Retrieval of the Best Counterargument without Prior Topic Knowledge

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Countering an argument

- **Argument**

  The Feminist Cause No Longer Appeals to Women.  
  Many women no longer identify themselves as feminists, associating feminism with man-hating, sex-hating humourlessness, and seeing it as a relic of the 1970s. Modern women are perfectly capable of competing with men on equal terms [...]  

- **Counterargument**

  Opponents of the feminist movement have always sought to stereotype feminists in order to reduce their support. That this enterprise is often successful is not an argument against feminism [...]  

- **Disclaimer**

  - Even the best counterargument will not convince everyone
Countering an argument — with no/less prior knowledge

- **Argument**

  Neo-functionalism proposes a purpose to EU integration. (conclusion)

  Neo-functionalism proposed building a community Europe, through the concept of spillover the theory proposes economic determinism. Spillover will eventually lead to a completely integrated Europe with a strong central government [...] (premise)


- **Counterargument**

  Neo-functionalism believes in building a community Europe, but then the question is raised, what is the purpose of this new entity? There is no common outlook and getting the major powers of Europe to agree what this should be will be near impossible [...]  


- **Observation**

  - Similar aspects but opposite stance
Motivation: Counterarguments on https://args.me

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This paper

- **Research question**
  - Given any argument on any controversial topic, how to best counter it?

- **Simplifying hypothesis**
  - The best counterargument invokes the same aspects while having opposite stance

- **Contributions**
  - **Corpus.** 6753 argument-counterargument pairs
  - **Approach.** Topic-independent counterargument retrieval
  - **Insights.** Evidence for partial truth of hypothesis
A counterargument corpus (available at http://www.arguana.com)

- **Web portal iDebate.org**
  - Debates on controversial topics
e.g., feminism is still needed
  - Categorized into 15 themes
economy, religion, society, ...

- **Arguments on the portal**
  - Pro and con points on each topic
each with conclusion and premise
  - Counterpoint to every point

- **Corpus construction**
  - 1069 debates crawled
  - 6753 true point-counterpoint pairs
  only counterpoint seen as correct counterargument

- **Datasets**
  - 60% train, 20% validation, 20% test
  no debate in two datasets

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Counterargument retrieval tasks

- point
- same-stance points
- oppo'-stance points
- true counterpoint
- same-stance counters
- oppo'-stance counters

One debate

One theme

Full iDebate.org

Eight tasks in paper, two in this talk
1. Candidates are all counters with opposite stance → true-to-false ratio 1:3
8. Candidates are all arguments → true-to-false ratio 1:2800
Retrieval approach: Concept

- **Approach**
  - Capture simultaneous topic similarity and stance dissimilarity

- **Background from theory** (Walton, 2009)
  - A counterargument attacks an argument’s conclusion
  - ... or the argument’s premise(s)
  - ... or the inference from premise(s) to conclusion

- **Infer both similarities from premise(s) and conclusion** ... in different ways

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Retrieval approach: Realization

- **Ranking by simultaneous (dis)similarity**

\[ \alpha \cdot \text{topic similarity} \quad \text{—} \quad (1-\alpha) \cdot \text{stance similarity} \]

\[
\begin{align*}
1.0 & \cdot \begin{cases}
\min & \text{similarity to conclusion} \\
\max & \text{similarity to premise(s)} \\
0.9 & \text{prod'} \\
0.8 & \text{sum}
\end{cases} \\
\end{align*}
\]

- Learn best \( \alpha \) and best topic-stance similarity pair on validation set
- Apply best combinations on test set

- **Embedding + word similarity**
  - **Embeddings.** Word mover's distance on ConceptNet Numberbatch outperformed average word embeddings and GoogleNews-vectors, wiki-news-300d-1M, and crawl-300d-2M
  - **Words.** Manhattan distance on stem 1-grams outperformed Jaccard, Euclidean, and Cosine distance on word, stem, and lemma 1-, 2-, and 3-grams
Accuracy of ranking the best counterarguments highest

- **Selected baselines and approaches**

<table>
<thead>
<tr>
<th>Argument-level similarities</th>
<th>Best conc‘/prem‘ similarities</th>
<th>Best approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>embedding similarity</td>
<td>embedding product</td>
<td>emb'+word 1.0 · product</td>
</tr>
<tr>
<td>word similarity</td>
<td>word sum</td>
<td>emb'+word 0.9 · sum – 0.1 · max</td>
</tr>
</tbody>
</table>

1. **Candidates: All counters with opposite stance** (true-to-false ratio 1:3)

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean Rank</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>embedding similarity</td>
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<tr>
<td>emb'+word 1.0 · product</td>
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<td>74.5</td>
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</table>

8. **Candidates: All arguments** (true-to-false ratio 1:2800)

<table>
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<tr>
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<th>Score</th>
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</thead>
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<tr>
<td>word similarity</td>
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<td>28.6</td>
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<tr>
<td>emb'+word 1.0 · product</td>
<td>32.2</td>
<td>32.4</td>
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</tbody>
</table>
Selected insights from the experiments

- **Results on different themes** (true-to-false ratio 1:2800)

- **Results on different tasks**
  - Baselines outperformed with $p < 0.01$ on all tasks
  - $\alpha = 0.9$ best on six tasks, $\alpha = 1.0$ on two
  - sum-max best on seven tasks, prod'-min on one

- **Results on side hypotheses**
  - Rejected. Counterarguments have high embedding but low word similarity
  - Rejected. Counterarguments have opposite sentiment
  - Confirmed. Counterargument similarity varies across topics
Take aways

- **Counterarguments**
  - Attack an argument‘s conclusion, premises, or both
  - Critical to know for both arguers and opponents
  - Hard to find, especially without prior topic knowledge

- **This paper**
  - **Question.** Given *any* argument, how to best counter it?
  - **Hypothesis.** Similar aspects but opposite stance
  - **Approach.** Simultaneous similarity and dissimilarity

- **Results and implications**
  - Best counter among 2801 candidates found in 32.4%
  - Approach robust across iDebate topics
  - But there‘s more to do on counterarguments...

- [corpus at arguana.com](https://arguana.com)
- [arguments at args.me](https://args.me)