

Computational Argumentation — Part VII

Applications of Computational Argumentation

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Learning goals

▪ **Concepts**

- Overview of applications of computational argumentation
- Details on argument search, debating technology, and writing support



<https://commons.wikimedia.org>

▪ **Methods**

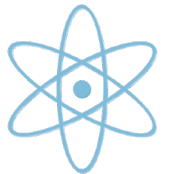
- Processes based on computational argumentation methods
- What works well in practice and what not
- "Tricks" that can be used in practice



<https://pixabay.com>

▪ **Associated research fields**

- Natural language processing
- Information retrieval



<https://pixabay.com>


▪ **Within this course**

- Understand what can be done with computational argumentation and what the status quo is



Outline

- I. Introduction to computational argumentation
- II. Basics of natural language processing
- III. Basics of argumentation
- IV. Argument mining
- V. Argument assessment
- VI. Argument generation
- VII. Applications of computational argumentation**
- VIII. Conclusion

- 
- a) Introduction**
 - b) Argument search
 - c) Debating technology
 - d) Argumentative writing support
 - e) Conclusion

What are applications of computational argumentation?

▪ Applications

- The term *application* is used in multiple ways in NLP:
- **Approaches.** Developed approaches process new data.
- **Downstream tasks.** General NLP techniques are used for specific tasks.
- **Technologies.** Developed approaches are deployed in software.

This is what is meant here.

▪ Application in technologies

- Software applications that use computational argumentation to solve real-world tasks
- Examples follow on the next slide.



<https://de.wikipedia.org>

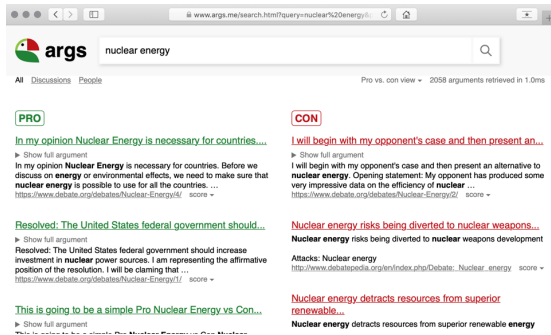
▪ Argumentation in these applications

- Argumentative utterances (text or speech) may be given as input.
- Argumentative utterances may be provided as output.
- Other output may be computed from argumentative utterances.

Overview of applications

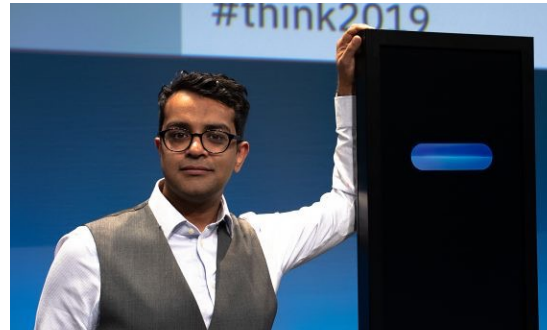
Argument search

(Wachsmuth et al., 2017b)



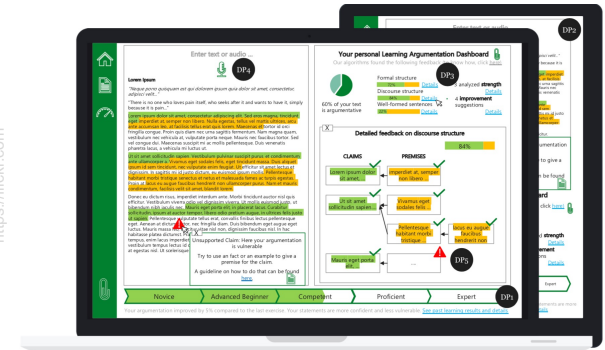
Debating technology

(Slonim et al., 2021)



Writing assistance

(Stab, 2017)



Law decision making

(Bench-Capon et al., 2009)



Deliberative democracy

(Plüss et al., 2018)



Scientific summarization

(Contractor et al., 2012)



Computational argumentation in the media



Sign in The...

SingularityHub

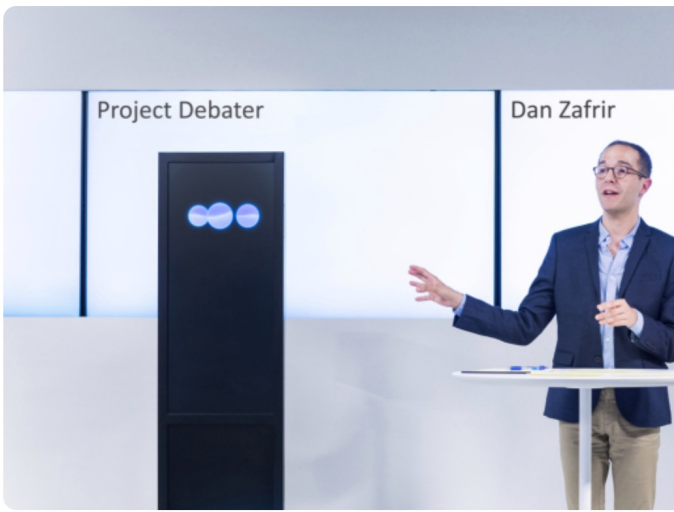
ITUNews

VB

AI

IBM is bringing Project Debater to Watson

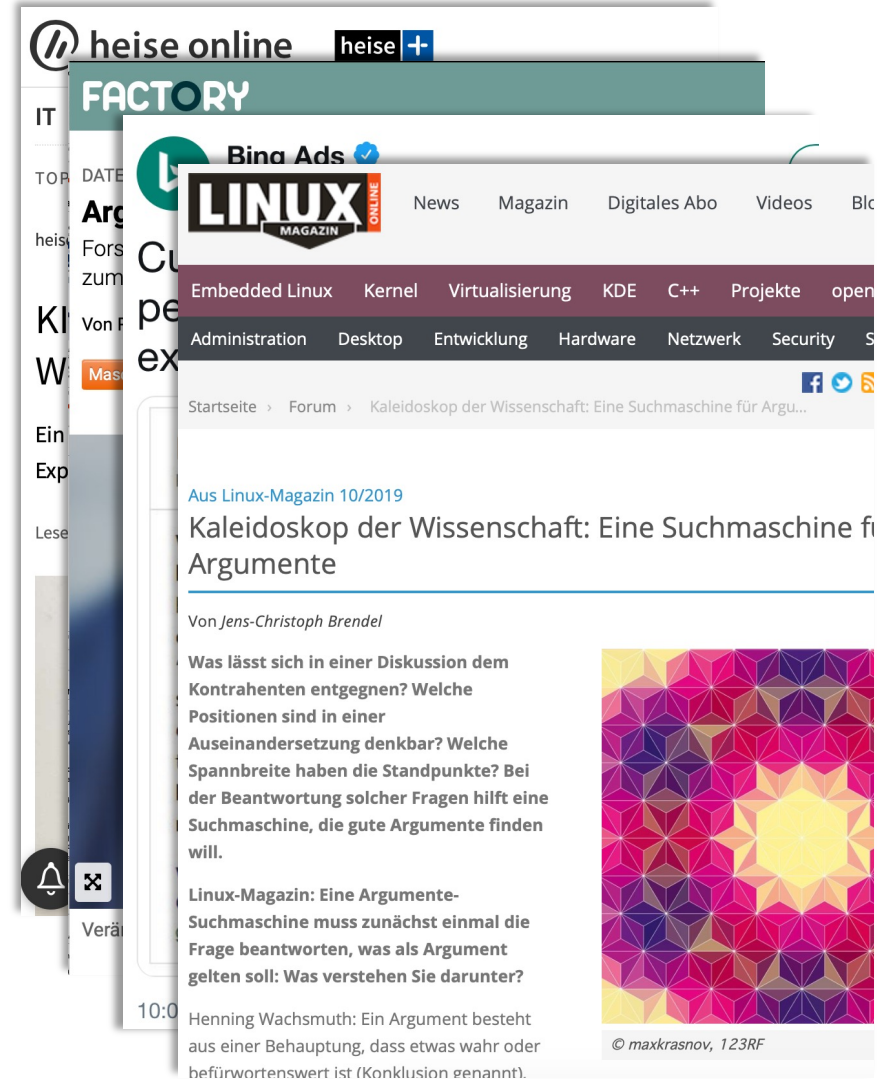
KHARI JOHNSON @KHARIJOHNSON MARCH 10, 2020 9:01 PM



Project Debater Dan Zafrir

Dan Zafrir and Project Debater compete at IBM offices in San Francisco in June
Image Credit: IBM Research

IBM today announced plans to integrate Project Debater into Watson products like Watson NLP, Watson Knowledge Studio, and Watson Dis



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FACTORY

Bina Ads

LINUX MAGAZIN ONLINE

News Magazin Digitales Abo Videos Blo...

