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Argumentation Mining in Parliamentary Discourse

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Abstract: In parliamentary discourse, politicians expound their beliefs and goals through argumentation, and, to persuade the audience, they communicate their values by highlighting some aspect of an issue, an action which is commonly known as framing. The choices of frames are typically dependent upon the speaker's ideology.
In this proposed doctoral work, we will computationally analyze framing strategies and present a model for discovering the latent structure of framing of real-world issues in Canadian parliamentary discourse.

Keywords: frames, framing, parliamentary discourse

1. Introduction

Theoretical perspectives on framing and frames are diverse, but these theories converge in their conceptualization of framing as a communication process to present an object or an issue. According to Entman (1993):

> Framing involves selection and salience. To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.

For Entman, frames are schemata with the four functions listed above: *defining problems, diagnosing causes, making moral judgments,* and *suggesting remedies*. He also notes that some of these functions might not exist in the text, suggesting that frames should be disassociated from the stance that is taken in the text. By contrast, Chong and Druckman (2007) believe that frames define attitudes and thus they are inherently associated with stances of advocacy or opposition.

Despite these perspectives on framing and frames, some interpret frames instead as topics such as *crime and punishment* or *health and safety* (Card et al. 2015). However, these topics are just the categories of the subject matter in news articles. Obviously, multiple frames can fall under any of the categories, explaining why some theorists such as Card et al. (2015) claim that framing should be perceived as non-issue-specific and able to be analyzed with a fixed set of framing dimensions (topics), rather than being associated with a specific issue (Entman 1993, Chong and Druckman 2007). Nonetheless, we also agree with de Vreese (2005) that frames can be classified as generic or issue-specific; for example, *economic benefits* can be used as a generic frame for various issues. However, a frame such as *Marriage is about more than procreation* is specific to gay marriage.

Although framing manifests through language, the existing definitions pay little attention to its linguistic aspect and provide no guidelines on what constitutes a frame or how to find them. In Entman's view, frames are located in several places, including the "communicator", the "text", the "receiver", and the "culture" (in line with philosophical views on meaning as Hirst

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(2007) explains), and can be manifested by the *presence* or *absence* of "certain keywords, stock phrases, stereotyped images, sources of information, and sentences that provide thematically reinforcing clusters of facts or judgments." Along these lines, Gamson and Modigliani suggest that frames can be identified using "particular signature elements for a given frame," such as "metaphors, catch-phrases, or exemplars, depictions, and visual images." In contrast, Chong and Druckman (2007) suggest that in order to find frames, we need to find different attitudes towards a certain issue, because frames underlie these attitudes.

Here, we will define a frame as a device to highlight an aspect of a given issue, which might or might not also specify the presenter's stance. We first present previous work on framing and frame analysis, and then, we briefly present our work on supervised classification of parliamentary argumentative discourse by its use of various frames.

2. Related work

In computational linguistics, researchers have taken different approaches to operationalize the concept of framing. Boydstun et al. (2013) interpret frames as topics and present a coding scheme for content analysis of the issues. They categorized "framing" dimensions into fifteen categories, such as *economics, morality, fairness,* and *equality* frames. Then, they hand-coded the documents with a set of primary framing dimensions, and marked all the phrases, sentences, and paragraphs with any of the categories that they evoked. Boydstun et al. further suggested that hierarchical topic models can be used for identifying frames. Tsur et al. (2015) also considered various contexts of a specific topic as frames and tried to infer these frames using topic models and time series. In a related study, Nguyen et al. (2015) used hierarchical topic models to model issues and the associated "frames". They made use of bill texts, votes, and floor speeches of the U.S. Congress for their predictions. They further studied the topics that the Tea Party Republicans focused on and their voting patterns in the 112th U.S. Congress. These techniques, as we mentioned above, while useful from an analytic perspective, are merely modeling speeches on the topical and sub-topical level and do not tackle the problem of framing analysis.

Baumer et al. (2015) investigated various lexical and syntactic features to characterize framing language in political news stories. They reported that imagery, figurativeness, and other lexical features are important in identifying framing language.

