A study of modeling 2-tier argumentation framework with modified Toulmin structure

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Argumentation, which exists everywhere, is a manifestation of human intelligence. Arguments arise when there is a conflict between the statements (arguments) that one wants to express. When we are faced with a large amount of information with opinions, such as legal regulations, user-generated texts in social media, scientific articles, etc., obtaining and analyzing these arguments is an important research direction in artificial intelligence, urged to emerge the development that focuses on analyzing arguments from auto-generated data (a.k.a. argument mining).

Dung's pioneering theory of abstract argumentation explains its wide application as a general framework for all kinds of non-monotonic reasoning, and more generally, reasoning in the presence of conflict. Dung's argumentation framework is instantiated by arguments and binary conflict-based attack relations, based on some underlying logical theoretical definitions. However, the description of each argument itself in Dung's proposal is not detailed enough, we hope to provide a structure for each argument. Toulmin proposes an argumentation model in which claims against challenges can be defended. This model replaces the traditional concepts of "claim" and "premise" with new concepts such as "claim", "evidence" and "warrant".

In our study, the design of Toulmin was adjusted to propose a simplified Toulmin's structure. We show that Toulmin's idea provides a visual interpretation of logic-based arguments and produces a human-comprehensible form. Then, this thesis implements the findings and proposes a novel 2-tier Argumentation Framework that combines the advantages of Toulmin's model and Dung's Framework. To demonstrate its effectiveness, we consider the available datasets annotated in Toulmin's method. We develop machine learning models by using Argument Mining techniques to automatically indicate each components of Toulmin's scheme from text.

Finally, combining the results of the machine learning model and the 2-tier Argumentation Framework we just mentioned, we built a 2-tier Argumentation Framework system to achieve the purpose of allowing people to better understand the arguments that appear in the text.

Keywords: Argumentation Framework, Toulmin Model, Argument Mining, Project Debater Datasets