Embedded Linux Kernel Virtualisierung KDE C++ Projekte open...

Administration Desktop Entwicklung Hardware Netzwerk Security S...

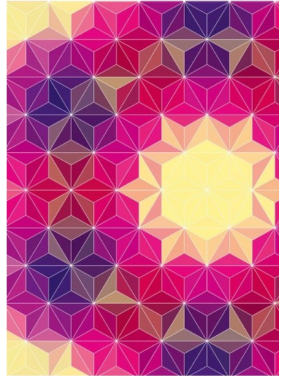
Startseite > Forum > Kaleidoskop der Wissenschaft: Eine Suchmaschine für Argu...

Aus Linux-Magazin 10/2019 Kaleidoskop der Wissenschaft: Eine Suchmaschine für Argumente

Von Jens-Christoph Brendel

Was lässt sich in einer Diskussion dem Kontrahenten entgegnen? Welche Positionen sind in einer Auseinandersetzung denkbar? Welche Spannweite haben die Standpunkte? Bei der Beantwortung solcher Fragen hilft eine Suchmaschine, die gute Argumente finden will.

Linux-Magazin: Eine Argumente-Suchmaschine muss zunächst einmal die Frage beantworten, was als Argument gelten soll: Was verstehen Sie darunter?



© maxkrasnov, 123RF

10:0

Verä

Next section: Argument search

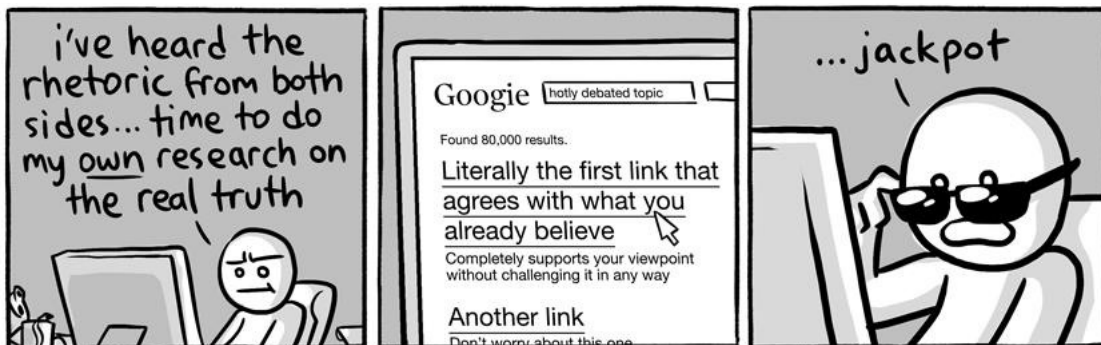
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What is argument search?

■ Argument search

- A technology that finds and opposes arguments in response to queries on controversial issues

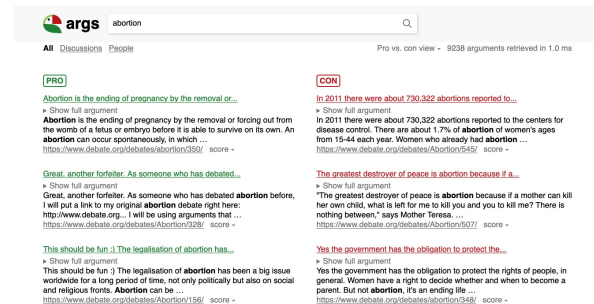
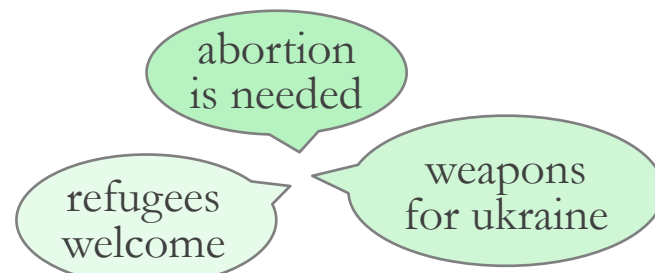


■ Goals

- Help people form self-determine opinions.
- Make it easy to find relevant arguments.
- Avoid being biased towards either stance.

■ Selected requirements

- Rank the *best* arguments highest.
- Cover diverse aspects.
- Cover reliable and heterogeneous sources.
- Cover the most recent arguments.
- Present arguments concisely.



Overview of argument search

▪ Characteristics of argument search

- All existing systems oppose pro and con arguments for an issue.
- Main differences lie in the sources, processing paradigms, and interfaces.

▪ Available argument search engines

- [args.me](https://www.args.me). Indexes debate portal arguments; retrieves arguments relevant to a query
- [ArgumentText](https://www.argumenttext.com). Indexes diverse web pages; mines arguments relevant to a query
- [PerspectroScope](https://seas.upenn.edu/perspectroscope/). Similar to ArgumentText for debate portals and Wikipedia texts
- [Bing Multi-Perspective Answers](https://de.wikipedia.org/wiki/Bing). Part of Bing; 1 pro and 1 con point on selected issues

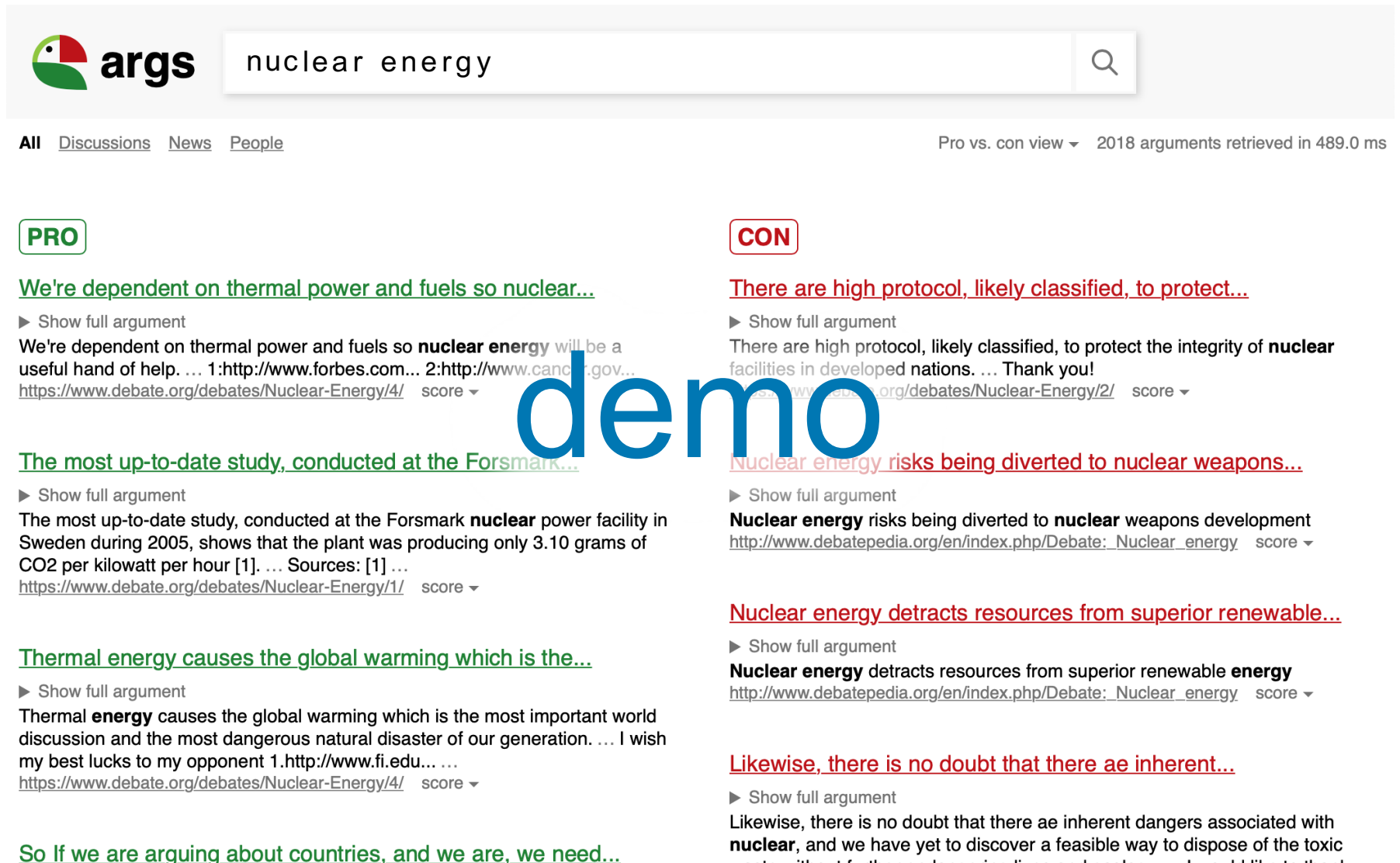


<https://www.argumentsearch.com>

▪ Notice

- IBM's Project Debater is not covered here but under *debating technology*. Its main tasks resemble argument search, but the intended use case differs.