In recent years, researchers have studied argument analysis of user postings. Cabrio and Villata (2012) used a textual entailment approach to find *pro* and *con* arguments in a set of debates selected from Debatepedia.[1] Boltužić and Šnajder (2014) proposed a categorization task of tagging user postings with a pre-existing set of frames. Their supervised classification model made use of entailment and semantic similarity features. To generalize their earlier work for various topics, Boltužić and Šnajder (2015) presented an unsupervised model to recognize frames by means of textual similarity. In a similar task, Hasan and Ng (2014) employed a probabilistic approach for stance and reason classification of user postings. Misra et al. (2015) took a supervised approach to classify dialogue postings by "argument facets" using lexical and semantic similarity features. These approaches focused on user-generated content in online forums. In contrast, we explore framing strategies in parliamentary discourse.

1 http://idebate.org/debatabase.

3. Corpus and annotation

For our frame prediction task, we use user-postings manually annotated with known frames as a training set and argumentative Canadian parliamentary speeches as a test set. The corpora that we conducted our study on are described in the following sections.

3.1. The ComArg corpus

The ComArg corpus,[2] developed by Boltužić and Šnajder (2014), is a corpus of user statements manually annotated with users' positions towards a specific topic (pro or con stance), and a set of pre-existing "arguments". These arguments are, in effect, *frames* in the sense that we introduced above, as each highlights certain aspects of the issue. The authors chose two different sources for collecting their data; the user statements are compiled from *ProCon.org*, where the statements are associated with a labelled *pro* or *con* stance, and the frames are taken from *Idebate.org*.

The corpus covers the two topics of g*ay marriage (GM)* and *Under God in Pledge (UGIP)*. Since the latter (regarding the Pledge of Allegiance) is an issue specific to the United States, we focused solely on the GM part of the corpus, which contains 198 statements and 7 pre-existing frames, shown in Table 1.[3] In this corpus, the pairs of statements and frames are annotated as *explicit attack, implicit attack, no mention, explicit support*, and *implicit support;* that is the statements *for* gay marriage can support the *pro* frames, and attack the *con* frames, and vice versa for statements opposing gay marriage. In this work, we only used the statements that explicitly (176 instances) and implicitly (98 instances) *supported* the pre-existing frames.

Table 1. ComArg frames on gay marriage.

Frame	Stance	Description
1	con	Gay couples can declare their union without resort to marriage.
2	pro	Gay couples should be able to take advantage of the fiscal and legal benefits of marriage.
3	con	Gay marriage undermines the institution of marriage.
4	pro	It is discriminatory to refuse gay couples the right to marry.
5	con	Major world religions are against gay marriages.
6	pro	Marriage is about more than procreation; therefore gay couples should not be denied the right to marry due to their biology.
7	con	Marriage should be between a man and a woman.

3.2. Argumentative parliamentary statements

For our test set, we focused on debates regarding same-sex marriage in the Canadian Parliament. In 2005, Bill C-38, *An act respecting certain aspects of legal capacity for marriage for civil purposes*, to legalize same-sex marriage in Canada, was introduced in the Parliament. Later that year, the bill was passed and the legal definition of marriage was expanded under the then-Liberal government to include conjugal couples of the same sex. After the Conservative Party of

2 http://takelab.fer.hr/data/comarg/

3 The third frame is modified to accommodate frames in our current corpus.

Canada gained power, the debate on same-sex marriage was re-opened in the Parliament in 2006; therefore, the issue was debated in the Parliament in two different periods of time. We selected speeches regarding same-sex marriage made by the members of the Canadian Parliament from both periods. The corpus described here consists of two sets of debate speeches. The first set consists of 136 sentences of the debate speeches. We took a similar approach to that of Boltužić and Šnajder (2014) for annotating our corpus. The statements were first examined with respect to the position of the speaker towards same-sex marriage, and assigned *pro, con*, or *no* stance. We further examined which of the pre-existing frames (described in Section 3.1) support the statements, and manually annotated them with one of the frames or none; Table 2 shows a few examples from our corpus. This annotation task was carried out by three annotators. To measure inter-annotator agreement, Weighted Kappa was computed for both stance (0.54), and for frames (0.46). For almost 90% of the statements, at least two annotators were in agreement, and these were kept as the final dataset. Some statements cannot be judged without their context, and annotators did not agree on the stance or the frame. After discarding the statements for which the annotators were not in agreement, the final set has 121 statements; 87 of these remaining statements are supported by one of the ComArg frames.

