

Title	AN ARGUMENTATION-BASED FRAMEWORK FOR PRACTICAL REASONING
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Polarization, especially political polarization is becoming a severe problem all over the world. One of its peaks is at the 2020 United States presidential debates. Through watching the presidential debates, audience usually seek for information related to topics they concern about to help them decide which candidate they will vote for. However, the debates in 2020 were probably the most chaotic one in history. Audience might find themselves drown in quarrels and interruptions without perceiving what each candidate trying to say. We want to propose an application that can help the audiences to have a better understanding about the narrative of both candidates by visualizing how they arrange their own arguments and counterattack each other's, therefore, contributing to bridging the gap of polarization.

Researchers have introduced a various of ways to analyze the debate or, in general, dialogues. Traditionally, there is rhetoric analysis that done by expert focusing on the nuance, implicit messages as well as strategies a speaker might have. With the help of machine learning techniques, in recent years word frequency analysis and quazar graph come into existence. The word frequency analysis counts the occurrence of key words in a dialogue and visualize it in a tag cloud where the font size of each key word is directly proportional to its frequency. Quazar graph on the other hand treat key words as entities and visualize them in a graph where entities are nodes and each edge between two nodes indicates their co-occurrence within a speech.

Although these aforementioned approaches have their irreplaceable advantages, they may not serve our purpose as a whole. Rhetoric analysis is precise and profound, but it is overwhelming for people without sufficient background knowledge. Machine learning based approaches are automatic or semi-automatic but lack explicit explanation about how two entities interact.

Thus, we turn to logic based methods for they can present their reasoning procedure explicitly which not only suit our aim but also satisfy the requirements of explainable artificial intelligence (XAI). However, commonly used expert system such as ontology cannot deal with information that contains conflicts which is exactly the characteristics of a debate. Bear this in mind, we finally decide to build a system based on abstract argumentation frameworks that is instantiated following natural deduction based structured argumentation (NDSA) frameworks.

Our system is called NDSA based visualization. When an inconsistent knowledge base written in propositional logic that developed from a preposessed debate or more generally a dialogue is inputted, our system will first model the knowledge base as a set of arguments and their attack relations and visualize it as a directed graph with arguments as nodes and attacks as edges. Moreover, following the insights in NDSA, we draw dispute trees as an explanation for an argument and its relationship with other arguments and derive a natural deduction proof as an explanation from the premises to the claim within an argument. We also translate the natural deduction proof to natural language explanations improving intelligibility.

We further apply our system to a fragment of the second presidential debate showing that our system can model real debate and provide human-friendly explanations to the users.