Example: args.me



The screenshot shows the args.me website interface. At the top left is the 'args' logo, a stylized globe. To its right is a search bar containing the text 'nuclear energy' and a magnifying glass icon. Below the search bar are navigation links: 'All', 'Discussions', 'News', and 'People'. On the right side, there is a dropdown menu for 'Pro vs. con view' and a status message: '2018 arguments retrieved in 489.0 ms'. The main content area is divided into two columns: 'PRO' (Pro) on the left and 'CON' (Con) on the right. Each column contains several argument snippets, each starting with a 'Show full argument' link followed by a short text excerpt and a URL with a 'score' dropdown. A large, semi-transparent blue 'demo' watermark is overlaid across the center of the page.

PRO

[We're dependent on thermal power and fuels so nuclear...](#)

► Show full argument

We're dependent on thermal power and fuels so **nuclear energy** will be a useful hand of help. ... 1:<http://www.forbes.com...> 2:[http://www.cand...gov...](http://www.cand...) <https://www.debate.org/debates/Nuclear-Energy/4/> score ▼

[The most up-to-date study, conducted at the Forsmark...](#)

► Show full argument

The most up-to-date study, conducted at the Forsmark **nuclear** power facility in Sweden during 2005, shows that the plant was producing only 3.10 grams of CO2 per kilowatt per hour [1]. ... Sources: [1] ... <https://www.debate.org/debates/Nuclear-Energy/1/> score ▼

[Thermal energy causes the global warming which is the...](#)

► Show full argument

Thermal **energy** causes the global warming which is the most important world discussion and the most dangerous natural disaster of our generation. ... I wish my best lucks to my opponent 1.<http://www.fi.edu...> ... <https://www.debate.org/debates/Nuclear-Energy/4/> score ▼

[So If we are arguing about countries, and we are, we need...](#)

CON

[There are high protocol, likely classified, to protect...](#)

► Show full argument

There are high protocol, likely classified, to protect the integrity of **nuclear** facilities in developed nations. ... Thank you! <https://www.debate.org/debates/Nuclear-Energy/2/> score ▼

[nuclear energy risks being diverted to nuclear weapons...](#)

► Show full argument

Nuclear energy risks being diverted to **nuclear** weapons development http://www.debatepedia.org/en/index.php/Debate:_Nuclear_energy score ▼

[Nuclear energy detracts resources from superior renewable...](#)

► Show full argument

Nuclear energy detracts resources from superior renewable **energy** http://www.debatepedia.org/en/index.php/Debate:_Nuclear_energy score ▼

[Likewise, there is no doubt that there ae inherent...](#)

► Show full argument

Likewise, there is no doubt that there ae inherent dangers associated with **nuclear**, and we have yet to discover a feasible way to dispose of the toxic

Computational tasks in argument search

The screenshot shows the 'args' search engine interface. The search bar contains the word 'feminism'. Below the search bar, there are navigation links for 'All', 'Discussions', 'News', and 'People'. The search results are displayed in a 'Topic space view' showing 1031 arguments retrieved in 1.0 ms. The results are presented as a cluster of red and green dots within a hexagonal frame. The vertices of the hexagon are labeled with terms: 'Domestic violence', 'Abortion', 'Other', 'Women', 'Gender', 'Woman', 'Rape', 'Women's rights', and 'Cancer'. Several computational tasks are highlighted with blue callouts: 'relevance assessment', 'quality assessment', 'stance classification', 'snippet generation', 'argument mining', 'frame identification', and '... and more'. Three example arguments are shown on the left, each starting with a 'PRO' label and a green underlined title. Each example includes a 'Show full argument' link and a URL to the full argument page on the 'debate.org' website.

args feminism

All Discussions News People **relevance assessment** Topic space view ▾ 1031 arguments retrieved in 1.0 ms

PRO Instead of measuring themselves against men, women should...
► Show full argument
Instead of measuring themselves against men, women should make their own activities more visible and valued. ... Want to do away with the dehumanization of women in pornography You say that **feminism** has "gone too far," but before ...
<https://www.debate.org/debates/feminism/29/> score ▾

PRO Feminism is the ACT of Advocating (though perhaps...
► Show full argument
Feminism is the ACT of Advocating (though perhaps passively in some circumstances) against Woman Abuse, and EVERYTHING which leads to women being slandered - Including False propaganda of **Feminism** by SLuts who enable ...
<https://www.debate.org/debates/Feminism./1/> score ▾

PRO If Con cannot, then this debate must concede that...
► Show full argument
If Con cannot, then this debate must concede that **Feminism** is about equality between men and women by definition. ... Therefore, like me, Con is for **Feminism** as defined in the dictionaries. ...
<https://www.debate.org/debates/Feminism/21/> score ▾

quality assessment

stance classification

snippet generation

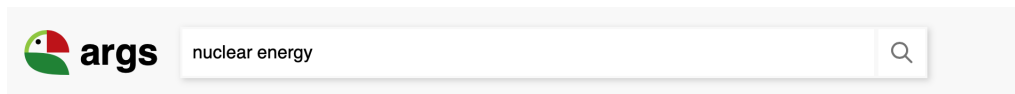
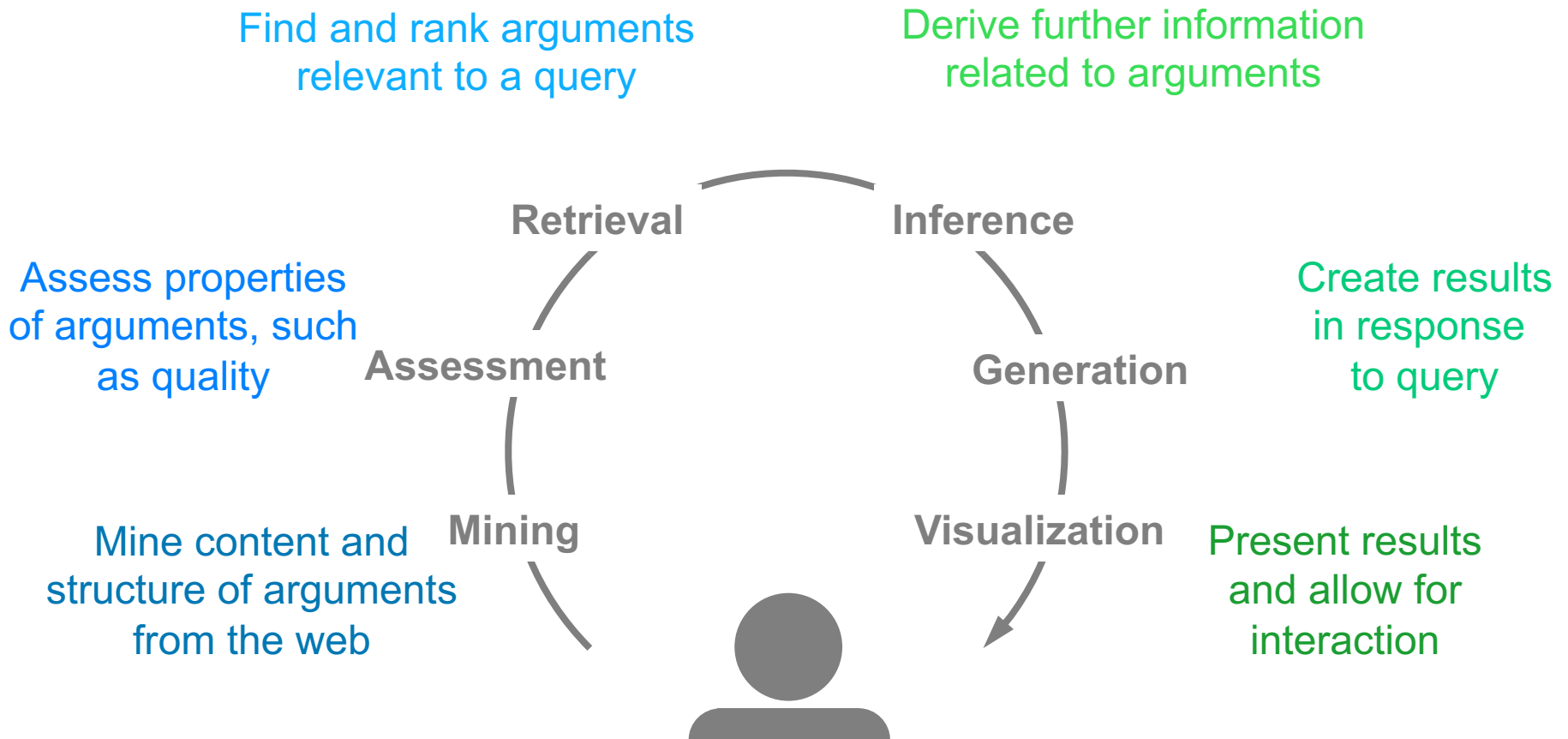
argument mining