Table 2. Examples of frame and stance annotations from parliamentary discourse corpus.

Stance	**Frame**	**Parliamentary statements**
con	7	If marriage is just about a couple, then we simply would not need this net of cultural and legal obligations and norms.
pro	4	who among us would dare consider returning to a debate on the rights of women in our society or the rights of visible minorities?
–	5	Sweden and Canada are already creating a chill on expression of concern over same sex marriage. How can we criticize China for imprisoning those who practise their religion when we cannot offer protection of religious beliefs in Canada?
–	3	I am flabbergasted in the sense that this whole issue of the charter argument keeps coming up time and time again. If we sit back and look at it and analyze what is happening with the use of the charter in this country, the Liberals, the NDP and whoever else supports this kind of initiative, it is being used by them to cover up a myriad of sins. When I say a myriad of sins, look at it: decriminalization of marijuana, decriminalization of prostitution, and same sex marriage. It is all in the same basket, and the Liberals and NDP love to use the charter to that end. It is to the detriment of this country.

The second set of statements consists of the debate paragraphs with an average of 70 words. Unlike the first set, here, we asked the annotators to examine the speeches with respect to only the ComArg frames and ignore the stance. In total 400 paragraphs were annotated with one or more of the frames. The annotation task for this set was carried out by two annotators and to check the reliability, we computed Weighted Kappa (0.70). The disagreements arose in cases where the speaker used anecdotes or examples. These ambiguous speeches were discarded to create the final dataset. The statistics of the annotated corpora are presented in Table 3.

Table 3. Corpus statistics.

	ComArg annotations		Parliamentary annotations	
Frame	**Explicit**	**Implicit**	**sentences**	**paragraphs**
1	16	18	14	16
2	12	18	1	14
3	1	4	0	37
4	50	81	33	55
5	28	52	10	56
6	13	13	2	2
7	56	84	27	63
None	0	0	34	123

4. Methods

We took a supervised approach to predict frames in the parliamentary discourse. For this, we first use the ComArg corpus as we explained earlier to learn features that are likely to be associated with each frame. Then, we test the learned model to identify the frames in our parliamentary discourse corpus. In order to capture characteristics of each frame, we explore different features that are based on the similarity between the statements and the frames, as well as the features solely based on the statements.

Distributed representations are real-valued vectors that capture semantic and syntactic content of words and sentences. Recently, embedding models such as those of Mikolov et al. (2013), Wang et al. (2015), and Kiros et al. (2015) have provided an effective and easy way to employ word and sentence representations. Here, we use these word and sentence vector representations to measure the semantic textual similarity (STS) between the statements and the frames (Naderi and Hirst 2016). We compute two similarity scores between statements and frames; (1) the cosine similarity of sentence vectors, (2) the similarity score represented by a concatenation of the component-wise product of two vectors and their absolute difference (P&D) (Tai et al. 2015). We further studied the impact of adding the stance feature (Pro/Con) to the similarity scores as suggested by Boltužić and Šnajder (2014) for predicting the frames.

The features based on the statements include part-of-speech-tags, typed dependencies (Marneffe and Manning 2008), and distributed representations of the statements. Dependency relation features represent relationships between pairs of words. For example, the sentence *Everyone has equal rights*, is represented as: nsubj(has-2, Everyone-1), root(ROOT-0, has-2), amod(rights-4, equal-3), dobj(has-2, rights-4).

5. Experiment and results

Using the extracted features based on the textual similarity scores and stance feature, we train a support-vector machine model to predict frames in our first dataset of parliamentary sentences. Our baselines are the majority class and bag-of-words classifiers (with vectors weighted for term frequency and rare words removed). Tables 4 and 5 summarize our results. We observe that almost all models that use STS features outperform the baselines. Furthermore, in our first dataset, adding the stance feature to the cosine similarity scores gives an improvement of about

20 to 40 percentage points in accuracy above the baseline. Without using the stance feature, the best score was obtained by training the classifier on explicit and implicit instances with the P&D similarity score.

Table 4. Frame prediction results on parliamentary sentences. Boldface indicates best results.

