

Argumentation Mining

Filip Boltuzic

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1 Definition of Argumentation Mining

Argument(ation) Mining is the automatic identification of the argumentative structure contained within a piece of language [Lawrence and Reed, 2017].

Argument mining is automatic extraction of arguments from natural text [Aker et al., 2017].

2 Tasks of Argumentation Mining

1. Identifying argumentative segments in text [Ajjour et al., 2017, Stab, 2017]
2. Clustering recurring arguments [Boltužić and Šnajder, 2015, Misra et al., 2017]
3. Recognizing argument schemes [Feng and Hirst, 2011].
4. Prediction of structure (connecting premises to claims) [Aker et al., 2017, Lawrence and Reed, 2017]
5. Claim detection (can be similar to argument segments in text) [Levy et al., 2017].
Can be context dependent [Levy et al., 2014] or independent [Lippi and Torroni, 2015]

2.1 Identifying argumentative segments in text

Unit segmentation consists in the splitting of a text into its argumentative segments (ADU) and their non-argumentative counterparts [Ajjour et al., 2017].

[Persing and Ng, 2016] rely on handcrafted features based on the parse tree of a sentence to identify segments. [Stab, 2017] uses sequence modeling and sophisticated features to classify the argumentativeness of each single word based on its surrounding words. [Eger et al., 2017] employ a deep learning architecture using different features based on the entire essay. [Al Khatib et al., 2016] have a rule-based where they suggest where the arguments should be split before the actual argument annotation (annotators could merge arguments back). [Aker et al., 2017] determine if a sentence is a claim, premise or none. They work on a sentence boundary. [Ferrara et al., 2017] model their approach as *attraction to topics*. In an unsupervised setting, they claim an argumentative unit is something that is highly related to one topic only working on a sentence level.

2.2 Clustering recurring arguments

2.3 Prediction of structure

[Lawrence and Reed, 2017] have annotated debates on “Moral Maze” and created argument diagrams via AIFDB. They aim to recognize the support relation from text (inference or non-inference). [Aker et al., 2017] use claim-premise pairs and go full Cartesian on them, making negative examples for those who aren’t linked in the gold set. They work on the [Stab and Gurevych, 2017, Aharoni et al., 2014] datasets. [Hou and Jochim, 2017] predict support/attack relations and stance classification at the same time (jointly). They assume arguments that attack each other have opposing stances.

2.4 Claim detection

[Ferrara et al., 2017] use topic modeling to predict which sentence is a claim, major claim or premise.

3 Unsupervised approaches to Argumentation Mining

Lack of large datasets for argumentation mining is one of the largest concerns of the community.

[Habernal and Gurevych, 2015] try to use unsupervised features for better argument component identification from online debate portals. [Al-Khatib et al., 2016] apply distant supervision to automatically create a large annotated corpus from online debate portals with argumentative and non-argumentative segments from several domains. [Lawrence and Reed, 2017] try to use web search in combination with *therefore* and *because* discourse indicators in addition to some other filtering. They make their own premise-conclusion pairs by searching the web for the discourse marker and then use LDA to predict support/non-support relations. [Levy et al., 2017] do unsupervised claim detection where they extract

sentences with “that” words in them and use them for claim detection. They acquire the sentences from Wikipedia (which is kind of distant supervision). They evaluate their work through crowdsourced data labels. [Ferrara et al., 2017] try to identify argumentative relations (see Subsection ??) using unsupervised topic modeling.

4 Predicting support relations

Predicting support relations is similar to textual entailment, but involves more contextual knowledge and common-sense reasoning since the semantic distance is greater. Also, it is not strictly a logical relation and (with a well-defined hypothesis-text relation), but (usually) there is a direction defined. [Lawrence and Reed, 2017] constructs a corpus using web-search and a gold set then does supervised classification whether a sentence supports (infers) another.

5 Ontology-based approaches to argumentation mining

[Szabo and Groza,] has an ontology on climate change and wants to solve textual entailment on debate texts. They extract t-h pairs from debate sites (which have annotated pro/cons) and use the ontology to improve classification (quite common knowledge base aid approach).

6 Cross-domain argumentation mining

[Ajjour et al., 2017] do argumentative unit segmentation on three corpuses: Habernal’s Web Discourse, Stab’s Essay corpus, and Editorials to show how cross-domain argumentative unit segmentation is a huge problem as it is defined today and even end with open questions about how should segmentation and argumentative units be defined.