frame identification

... and more

Domestic violence Abortion Other Women Gender Woman Rape Women's rights Cancer

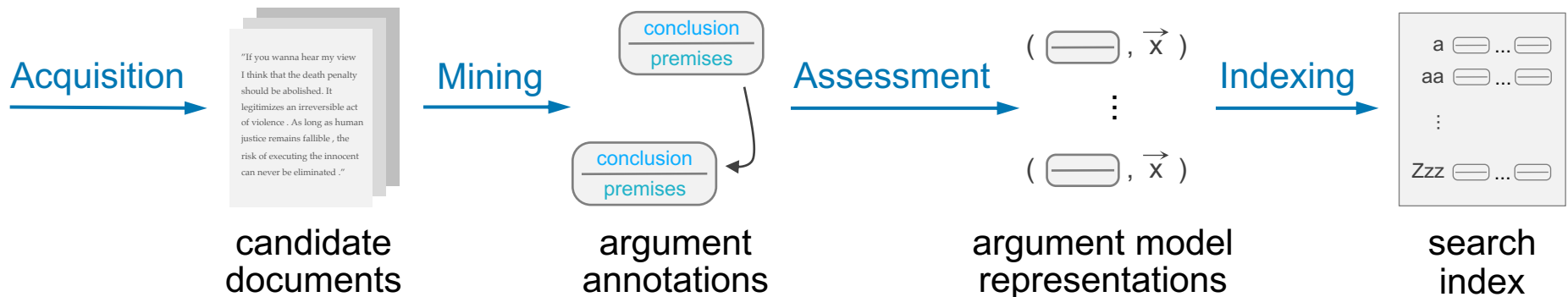
Argument search process: Concept



Argument search process in args.me (Wachsmuth et al., 2017e)

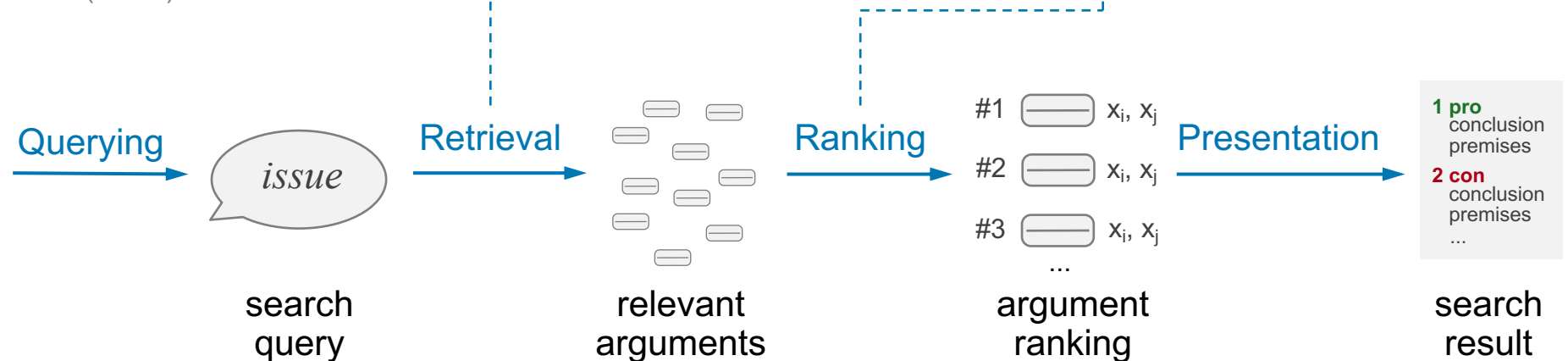
Indexing process

(offline)



Retrieval process

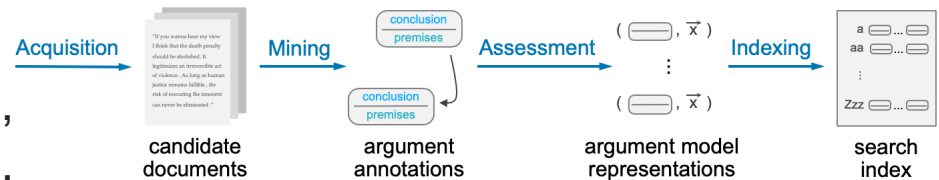
(online)



Argument search process in args.me: Steps

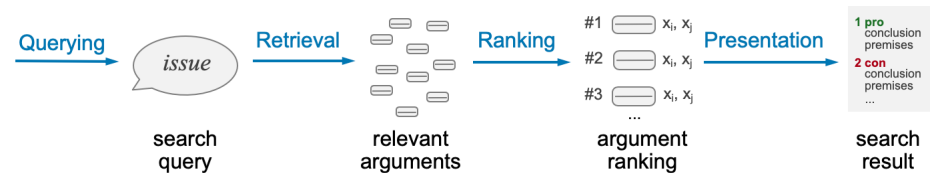
Indexing process

- **Acquisition.** Crawl candidate texts, in which arguments may be found.
- **Mining.** Mine arguments from the candidate texts.
- **Assessment.** Assess properties of the mined arguments, such as quality.
- **Indexing.** Store arguments in search index.



Retrieval process

- **Querying.** A user enters a query on a controversial issue or claim.
- **Retrieval.** Determine indexed pro and con arguments relevant to the query.
- **Ranking.** Sort arguments by relevance, quality, recency, or similar.
- **Presentation.** Present arguments, such that the user can interact with them.



Argument search framework

- The decomposition into eight steps defines a framework that allows stepwise working towards the goals of argument search.

Indexing process in args.me

Argument model in args.me

- A conclusion and k premises with a stance towards the conclusion

Along with different meta-information, such as the URL

conclusion
pro/con premises

- Basically applicable to all arguments
- Allows treating all arguments equally

Indexing process

- "Mining". Distant supervision on four debate portals
idebate.org, debatepedia.org, debatewise.org, debate.org
- Assessment. Only general filtering so far

Result

- Index. 387,606 nearly balanced arguments

Debate title. *This house believes that the united nations has failed*

Point against. *The UN has performed a valuable service in preventing wars and in peacekeeping.*

Point. *It is clearly unrealistic to imagine that the United Nations could prevent all wars, but nonetheless it has been successful at negotiating peaceful resolutions to international disputes. It has also authorised military force [...]*

Debate title
Point against

Point against
Point

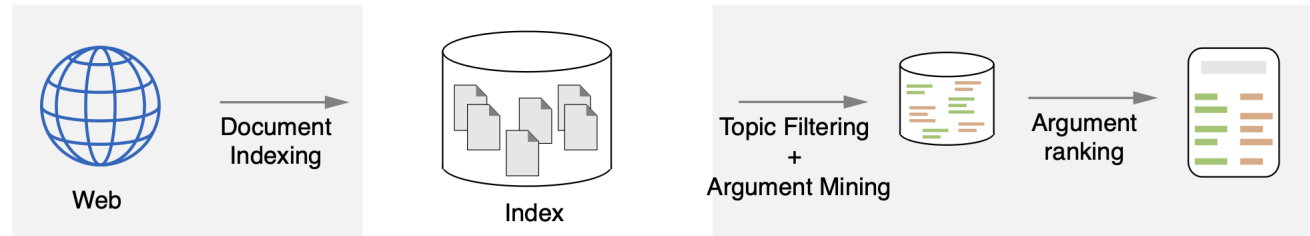
Indexing process: Acquisition paradigms (Ajjour et al., 2019)

Argument acquisition paradigm

- A choice of data sources, along with a method to obtain arguments

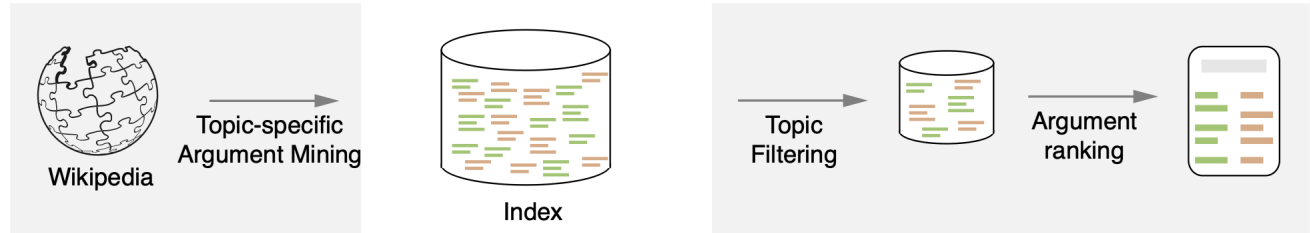
ArgumentText

- Lower precision
- Higher recall
- Slower



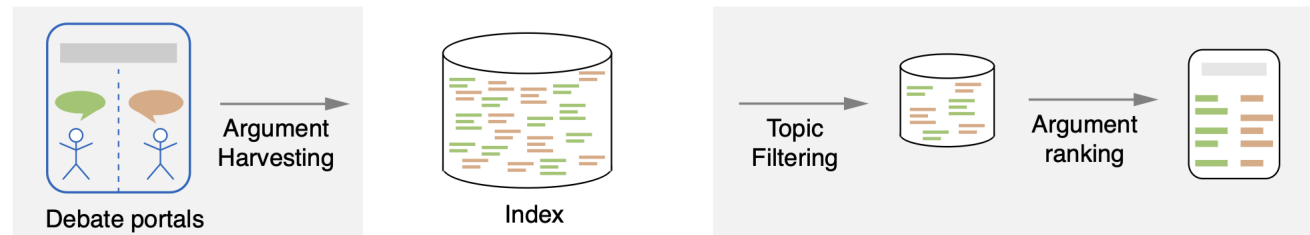
Project Debater

- Higher precision
- Lower recall
- Faster



args.me

- High precision
- Low recall
- Faster



Offline (indexing time)

Online (querying time)

Retrieval process in args.me

■ Querying

- Free text *phrase* and *and queries* possible
- No argument-specific interpretation so far

■ Retrieval

- For precision, only the conclusion is matched with the query terms.
- Stance is simply taken from premises.