Train	**Features**	**Accuracy (%)**
–	Majority Class (argument 4)	33.0
ComArg (Explicit+Implicit)	Bag of words	48.2
ComArg (Explicit+Implicit)	STS (Sum of vectors, cosine similarity, word2vec)	54.0
ComArg (Explicit+Implicit)	STS (Sum of vectors, cosine similarity, word2vec)+stance	**72.4**
ComArg (Explicit+Implicit)	STS (Sum of vectors, P&D, word2vec)	58.6
ComArg (Explicit+Implicit)	STS (Sum of vectors, P&D, word2vec)+stance	58.6
ComArg (Explicit+Implicit)	STS (Sum of vectors, P&D, syntactic embeddings)	50.5
ComArg (Explicit+Implicit)	STS (Skip-thought vectors, P&D)	50.5
ComArg (Explicit+Implicit)	STS (Skip-thought vectors, cosine similarity)	48.2
ComArg (Explicit+Implicit)	STS (Skip-thought vectors, cosine similarity)+stance	68.9

Despite the usefulness of the stance feature for these set of frames, we decided to ignore this feature for our other experiments and we relied only on the STS features and features that are based only on the statements for our second dataset. The reason for this is that we believe some frames can be used with either position; for example, the frame *impact of gay marriage on children* can be used with either *for* or *against* positions towards gay marriage. In addition to STS features, typed dependencies and vector representations of the statements proved to be useful features for predicting frames (more details of our results are given by Naderi and Hirst 2016). We see that across genre semantic textual features provide better features.

Table 5. Frame prediction results on debate paragraph corpus
using ComArg corpus (Explicit+Implicit). Boldface indicates best results.

Features	**Accuracy (%)**
Majority class (argument 7)	53.3
Bag of words	71.0
Dependency features	72.0
Sum of vectors, word2vec	72.9
Sum of vectors, syntactic embeddings	64.4
STS (Sum of vectors, P&D, word2vec)	**75.4**
STS (Sum of vectors, cosine similarity, word2vec)	61.8
STS (Sum of vectors, P&D, syntactic embeddings)	62.7
STS (Sum of vectors, cosine, syntactic embeddings)	61.4
STS (Skip-thought vectors, P&D)	59.3
STS (Skip-thought vectors, cosine similarity)	53.3

By comparing the predicted frames with the annotations, we noticed that in cases where anecdotes are used to frame the issue, some models were more susceptible to errors; for example:

> *Like Canada, the Netherlands has many historic ties to other parts of the world, such as Aruba in the Caribbean which, since 1986 has been a separate entity within the Kingdom of Netherlands. After a Dutch lesbian married an Arubian*

> *lesbian in the Netherlands, they moved to Aruba and expected their marriage would be recognized there. Instead, their application to register their marriage was denied amidst significant degrees of social pressure that ultimately compelled the couple to return to the Netherlands.*

The speaker uses an anecdote to express that it is discriminatory to refuse gay couples the right to marry. Moreover, during the debates, members of the Parliament usually refer to the opposing viewpoints, and relying on all the statements in the paragraph to predict the frame causes errors; therefore, more complex approaches will be required to successfully recognize the frames.

6. Conclusion and future directions

Given the complex nature of the parliamentary discourse, our initial results are promising. We further developed a manually annotated corpus for frame recognition in parliamentary discourse. Parliamentary data is a rich body of knowledge for debating strategies, and provides a diverse range of frames with respect to various issues. Considering the cost and labour-intensive process of annotating data for various frames of issues in order to automate the recognition of frames, we will rely on semi-supervised approaches, in which small labelled datasets along with large unlabelled ones are used in learning. Using the surface representation of the data, we will construct a model to provide a latent representation which captures the meaning of frames. This representation can be then used for classification.

References

Baumer E., Elovic E., Qin Y., Polletta F., & Gay G. (2015). Testing and comparing computational approaches for identifying the language of framing in political news. *Proceedings of NAACL HLT 2015, The 2015 Conference of the North American Chapter of Association for Computational Linguistics: Human Language Technologies, Denver, Colorado,* 1472–1482. Association for Computational Linguistics.

Boltužić F. & Šnajder J. (2014). Back up your stance: Recognizing arguments in online discussions. *Proceedings of the First Workshop on Argumentation Mining, Baltimore,* 49–58.

