Making sense of public participation in rulemaking using argument explication

Ankita Gupta  Ethan Zuckerman  Brendan O’Connor

University of Massachusetts Amherst

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Overview

- Goal: understand large-scale corpora of opinions and arguments
- This work: use large language models (LLMs) to extract their argument structure
**NLP Task: Argument Explication**

Text => {(claim, reason, warrant)}

- **Argumentation theory:** an argument has multiple components (Toulmin 1958, Freeman 1991, Walton 1996). We focus on:
  - **Claim** (a.k.a. conclusion): central, normative assertion
  - **Reason** (a.k.a. data, grounds, premise): support for the claim
  - **Warrant:** logical (implicit) link from reason to claim

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**Input Argument**

I oppose the approval of this covid vaccine on children. Children recover from it much quicker and have less severe than adults. Young boys have developed myocarditis after having the mRNA vaccines.

**Explicated Output**

- **Claim (c)**: I oppose the approval of this covid vaccine on children.
- **Reason (r)**: Children recover from it much quicker and have less severe than adults.
- **Warrant (w)**:

![Diagram](image)
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Capital punishment is not a solution, as it cannot be ruled out that the judicial process may make mistakes. Criminals should not be put in luxury prisons, though. After all there are criminals who enjoy 'living' in prison for its decent board, no taxes to be paid, no stress with work. Still, the state needs the death penalty as a deterrent to horrific crimes.

According to Toulmin model,

The **claim** is "the state needs the death penalty as a deterrent to horrific crimes." The **grounds** are "criminals should not be put in luxury prisons" and "there are criminals who enjoy 'living' in prison for its decent board, no taxes to be paid, no stress with work." The **warrant**, which is the underlying assumption that connects the grounds to the claim, is that the death penalty will deter criminals from committing horrific crimes. The **rebuttal** is "capital punishment is not a solution, as it cannot be ruled out that the judicial process may make mistakes." The **qualifier** and **backing** are not explicitly stated in the argument.
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Automatic eval + human study with prior argument component datasets
[ARCT (Habernal and Gurevych 2017), Microtext Corpus (Peldszus and Stede 2015, Becker et al. 2020)]
Method: LLM prompting

Capital punishment is not a solution, as it cannot be ruled out that the judicial process may make mistakes. Therefore, the death penalty as a deterrent to horrific crimes is not supported.

According to Toulmin model, the claim is "the state needs the death penalty as a deterrent to horrific crimes." The grounds are "criminals should not be put in luxury prisons" and "there are criminals who enjoy 'living' in prison for its decent board, no taxes to be paid, no stress with work." The warrant, which is the underlying assumption that connects the grounds to the claim, is that the death penalty will deter criminals from committing horrific crimes. The rebuttal is "capital punishment is not a solution, as it cannot be ruled out that the judicial process may make mistakes." The qualifier and backing are not explicitly stated in the argument.

Analyzed prompt sensitivity; correlate output quality to theory names' web frequency (C4≈LLM training data)

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Compare LLMs:
- GPT4 (proprietary)
- Llama2 (open-weight)
• Argument (hyper)graph extracted from public comments corpus (Hoyle et al., 2023)
  • 10,000 comments to FDA
  • Cluster all propositions from all extracted (c,r,w) triples (SentenceBERT + DP-Means)
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Conclusion

• Use NLP to analyze semantic structures for social scientific analysis of textual corpora
  • This work: argument structures
  • Method finding: effective LLM prompt by using name of a pedagogically popular linguistic theory
• For more details...
  • Abstract: ankitaiisc.github.io
• Thanks!