■ Ranking

- Arguments are scored with weighted BM25F.
BM25F is a variant of TF-IDF (Robertson and Zaragoza, 2009).
- No real quality assessment so far

■ Presentation

- Different views (pro vs. con, topic space)
- Snippets based on extractive summarization (Alshomary et al., 2020b)



nuclear energy|



[Nuclear radiation is clearly hazardous but the practices...](#)

▼ Show full argument

Nuclear radiation is clearly hazardous but the practices at Fukushima were less than safe. Fukushima was not a Chernobyl but it was a horrible occurrence. The reason it made international news is because that because of the hazard of **nuclear energy**, there are many safety practices. I'd like to share a New York Times headline: No Survivors Found After West Virginia Mine Disaster. Twenty nine people are dead. Certainly the alternative can be just as harmful as **nuclear energy**. Thank you for letting me debate this with you.

Attacks: Nuclear energy should not be used.

<https://www.debate.org/debates/Nuclear-energy-should-not-be-used./1/> score ▼

BM25 score: 34.05

nuclear: 17.45

conclusion: 8.76 (boost 1.50, idf 5.26, tfNorm 1.11)

premises: 7.57 (idf 4.12, tfNorm 1.83)

sourceText: 1.12 (boost 0.20, idf 2.66, tfNorm 2.11)

energy: 16.60

conclusion: 9.52 (boost 1.50, idf 5.72, tfNorm 1.11)

premises: 6.20 (idf 3.66, tfNorm 1.69)

sourceText: 0.89 (boost 0.20, idf 2.10, tfNorm 2.11)

[PRO] [Greetings! Thank you for this debate, this should be fun!](#)

► Show full argument

Greetings! Thank you for this debate, this should be fun! In accepting this debate I do not pretend to stand for all of **feminism** seeing as there are many different sects of the movement...

<https://www.debate.org/debates/feminism/23/> score ▼

[PRO] [Feminism Has NO gender, I am a Man And I am A Feminist...](#)

► Show full argument

Feminism Has NO gender. I am a Man And I am A Feminist. **Feminism** by definition stands up for all my perspectives, ambitions, desires and behaviours. **Feminism** is the ACT of Advocating (though ...

<https://www.debate.org/debates/feminism./1/> score ▼

[PRO] [Feminism is definitely something that there needs to be...](#)

► Show full argument

Feminism is definitely something that there needs to be more of in the world. **Feminists** just want to have equal rights, not overpower men. People who say they are feminists but say women ...

<https://www.debate.org/debates/feminism/12/> score ▼



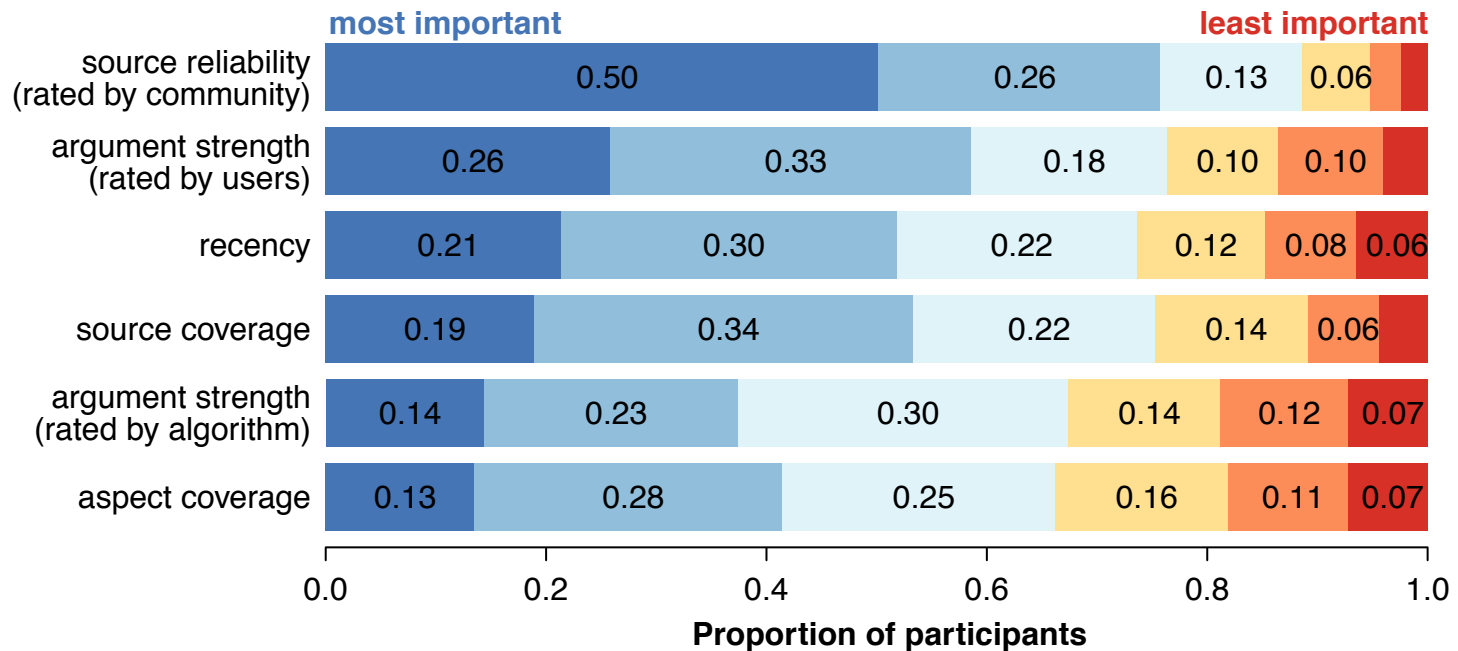
Retrieval process: How to rank search results? (Kiesel et al., 2020)

