

# An Argument-Ontology for a Response-Centered Approach to Argumentation Mining

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## 1 Introduction

An interesting practical problem for argumentation mining is the detection of argument in a specific social or cultural context. Communicative-rhetorical actions may look like argument with overt or contentious linguistic markers (e.g., ‘well’, ‘but’, ‘that’s stupid’, ‘I disagree’) but may not function as argument. Communicative-rhetorical actions may include or point to reasons but without any obvious argumentative function (e.g., explaining, clarifying). Moreover, reasoning to resolve a difference can happen implicitly among participants with only traces of the jointly owned reasoning evident in the language use. The challenge becomes how to mine in a way that excludes language that only appears to be argumentative, while including the non-obvious uses of language for argument.

A *response-centered* approach for the context sensitive discovery and classification of argument in argumentation mining is outlined here. It is built around a conceptualization of argument as the use of language and reasoning in the context of disagreement for the purpose of managing disagreement or resolving differences of opinion (e.g., Jackson and Jacobs, 1980). The novelty of the approach is its *basic upper ontology*, which is designed on the idea that the argumentative use of reasons arise in the context of disagreement. The primary relation to be identified in argument mining is when a communicative-rhetorical action targets a prior action and calls out and makes problematic what has (could have) been said, meant, or implied. From here *lower levels of ontology* can be built in a principled way that can also incorporate insights of various argument formalisms (e.g., schemes, dialogues).

## 2 Theoretical Grounds

The response-centered approach builds from three key insights of argumentation theory and practice.

First, the argumentative functions of language use are not merely conveyed through a homogenous class of linguistic forms. “Instead of an isolable and homogeneous speech act, one finds a family of act types that vary in function and pragmatic logic depending upon the context of their use and

the form of their expression” (Jacobs, 1989, p. 350). The pragmatic context of those addressed, the practical activity and its discourse, and the dialogue activity factor into what constitutes argument.

Second, the pragmatics of interaction is consequential for what is argued and how, especially the way in which responses and countermoves take up and develop (or not) the propositional content at issue (Jacobs and Jackson, 1992). What is classically considered the essence of argument -- the fixing of the propositional content -- is often unexpressed, implicit, inarticulate, or simply taken for granted as understood.

Third, argumentative discourse unfolds sequentially while depending upon networks of overarching presumptions and underlying assumptions (Aakhus, Muresan, and Wacholder, 2013). The dynamic relationship between the explicit sequence of language use in interaction and the tacit network of assumptions and presumptions that are used argumentatively is known as “disagreement space” (van Eemeren, Grootendorst, Jackson, and Jacobs, 1993; Jackson, 1992).

Argument mining must contend with the creative uses of language, pragmatics of interaction, and the disagreement space – that is, arguing as a process not just argument as a product.

## 3 Ontology Design

A response-centered approach places a premium on identifying what is *targeted* and how it is *called out* as the means to discover actual argumentative uses of language and reason. Such an approach seeks to maximize the power of current Natural Language Processing methods while supporting the development and refinement of those methods for the discovery of argument practices. *Ontology* here refers to a set of concepts and relations among those concepts, a view that aligns with work on developing argumentation ontologies for the semantic web (e.g., Tempich et al., 2005).

### 3.1 Upper Ontology

There are two main concepts that form our upper ontology:

**CallOut:** A CallOut is a subsequent communicative-rhetorical action that selects (i.e., refers back to) all or some part of a prior action (i.e., Target). At a minimum, a CallOut implies the availability of alternatives to the Target's manifest meaning, its epistemic or deontic presumptions, or its use of reasoning (explicit or implicit).

**Target:** A Target is a part of a prior action (communicative or material action) that has been called out by a subsequent action.

These two concepts are connected by an **Argumentative Relation**, which can take particular forms depending on what is targeted and how it is called out.

The concepts Target and CallOut and the Argumentative Relation between them are key elements that identify the conditions for discovering the argumentative uses of reasons in managing disagreement. The Target and CallOut concepts are more basic than conventional argumentative structures such as premises and conclusions of a single contribution or a predefined dialogue type. The Upper Ontology defines the elements that make it relevant to look for conventional argument structures but that enable the discovery of unconventional structures and patterns.

### 3.2 Lower Ontology

Here we discuss features of a Lower Ontology and outline three key principled dimensions in its extension of the Upper Ontology toward finer grained aspects of naturally occurring argument.

*States of Affairs (SoA).* Targets might assert or assume particular SoAs and reasoning about SoAs that become marked by a CallOut. Targets can make (or presume) commitments to a SoA and use (or presume) some reason(s), while CallOuts problematize, elaborate, or project a Target's commitments or reasoning. The Argumentative Relation between a CallOut and a Target can be further specified based on what the CallOut targets about commitments to SoAs or Reasoning about SoAs (e.g., schemes, maxims). In this way, the most general and common relationships in the literature (e.g., Agree/Disagree; Support/Challenge) can be further specified as to whether it is the Premises, Reasoning, Conclusion or their combination that is being targeted. Doing so, however, will require further refinement of argumentative relations between Target and CallOut, such as Refutation, Rebuttal, Doubt, Challenge, or Dismissal.