References

- [Aharoni et al., 2014] Aharoni, E., Polnarov, A., Lavee, T., Hershcovich, D., Levy, R., Rinott, R., Gutfreund, D., and Slonim, N. (2014). A benchmark dataset for automatic detection of claims and evidence in the context of controversial topics. In *Proceedings of the First Workshop on Argumentation Mining*, pages 64–68.
- [Ajjour et al., 2017] Ajjour, Y., Chen, W.-F., Kiesel, J., Wachsmuth, H., and Stein, B. (2017). Unit Segmentation of Argumentative Texts. pages 118–128.
- [Aker et al., 2017] Aker, A., Sliwa, A., Ma, Y., Liu, R., Borad, N., Ziyaei, S. F., and Ghabadi, M. (2017). What works and what does not: Classifier and feature analysis for argument mining. pages 91–96.
- [Al-Khatib et al., 2016] Al-Khatib, K., Wachsmuth, H., Hagen, M., Köhler, J., and Stein, B. (2016). Cross-domain mining of argumentative text through

- distant supervision. In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, pages 1395–1404.
- [Al Khatib et al., 2016] Al Khatib, K., Wachsmuth, H., Kiesel, J., Hagen, M., and Stein, B. (2016). A news editorial corpus for mining argumentation strategies. In *Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers*, pages 3433–3443.
- [Boltužić and Šnajder, 2015] Boltužić, F. and Šnajder, J. (2015). Identifying prominent arguments in online debates using semantic textual similarity. In *Proceedings of the 2nd Workshop on Argumentation Mining*, pages 110–115.
- [Eger et al., 2017] Eger, S., Daxenberger, J., and Gurevych, I. (2017). Neural end-to-end learning for computational argumentation mining. *arXiv preprint arXiv:1704.06104*.
- [Feng and Hirst, 2011] Feng, V. W. and Hirst, G. (2011). Classifying arguments by scheme. In *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies-Volume 1*, pages 987–996. Association for Computational Linguistics.
- [Ferrara et al., 2017] Ferrara, A., Montanelli, S., and Petasis, G. (2017). Un-supervised Detection of Argumentative Units through Topic Modeling Techniques. pages 97–107.
- [Habernal and Gurevych, 2015] Habernal, I. and Gurevych, I. (2015). Exploiting debate portals for semi-supervised argumentation mining in user-generated web discourse. In *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*, pages 2127–2137.
- [Hou and Jochim, 2017] Hou, Y. and Jochim, C. (2017). Argument Relation Classification Using a Joint Inference Model. pages 60–66.
- [Lawrence and Reed, 2017] Lawrence, J. and Reed, C. (2017). Mining Argumentative Structure from Natural Language text using Automatically Generated Premise-Conclusion Topic Models. pages 39–48.
- [Levy et al., 2014] Levy, R., Bilu, Y., Hershovich, D., Aharoni, E., and Slonim, N. (2014). Context dependent claim detection. In *Proceedings of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers*, pages 1489–1500.
- [Levy et al., 2017] Levy, R., Gretz, S., Sznajder, B., Hummel, S., Aharonov, R., and Slonim, N. (2017). Unsupervised corpus-wide claim detection. pages 79–84.
- [Lippi and Torroni, 2015] Lippi, M. and Torroni, P. (2015). Context-independent claim detection for argument mining. In *IJCAI*, volume 15, pages 185–191.
- [Misra et al., 2017] Misra, A., Anand, P., Tree, J. E. F., and Walker, M. (2017). Using summarization to discover argument facets in online ideological dialog. *arXiv preprint arXiv:1709.00662*.

- [Persing and Ng, 2016] Persing, I. and Ng, V. (2016). End-to-end argumentation mining in student essays. In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, pages 1384–1394.
- [Stab and Gurevych, 2017] Stab, C. and Gurevych, I. (2017). Parsing argumentation structures in persuasive essays. *Computational Linguistics*, 43(3):619–659.
- [Stab, 2017] Stab, C. M. E. (2017). *Argumentative writing support by means of natural language processing*. PhD thesis, Technische Universität Darmstadt.
- [Szabo and Groza,] Szabo, R. and Groza, A. Analysing debates on climate change with textual entailment and ontologies. pages 39–46.