▪ User study on argument ranking

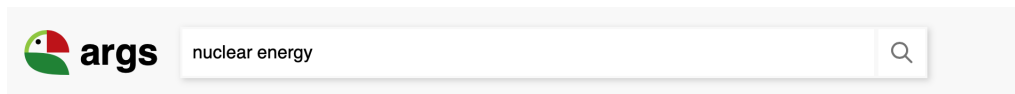
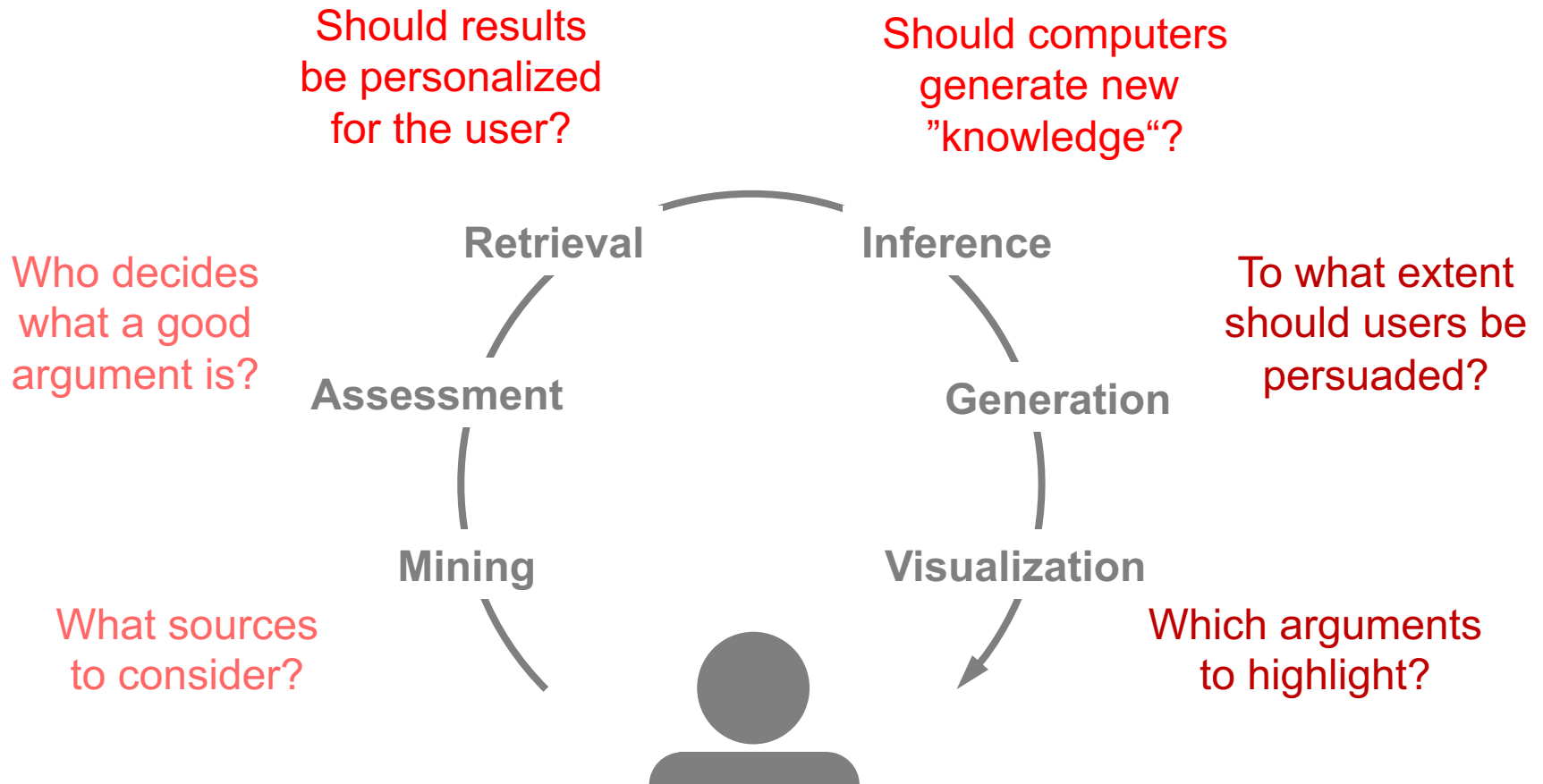
- Crowdsourcing study on MTurk with 500 participants from 11 countries
- The participants assessed the importance of six argument ranking criteria

▪ Results

- Reliability of sources is clearly seen as most important.
- Other criteria are rather close to each other.



Ethical questions in argument search



Next section: Debating technology

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What is debating technology?

■ What is debating technology?

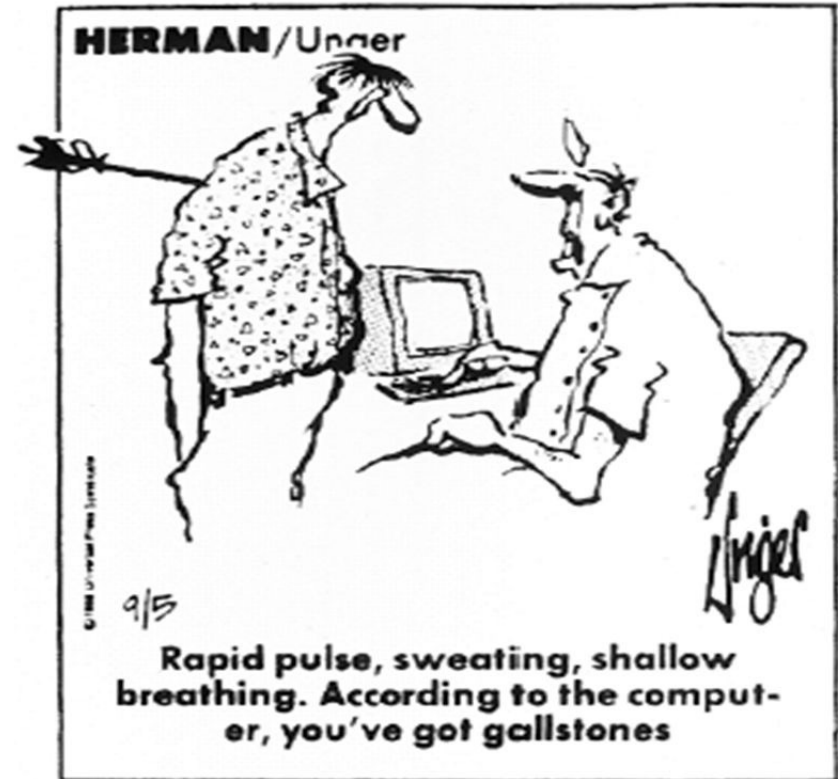
- Technology that debate humans on controversial issues
- The most widely-known such system is IBM's *Project Debater*.
- The underlying idea is to showcase methods for *decision assistance*.

■ Decision assistance (aka decision support)

- Analysis of data to help people make decisions about problems

■ Scenarios of decision assistance

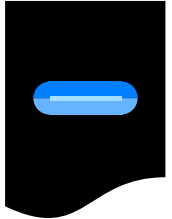
- Professional scenarios include medical diagnosis and market trading.
- Also, personal assistants such as Siri and Alexa directly entail applications.
- Weighing pros and cons may support more informed decisions.



Example: Project Debater

▪ Project Debater

- A system that can debate humans on (potentially) arbitrary issues
- In 2019, showcased on *intelligence*² against a top human debater



▪ Intelligence² debates

- US TV show where two parties debate against each other
- **Stages.** Opening (4 minutes each), rebuttal (4 each), closing (2 each)
- **Goal.** Change stance of audience (who votes before and afterwards)
- **Winner.** The side who has more votes after the debate than before



Additional question in the given debate: "Who better enriched your knowledge?"

▪ Showcase <https://research.ibm.com/interactive/project-debater/live/>

- **Issue.** "We should subsidize preschool"
The issue was chosen from curated list, but not trained on.
- **Stances.** Project Debater is **pro**, Harish Natarajan is **con**
- **Background.** Parties given 15 minutes for preparation

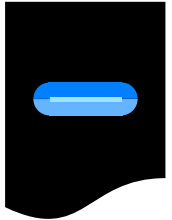


Project Debater showcase: Opening

▪ Opening Project Debater

- Video: Minutes 11:25 – 15:03 (intro starts at 10:50)
- Observations?

Discussed orally



▪ What is done (during preparation)

- **Input.** ~10B preprocessed, indexed sentences from 400M news articles
- Retrieve a few hundred relevant text segments, remove redundancy.
- Select the strongest segments classified as pro/con claims and evidence.
- Arrange them by clustered themes to create a narrative.
- Phrase a full text and convert it to speech.
- **Output.** A four-minutes speech

▪ Opening Harish Natarajan

- Video: Minutes 15:42 – 19:50 (intro starts at 15:28)
- Observations?

Discussed orally

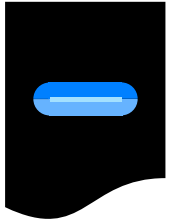


Project Debater showcase: Rebuttal

▪ Rebuttal Project Debater

- Video: Minutes 24:36 – 28:40 (intro starts at 24:22)
- Observations?

Discussed orally



▪ What is done (during break)

- **Input.** Opening speech of Harish Natarajan (and own speech)
- Recognize spoken language and transcribe it 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

- Video: Minutes 28:58 – 33:14 (intro starts at 28:48).
- Observations?

Discussed orally

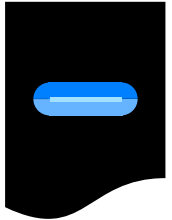


Project Debater showcase: Closing and results

▪ Closing Project Debater

- Video: Minutes 37:44 – 39:35 (intro starts at 37:29)
- Observations?

Discussed orally



▪ Closing Harish Natarajan

- Video: Minutes 39:52 – 42:17 (intro starts at 39:43)
- Observations?