Boltužić F. & Šnajder J. (2015). Identifying prominent arguments in online debates using semantic textual similarity. *Proceedings of the 2nd Workshop on Argumentation Mining, Denver,* 110–115. Association for Computational Linguistics.

Boydstun A. E., Gross J. H., Resnik P., & Smith N. A. (2013). Identifying media frames and frame dynamics within and across policy issues. *Proceedings of the Workshop on New Directions in Analyzing Text as Data, London.*

Cabrio, E., Villata, S. (2012). Combining textual entailment and argumentation theory for supporting online debates interactions. *Proceedings of the 50th Annual Meeting of the Association for Computational Linguistics*: *Short Papers,* 208–212. Association for Computational Linguistics.

Card, D., Boydstun, E. A. and Gross, H. J., Resnik, P., & Smith, N. A. (2015). The Media Frames Corpus: Annotations of Frames Across Issues. *Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics and the 7th International Joint*

Conference on Natural Language Processing: Short Papers, 438–444. Association for Computational Linguistics.

Chong, D., & Druckman, J. N. (June 15, 2007). Framing Theory. *Annual Review of Political Science* 10, 103–126.

De Marneffe, M. C. & Manning, C. D. (2008). The Stanford typed dependencies representation. *COLING: Proceedings of the workshop on Cross-Framework and Cross-Domain Parser Evaluation*, 1–8. Association for Computational Linguistics.

De Vreese C. (2005). News framing: Theory and typology. *Information Design Journal + Document Design*, 13(1):51–62.

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication* 43 (4), 51–58.

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: a constructionist approach. *American Journal of Sociology* 95 (1), 1-37.

Hasan, K. S. & Ng, V. (2014). Why are you taking this stance? Identifying and classifying reasons in ideological debates. *Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP), Doha, Qatar*, 751–762. Association for Computational Linguistics.

Hirst G. (2007). Views of text-meaning in computational linguistics: Past, present, and future. In: Gordana Dodig Crnkovic and Susan Stuart (Eds.), *Computation, Information, Cognition - The Nexus and the Liminal*, Newcastle-upon-Tyne, Cambridge Scholars Publishing, pp. 270–279.

Kiros, R., Zhu, Y., Salakhutdinov, R., Zemel, R.S., Torralba, A., Urtasun & R., Fidler, S. (2015). Skip-thought vectors. *arXiv preprint arXiv*:1506.06726.

Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient estimation of word representations in vector space. *arXiv preprint arXiv:1301.3781*.

Misra, A., Anand, P., Tree, J. E. F. & Walker, M. A. (2015). Using summarization to discover argument facets in online idealogical [sic] dialog. *Proceedings of NAACL HLT 2015, The 2015 Conference of the North American Chapter of Association for Computational Linguistics: Human Language Technologies, Denver, Colorado*, 430–440.

Naderi N. & Hirst G. (2016). Argumentation mining in parliamentary discourse. *To appear in the Post-proceedings of the Computational Models of Natural Argument (CMNA-15) workshop in PRIMA 2015, Bertinoro.*

Nguyen V., Boyd-Graber J., Resnik P., & Miler K. (2015). Tea party in the house: A hierarchical ideal point topic model and its application to Republican legislators in the 112th Congress. *Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics and the 7th International Joint Conference on Natural Language Processing (Volume 1: Long Papers)*, 1438–1448. Association for Computational Linguistics.

Tai, K. S., Socher & R., Manning, C. D. (2015). *Improved semantic representations from tree-structured long short-term memory networks.* arXiv preprint arXiv:1503.00075.

Tsur O., Calacci D., & Lazer D. (2015). A frame of mind: Using statistical models for detection of framing and agenda setting campaigns. *Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics and the 7th International Joint Conference on Natural Language Processing (Volume 1: Long Papers)*, 1629–1638. Association for Computational Linguistics.

Wang, T., Mohamed, A. & Hirst, G. (2015). Learning lexical embeddings with syntactic and lexicographic knowledge. *Proceedings of the 53rd Annual Meeting of the Association for*

Computational Linguistics and the 7th International Joint Conference on Natural Language Processing (Volume 2: Short Papers), Beijing, China, 458–463. Association for Computational Linguistics.