A CallOut expresses (or presumes) its commitments to a SoA or reasoning about the SoA via an expressed or implicit Stance and Rationale. Each Target or CallOut may be further characterized in terms of relations between Stance and Rationale expressed by the contribution and how that relation is warranted by some known argument scheme (e.g., Cause, Generalization, Sign) or common sense principle particular to a discourse community (e.g., Maxim). The Stance and Rationale for a Target or CallOut is a premise-

conclusion relationship relative to some state of affairs evident in a single contribution to a discussion.

*State of Felicity.* Targets perform (or are taken to be performing) communicative actions that CallOuts can make arguable. A Target may have performed an action (e.g., Assertion, Explanation, Description, Promise, Request) and a CallOut can focus on the quality of the performance of that action or the relevance of that action within the presumed activity or institutional context. Instead of focusing on a Target's propositional content (i.e., Stance/Rationale about a SoA), CallOuts can highlight alternative SoF by, for instance, contesting the social-communicative commitments of an action, such as whether a request was effectively or legitimately made when planning or whether a particular kind of promise is suitable when negotiating. Differences about the SoF may indicate that the parties do not agree on the activity in which they are engaged, and thus the subject of argument becomes the kind of activity in which to be engaged.

A CallOut expresses (or presumes) its commitments to a SoF or reasoning about the SoF via an expressed or implicit Stance and Rationale. The CallOut can be characterized in terms of Stance and Rationale warranted by maxims and principles about felicitous performances and communicative relevance.

*Modality.* The Argumentative Relation between a Target and CallOut expresses some modality of difference or opposition. The modality will vary according to whether SoA or SoF are called out and the degree of difference or opposition expressed. Beyond agree/disagree relations, a CallOut may challenge, redirect, or reframe the communicative relevance of a Target. The modality of argumentative relations can be further specified, for example, by Agreeing, Accepting, Embracing, Denying, Defending, Disagreeing, or Objecting.

## 5 Conclusion

This paper has proposed a design for an extensible argument-ontology for a response-centered approach to argumentation mining. The Upper Ontology and the Lower Ontology are grounded in the insights from research on natural argument that emphasizes argument as a pragmatic and social phenomenon. Earlier versions of an ontology for a response-centered approach to argumentation mining have been successfully implemented (Wacholder et al., 2014; Ghosh et al., 2014). The approach offers some direction forward in contending with the challenges of detecting argumentative uses of reason in specific social and cultural contexts. This contributes to further development of context sensitive discovery and classification of argument and promises to complement existing ontologies of conventional argument forms.

## References

[Aakhus et al., 2013] Aakhus, M., Muresan, S., & Wacholder, N. Integrating natural language pro-

cessing and argumentation theories for argumentation support. In: *Proceedings of Ontario Society for the Study of Argumentation 10: Virtues of Argumentation* (pp. 1–13), 2013.

- [Ghosh et al., 2014] Ghosh, D., Muresan, S., Wacholder, N., Aakhus, M., & Mitsui, M. Analyzing Argumentative Discourse Units in Online Interactions. In *Proceedings of the First Workshop on Argumentation Mining* (pp. 39–48), 2014. Baltimore MD: Association for Computational Linguistics.
- [Jackson and Jacobs, 1980] Jackson, S., & Jacobs, S. Structure of conversational argument: Pragmatic bases for the enthymeme. *Quarterly Journal of Speech*, 66(3), 251–265, 1980.
- [Jacobs, 1989] Jacobs, S. Speech acts and arguments. *Argumentation*, 3(4), 345–365, 1989.
- [Jacobs and Jackson, 1992] Jacobs, S., & Jackson, S. Relevance and Digressions in Argumentative Discussion: A Pragmatic Approach. *Argumentation*, 6, 161–176, 1992.
- Tempich, C., Pinto, H. S., Sure, Y., & Staab, S. (2005). An argumentation ontology for distributed, loosely-controlled and evolving engineering processes of ontologies (DILIGENT). In *The Semantic Web: Research and Applications* (pp. 241-256). Springer Berlin Heidelberg.
- [Eemeren et al., 1993] Eemeren, F. H. van, Grootendorst, R., Jackson, S. & Jacobs, S. Reconstructing argumentative discourse. Tuscaloosa, AL: University of Alabama Press, 1993.
- [Wacholder et al., 2014] Wacholder, N., Muresan, S., Ghosh, D., & Aakhus, M. In: Annotating Multiparty Discourse: Challenges for Agreement Metrics. *Proceedings of LAW VIII - The 8th Linguistic Annotation Workshop*, 120–128, 2014.