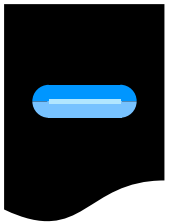
Project Debater showcase: Opening

- **Opening Project Debater**
  - Minutes 11:25 – 15:03 (intro starts at 10:50).
  - Observations?
    Discussed in the course only.

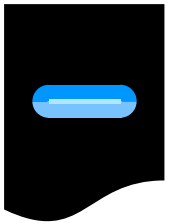


- **What is done (during preparation)**
  - Input. ~10B preprocessed, indexed sentences from newspapers and journals.
  - Retrieves a few hundred relevant text segments, removes redundancy.
  - Selects the strongest segments classified as pro/con claims and evidence.
  - Arranges them by clustered themes to create a narrative.
  - Phrases full text on this basis, converts to speech.
  - Output. A four-minutes speech.

- **Opening Harish Natarajan**
  - Minutes 15:42 – 19:50 (intro starts at 15:28).
  - Observations?
    Discussed in the course only.

Project Debater showcase: Rebuttal

- **Rebuttal Project Debater**
  - Minutes 24:36 – 28:40 (intro starts at 24:22).
  - Observations?
    Discussed in the course only.



- **What is done (during break)**
  - Input. Opening speech of Harish Nataranjan (and own speech).
  - Speech regcognition to transcribe speech to text.
  - Preprocess text in several standard NLP analyses.
  - Mine claims and key concepts from text.
  - Construct rebuttal (similar to opening steps).
  - Output. A four-minutes speech.

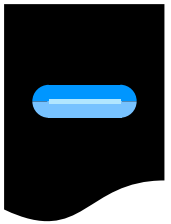
- **Rebuttal Harish Natarajan**
  - Minutes 28:58 – 33:14 (intro starts at 28:48).
  - Observations?
    Discussed in the course only.

https://flickr.com

Project Debater showcase: Closing and results

- **Closing Project Debater**
  - Minutes 37:44 – 39:35 (intro starts at 37:29).
  - Observations?

    Discussed in the course only.



- **Closing Harish Natarajan**
  - Minutes 39:52 – 42:17 (intro starts at 39:43).
  - Observations?

    Discussed in the course only.

https://flickr.com

- **Results**
  - Minutes 52:48 – 54:36.
  - Before the debate. 79% pro, 13% con, 8% undecided.
  - After the debate. 62% pro, 30% con, 8% undecided.

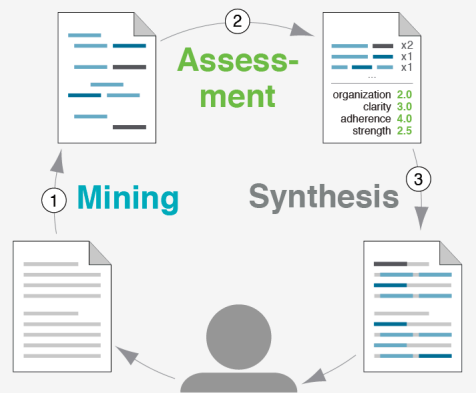
    Knowledge enrichment. ~60% Project Debater, ~20% Harish Nataranjan, ~20% undecided.

Writing support

Writing support in academia and industry

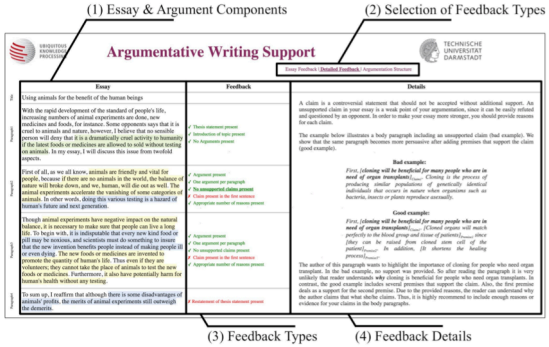
- **Argumentation-related essay scoring** (Wachsmuth et al., 2016)
  - Mine argumentative structure of persuasive essay.
  - Assess four argumentation quality dimensions based on the structure (such as organization).

  Demo found at: https://demo.webis.de/essay-scoring



- **Argumentative writing support** (Stab, 2017)
  - Mine argumentative structure of persuasive essay.
  - Detect several structure-related flaws.
  - Provide feedback on docoument and paragraph level (such as whether all claims are supported).

  Prototype system fully implemented, but not available.



from (Stab, 2017)

- **Augmented writing** (textio flow)
  - A system that writes text semi-automatically, using similar previous content and adapting to style.
  - Not focused on argumentation, but apparently related.

textio

https://textio.com/press/

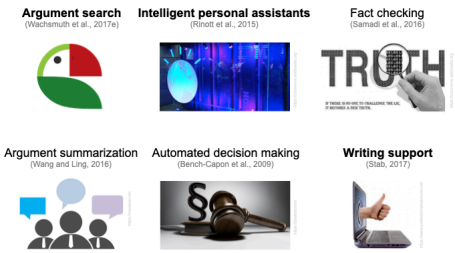
Demo: textio flow

https://textio.com/products/flow/

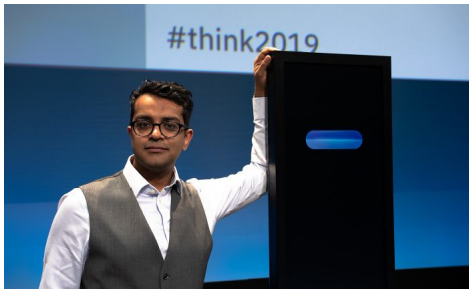
Conclusion

Conclusion

- **Applications of computational argumentation**
  - Opposition and summarization of arguments.
  - Support of opinion formation and decision making.
  - Assessment and support of argumentative writing.



- **Exemplary applications from research and academia**
  - *args.me* opposes pro and con arguments.
  - *Project Debater* debates humans.
  - *textio flow* semi-automatically writes texts.



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- **Capabilities and limitations**
  - Computational argumentation will never work perfectly.
  - Often, tricks make applications practically look fine.
  - Still, there‘s much research to be done.

args.me

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