

Modeling Argumentation and Explanation in the Social Web

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Abstract

This manuscript provides the research questions, proposed research plans, as well as expected contributions of my doctoral dissertation. My dissertation is primarily focused on providing computational approaches to study and analyze dialectical reasoning in large-scale online platforms. In particular, I aim to tackle the challenge of developing novel models to automatically classify explanation and argumentation as two different types of reasoning in text of discourse on the Web. The resulting models can be incorporated in the social Web environments to increase participants' awareness of others' reasoning types, which may lead to a more effective dialogue protocol and strategy.

Introduction and Background

The social Web allows crowd to gather and interact at a massive scale, which may result in exhibiting intelligent and problem solving features that is greater than what single computers and individual humans can ever achieve. In many social platforms, such as discussion fora and deliberation tools, this interaction takes place through discourse and dialogue exchange, where people can ideate, discuss, and deliberate collectively. To effectively harness the intelligence and problem solving capabilities of human collectives, it is necessary to understand how intelligence emerges from online dialogues and to determine the effects of various aspects of a dialogue on the collective intelligence phenomenon.

A particular aspect of interest is the study of dialectical reasoning, in which people follow certain rules to move from some initial assumptions toward conclusions and statements (Walton 1990). According to Walton (Walton 1990), reasoning can occur in argument or in the context of explanation. Arguments are normally used to convince and persuade other participants, whereas explanations are offered to help others understand the conclusion or the claim that they already accepted as a fact.

Even though argumentation and argument mining has been extensively studied in artificial intelligence research, relatively little attention has been paid to the explanation and to computationally differentiate between the two. Taking into account both explanation and argumentation, Bex et

al. (Bex et al. 2010; Bex and Budzynska 2010) have provided basic conceptual models to address this issue, but, to the best of our knowledge, no concrete computational method has been proposed to automatically classify argumentation and explanation in a given text of discourse. However, it is important to distinguish between the two as "the type of reasoning used might influence the allowed and desired moves in a dialogue" (Walton 1990). In addition, the criterion used to identify false arguments, such as being circular, are not applicable on explanations. Thus, explanations might be incorrectly labeled as fallacious arguments, which can be misleading (Walton 1990).

Research Questions

The focus of my thesis is on developing natural language models to analyze reasoning in text of discourse and to effectively identify argumentation and explanation as two separate reasoning types. In particular, I will focus on the following research questions:

- Which linguistic theories and methods can play an effective role in building models to distinguish between explanation and argumentation in the context of dialogue? and how these methods can be utilized to build models with high precision and recall?
- Is there any difference in the properties of argumentation and explanation in large-scale Web-based platforms compared to traditional small-scale and one-to-one settings? If yes, how these differences can be effectively encoded into the models?
- How the resulting models can be incorporated in the social Web platforms to positively influence the collective intelligence phenomenon?

Proposed Research Plans

To address the first research question, I plan to employ several theories and methods in building models to distinguish between the two reasoning types. Inspired by some prior studies, I hypothesized that the use of speech act theory (Searle 1969), Rhetorical Structure Theory (RST) (Mann and Thompson 1987), as well as sentiment analysis (Pang and Lee 2008) can be effective in building such models.

It has been argued (Walton 2004; 2007; Bex and Budzyska 2010) that the effective classification of argumentation and explanation relies on the analysis of connections between the reasoning product and the intentions of the participants. Such intentions can be captured by the analysis of the context of reasoning. Thus, a potentially effective approach is to analyze the illocutionary force of the speech acts in the context of dialogue (Bex and Budzyska 2010). For example, explanation can be seen as a kind of speech act offered to address a request. Since request is a basic type of speech act, explanations can be identified when provided to address a somewhat explicit request (Walton 2004). Hence, I plan to utilize ideas from speech act theory to determine whether a piece of text is argumentation or explanation.

RST (Mann and Thompson 1987) can provide another effective tool to classify the reasoning types. RST has been recently used to identify justifications and arguments in the social Web (Biran and Rambow 2011), where the existence of certain discourse structures has been considered argument indicators. I plan to extend this approach by conducting further analysis on discourse relations and their potential connections to different types of reasoning.

As discussed, the purpose of argumentation is to address an unsettled issue, while the explanation is offered to help others understand a previously agreed upon fact (Walton 1990). Therefore, it is expected that emotions may come into play in argumentation. Therefore, sentiment analysis may also contribute to distinguishing argumentation from explanation and so will be taken into account in my approach.

I plan to build several models based on the aforementioned ideas. These models will iteratively be evaluated on small-scale discussions and will be modified accordingly until the best approach is found. The dataset that I plan to use has been recently collected in our laboratory, where different groups of five participants were recruited to deliberate and solve a murder mystery adopted from the mystery presented in (Stasser and Stewart 1992). This dataset has been already transcribed and annotated. I am currently at the beginning of this step and it is planned to be complete by 10/2014; thus, it is expected that some of these methods are already tested and primary results are collected by the time of the workshop.

To address the second research question, models built in the first step will be utilized along with other empirical methods to understand the potential differences in the peoples' reasoning strategies in web-based large-scale environment compared to traditional small-scale settings. If differences are found, models from the first step will be adjusted to suit the online data. I will explore different online datasets for this phase of the study. An interesting option is Wikipedia's article for deletion dataset, where Wikipedians deliberate and reason to decide whether an article should be deleted. This step is expected to be complete by 06/2015.

Responding to different types of reasoning in the right way can be influential in directing a dialogue towards the collective goal of the participants (Bex and Budzyska 2010). Hence, I intend to incorporate the models into web-based environments through human-computer interaction and information visualization tools, allowing participants' to understand other parties' type of reasoning and respond

accordingly. Then, I will utilize empirical methods and user studies to evaluate the effectiveness of our approach. This step allows us to understand whether increasing participant's awareness of the type of reasoning utilized by other parties can indeed influence their collective intelligence. This step is expected to be complete by 04/2016.

Expected Contributions

Building computational models to automatically distinguish between argumentation and explanation in text of discourse is a multidisciplinary, challenging, and a novel task. My work can contribute in the artificial intelligence research by providing models to analyze and study dialectical reasoning. As well, this study is expected to improve our knowledge of textual properties that are specific to each of the two type of reasoning, which can later be utilized to generate models for argumentation and explanation generation in a dialogue. This work can also contribute to the philosophy and sociology research as the resulting models can be utilized to understand peoples' reasoning strategies in the social Web. In addition, incorporating such models into the web-based platforms can positively influence crowd's dialogue protocol and strategy, which may finally lead to higher levels of collective intelligence and problem solving.

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