Discussed orally



▪ Results

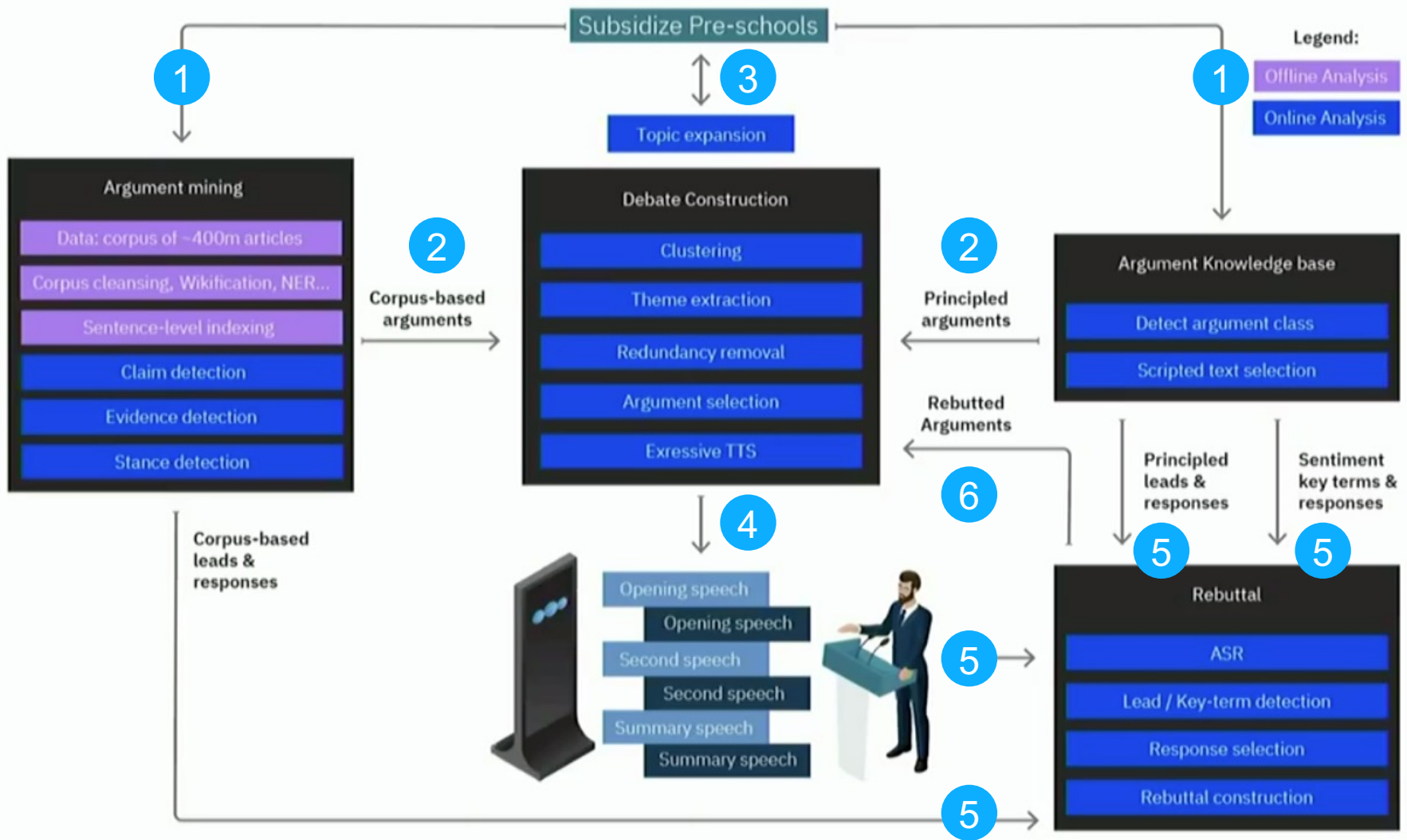
- Video: Minutes 52:48 – 54:36
- **Before the debate.** 79% pro, 13% con, 8% undecided
- **After the debate.** 62% pro, 30% con, 8% undecided

Knowledge enrichment: 55% Project Debater, 22% Harish Natarajan, 23% undecided

▪ Conclusion

- Human debater won, but Project Debater competed well.

Project Debater: The process behind



Learn more? See the Project Debater documentary: www.theverge.com/ad/21244164/project-debater-film-artificial-intelligence

Next section: Argumentative writing support

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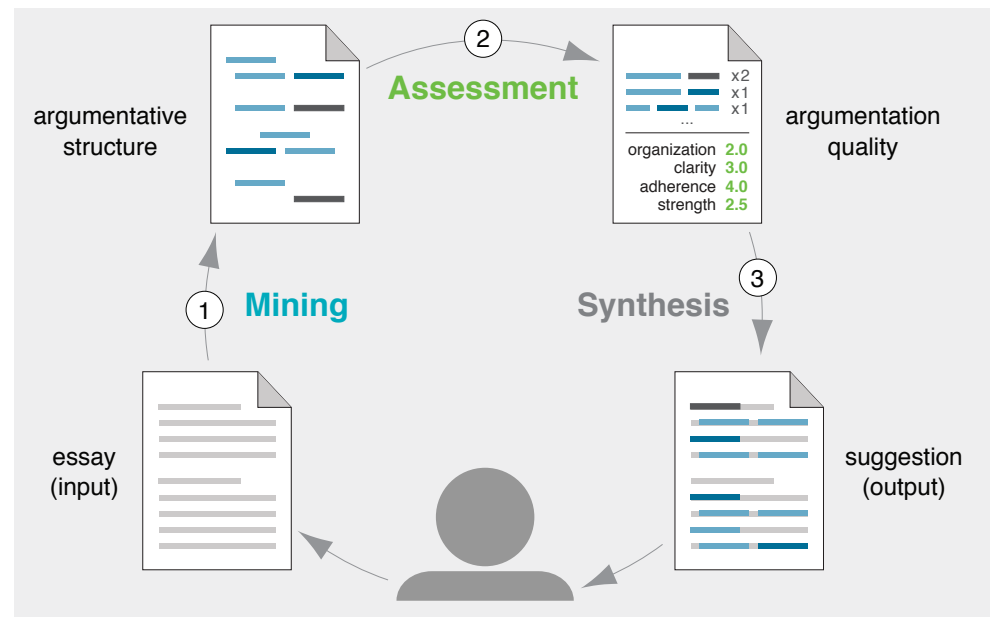
What is argumentative writing support?

■ Argumentative writing support

- A technology that automatically analyzes argumentative texts (e.g., essays), in order to provide feedback to the authors

■ Typical process

- The user enters a text draft into the system.
- The system analyzes the draft to synthesize feedback for the user.
- The user revises the draft and repeats the process.



■ Main computational steps

1. **Mining** of the argumentative structure of a written text draft
2. **Assessment** of specific quality dimensions based on the mined structure
3. **Synthesis** of feedback in terms of suggestions for improvements

Overview of argumentative writing support

■ Scenarios of argumentative writing support

- **Teaching** of argumentative writing
- **Optimization** of the persuasive effectiveness of texts
- **Increase** of writing speed

... and similar



<https://www.publicdomainpictures.net>

■ Selected applications of argumentative writing support

- Argument-related essay scoring (Wachsmuth et al., 2016) <https://demo.webis.de/essay-scoring>
- Argumentative writing support system for essays (Stab, 2017)
- Learning support system for arguing skills (Wambsganss et al., 2020)
- ChatGPT provides respective support to some extent

■ Related applications

- **Build-in tools** for orthography and syntax checking (e.g., in Microsoft Word)
- **Professional writing tools** even analyze style, tone, etc. (e.g., Grammarly)
- **Augmented writing tools** actively complete text drafts (e.g., textio flow)

All these may be integrated with argumentative writing support.

Argumentative writing support system for essays (Stab, 2017)

▪ System

- A tool that gives formative feedback to English persuasive student essays
- **Components.** Argument analysis, feedback generation

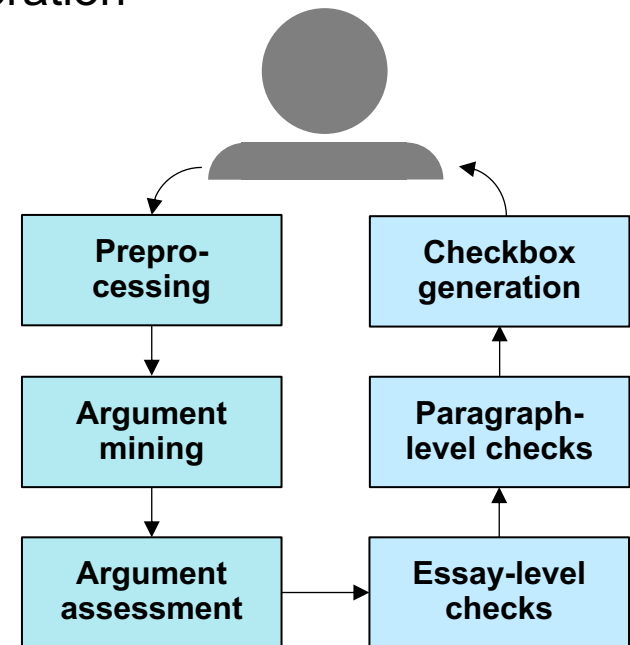
Fully implemented prototype, but not made publicly available

▪ Argument analysis

- **Preprocess** essay with several NLP analyses.
- **Mine** arguments using model of Stab (2017).
- **Assess** myside bias of the essay and local sufficiency of each paragraph.

