Argument extraction for supporting public policy formulation

Eirini Florou
Dept of Linguistics, Faculty of Philosophy
University of Athens, Greece
eirini.florou@gmail.com

S. Konstantopoulos, A. Kukurikos, P. Karampiperis
Institute of Inforatics & Telecommunications
NCSR ‘Demokritos’, Athens

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Overview

1. The NOMAD Project
2. Argument Recognition
3. Conclusion
Support for and opposition to unpublished policy drafts

Conventional opinion mining:
- Formulate a policy and publish a draft
- Crawl the Web for relevant material
- Aggregate per topic and sentiment

The NOMAD idea is applicable at an earlier stage:
- Formulate a policy
- Annotate policy items with relevant arguments
  - General political statements
  - Both in favour and against the policy regardless of the policy maker’s own stance
- Crawl and analyse material relevant to the arguments
- Positive sentiment for the argument is an estimator of support for the policy item
Extracting arguments

- Crawl and analyse material relevant to the *arguments*
- Positive sentiment for the argument is an estimator of support for the policy item

- Crawl for *arguments* that are supporting/opposing the policy arguments
  - Arguments indicate opinionated text
  - Summaries of relevant arguments are more useful input
- Supporting arguments are more accurate and more useful estimators of support for the policy item
Example

Incentives for increasing the market penetration of wind power.

Policy arguments:
- Greenhouse gas emissions should not be a concern at all.
- Greenhouse gas emissions should be reduced, but this should be balanced against other concerns.
- Greenhouse gas emissions should be reduced at all costs.

No textual/semantic similarity, but relevant:
- In case hard packaging is made compulsory by law, producers will be forced to consume more energy, leading to more greenhouse gas emissions.
- Tidal power production does not emit greenhouse gases, but other environmental problems are associated with its widespread deployment.
The NOMAD Project

Argument Recognition

Conclusion

The NOMAD processing pipeline

- Web crawling, HTML cleaning, Tokenization
- Sentence splitting
- Term lookup and disambiguation
- Semantic segmentation
  - Maximal chunks of contiguous, full sentences that are semantically relevant to policy argument
- Argument extraction
  - Classify chunks as being argumentative or not
  - Extract structure and polarity

For English, Greek, and German.
This paper is about argument recognition for Greek.
Looking for arguments

Variety of approaches: argument structure lexicons, patterns. Semantic role analysis to assign structure to opinions.

Most often boils down to discourse markers that correspond to the connectives between the elements of argument structure:

- if, because, therefore, etc.
- also longer phrases: this goes to show, it naturally follows that, etc.
Our hypothesis is that future and conditional tenses and moods often indicate conjectures and hypotheses which are commonly used in argumentation.

Experimental setup:
- Greek language texts
  - Crawled, segmented as discussed above
  - Manually annotated as arguments
- PoS-tagging, chunking
- JAPE grammar
  - PoS tags of main and aux verbs in the verb chunk
  - assigns tense and mood to the chunk
<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM</td>
<td>Absolute number of occurrences of discourse markers from a given category</td>
<td>5 numerical</td>
</tr>
<tr>
<td>Rel</td>
<td>Relative frequency of each of the 6 tenses and each of the 6 moods</td>
<td>12 numerical</td>
</tr>
<tr>
<td>RCm</td>
<td>Relative frequency of each tense/mood combination (only for those that actually appear).</td>
<td>9 numerical</td>
</tr>
<tr>
<td>Bin</td>
<td>Appearance of each of the 6 tenses and each of the 6 moods</td>
<td>12 binary</td>
</tr>
<tr>
<td>Dom</td>
<td>Most frequent tense, mood, and tense/mood combination</td>
<td>3 string</td>
</tr>
</tbody>
</table>

**TOTAL** 41 features
Experimental setup

- 677 text segments
  - between 10 and 100 words, avg. 60 words
  - 345 positive, 332 negative
- results reported are 10-fold average
## Results

<table>
<thead>
<tr>
<th>Morpho-syntactic features used</th>
<th>With Discourse Markers</th>
<th>Without Discourse Markers</th>
<th>Discourse Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prec.</td>
<td>Rec.</td>
<td>$F_{\beta=1}$</td>
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<tr>
<td>All</td>
<td>75.8%</td>
<td>71.9%</td>
<td>73.8%</td>
</tr>
<tr>
<td>no Dom</td>
<td>79.8%</td>
<td>73.3%</td>
<td>76.4%</td>
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<tr>
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<td>72.8%</td>
<td>73.8%</td>
</tr>
<tr>
<td>no RCm</td>
<td>76.3%</td>
<td>71.0%</td>
<td>73.6%</td>
</tr>
<tr>
<td>no Bin</td>
<td>70.0%</td>
<td>70.4%</td>
<td>70.2%</td>
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<tr>
<td>Rel</td>
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<td>75.9%</td>
<td>74.6%</td>
</tr>
<tr>
<td>Dom</td>
<td>57.1%</td>
<td>98.8%</td>
<td>72.4%</td>
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<tr>
<td>RCm</td>
<td>69.3%</td>
<td>66.7%</td>
<td>67.9%</td>
</tr>
<tr>
<td>Bin</td>
<td>71.7%</td>
<td>49.9%</td>
<td>58.8%</td>
</tr>
<tr>
<td>None</td>
<td>67.9%</td>
<td>20.9%</td>
<td>31.9%</td>
</tr>
</tbody>
</table>
Conclusion

- LT assistance for policy formulation:
  - Use Web content to assess policy draft *before* public consultation.
  - Cannot classify Web content as similar to policy
  - Look for public opinion wrt. more general concepts

- Argument extraction:
  - Core contribution: verb tense and mood are significant features
  - Not explored previously

- Publicly available resources:
  - JAPE grammar for tense/mood from PoS tags and chunking
  - Manually annotated corpus
Thank you for your attention.
Questions?