▪ Feedback generation


- **Check** for three essay-level structural criteria.
(1) Title present? (2) 4+ paragraphs? (3) Myside bias?
- **Check** for nine paragraph-level structural criteria.
(1) Thesis present in first paragraph? (2) 2+ premises for each conclusion? (3) 1+ arguments in body? (4–9) ...
- **Generate** feedback in terms of whether each criterion is fulfilled or not.




Argumentative writing support system for essays: Demo

(1) Essay & Argument Components

(2) Selection of Feedback Types



Argumentative Writing Support



Essay Feedback | Detailed Feedback | Argumentation Structure

	Essay	Feedback	Details
Title	Using animals for the benefit of the human beings		
Paragraph1	With the rapid development of the standard of people's life, increasing numbers of animal experiments are done, new medicines and foods, for instance. Some opponents says that it is cruel to animals and nature, however, I believe that no sensible person will deny that it is a dramatically cruel activity to humanity if the latest foods or medicines are allowed to sold without testing on animals. In my essay, I will discuss this issue from twofold aspects.	<ul style="list-style-type: none"> ✓ Thesis statement present ✓ Introduction of topic present ✓ No Arguments present 	<p>A claim is a controversial statement that should not be accepted without additional support. An unsupported claim in your essay is a weak point of your argumentation, since it can be easily refuted and questioned by an opponent. In order to make your essay more stronger, you should provide reasons for each claim.</p> <p>The example below illustrates a body paragraph including an unsupported claim (bad example). We show that the same paragraph becomes more persuasive after adding premises that support the claim (good example).</p> <p style="text-align: center;">Bad example:</p> <p><i>First, [cloning will be beneficial for many people who are in need of organ transplants]_{Claim1}. Cloning is the process of producing similar populations of genetically identical individuals that occurs in nature when organisms such as bacteria, insects or plants reproduce asexually.</i></p> <p style="text-align: center;">Good example:</p> <p><i>First, [cloning will be beneficial for many people who are in need of organ transplants]_{Claim1}. [Cloned organs will match perfectly to the blood group and tissue of patients]_{Premise1} since [they can be raised from cloned stem cell of the patient]_{Premise2}. In addition, [It shortens the healing process]_{Premise3}.</i></p> <p>The author of this paragraph wants to highlight the importance of cloning for people who need organ transplant. In the bad example, no support was provided. So after reading the paragraph it is very unlikely that reader understands why cloning is beneficial for people who need organ transplants. In contrast, the good example includes several premises that support the claim. Also, the first premise deals as a support for the second premise. Due to the provided reasons, the reader can understand why the author claims that what she/he claims. Thus, it is highly recommend to include enough reasons or evidence for your claims in the body paragraphs.</p>
Paragraph2	First of all, as we all know, animals are friendly and vital for people, because if there are no animals in the world, the balance of nature will broke down, and we, human, will die out as well. The animal experiments accelerate the vanishing of some categories of animals. In other words, doing this various testing is a hazard of human's future and next generation.	<ul style="list-style-type: none"> ✓ Argument present ✓ One argument per paragraph ✓ No unsupported claims present ✗ Claim present in the first sentence ✓ Appropriate number of reasons present 	
Paragraph3	Though animal experiments have negative impact on the natural balance, it is necessary to make sure that people can live a long life. To begin with, it is indisputable that every new kind food or pill may be noxious, and scientists must do something to insure that the new invention benefits people instead of making people ill or even dying. The new foods or medicines are invented to promote the quantity of human's life. Thus even if they are volunteers; they cannot take the place of animals to test the new foods or medicines. Furthermore, it also have potentially harm for human's health without any testing.	<ul style="list-style-type: none"> ✓ Argument present ✓ One argument per paragraph ✓ No unsupported claims present ✗ Claim present in the first sentence ✓ Appropriate number of reasons present 	
Paragraph4	To sum up, I reaffirm that although there is some disadvantages of animals' profits, the merits of animal experiments still outweigh the demerits.	<ul style="list-style-type: none"> ✗ Restatement of thesis statement present 	

(3) Feedback Types

(4) Feedback Details

Learning support system for arguing skills (Wambsganss et al., 2020)

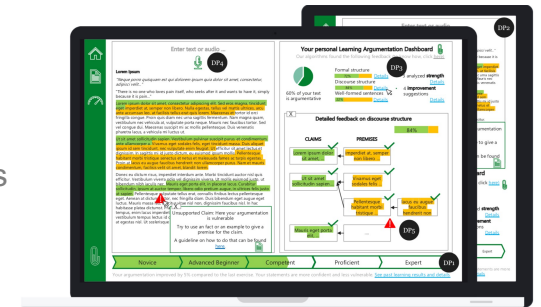
■ System

- A tool that provides visual feedback to the structure and quality of German argumentative texts

Not tailored to specific genre; so far, trained on business process model reviews

- Underlying idea similar to the system of Stab (2017)

Also not publicly available so far, but used at University of St. Gallen



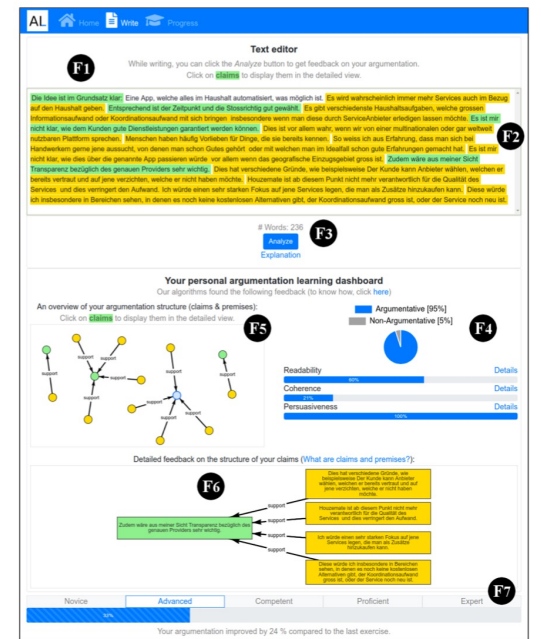
■ Argument analysis

- Mine claims, premises, and support relations.
- Assess readability, coherence, and persuasiveness.

The assessment is based on rudimentary rule-based approaches.

■ Feedback generation

- In-text highlighting of argumentative structure
- Graph visualization of argumentative structure, with detail view showing structural flaws
- Bar-chart visualization of quality dimensions



Learning support system for arguing skills: Demo

AL

An Adaptive Learning Support System for Argumentation Skills

Goal: Improve the users' argumentation skills by providing **immediate, individual feedback** using a **ML-based analysis** of their argumentation structure in written texts.

(thanks to Christina Niklaus from University of St. Gallen for providing this video)

Augmented writing

▪ Augmented writing

- A variant of writing support that semi-automatically transforms or completes a text segment written by a user

Alternatively, it may suggest alternatives to a given sentence or similar.

- Augmented writing may also include other typical features of writing support.

”need rescue boats“



”Rescue boats are needed in the mediterranean sea, because, without, innocent people will die.“

▪ How does that work?

- Identify and reuse similar content from previous texts.
- Adapt style and phrasing to given text segment.

ChatGPT-like technologies may be employed for similar ideas.

▪ Augmented argumentative writing?

- Augmented writing has not been explicitly studied yet for argumentation.
- But potential use cases are apparent.
- Only few augmented writing technologies exist yet, one of which is *textio flow*.


Augmented writing: Demo (commercial video)



<https://www.youtube.com/watch?v=F7zRLnkUS-I>

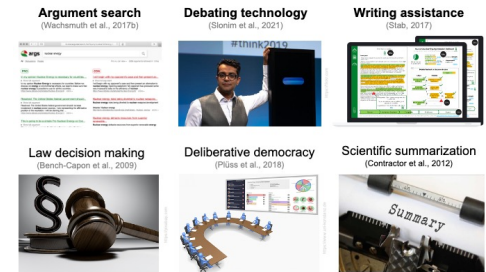
Next section: Conclusion

- I. Introduction to computational argumentation
- II. Basics of natural language processing
- III. Basics of argumentation
- IV. Argument mining
- V. Argument assessment
- VI. Argument generation
- VII. Applications of computational argumentation**
- VIII. Conclusion

- 
- a) Introduction
 - b) Argument search
 - c) Debating technology
 - d) Argumentative writing support
 - e) Conclusion**

Conclusion

- **Applications of computational argumentation**
 - Argument search to support opinion formation
 - Decision assistance through debating systems
 - Writing support for argumentative texts
- **Exemplary applications from industry and academia**
 - *args.me* opposes pro and con arguments
 - *Project Debater* debates humans
 - *AL* gives visual feedback to argumentative texts
- **Capabilities and limitations**
 - Computational argumentation will never work perfectly
 - Often, tricks make applications practically look fine
 - Still, there's much research to be done



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