# Introduction

Argumentation is increasingly becoming a popular aspect of Artificial Intelligence that deals with the creation of knowledge systems and evaluation of decision problems. Past and current research has allowed for the development of various argumentation frameworks that allow the analysis arguments by formulating them in a formal manner and evaluating them. This project focuses mostly on Assumption-Based Argumentation (ABA) and its implementation through a practical argumentation system. ABA is form of argumentation where arguments and attacks are notions derived from primitive notions of rules in a deductive system, assumptions and contraries thereof (1). This framework allows for the evaluation of a conclusion based on whether it is supported by a “winning” set of arguments. Such sets of arguments and assumptions can be determined as “winning/acceptable” based on a number of different semantics that ABA supports, which are discussed in more detail later on in the report.

Therefore, ABA is a potentially powerful tool which one could use to establish the validity of the conclusion put forward. Early successful application of argumentation theory and the ABA framework have occurred in fields such as legal-reasoning, medical diagnosis and decision theory. Within these fields ABA has been used not only because of its ability to determine propositions as acceptable, but also due to its ability to convey the derivation process to the user. There are various computational mechanisms that have been devised to algorithmically compute the acceptability of a claim. Using these mechanisms argumentation engines, such as proxdd and grapharg (REFERENCE), have been implemented thus allowing for the computation of acceptability of a claim under a defined ABA framework. Nonetheless, these engines are still at a primitive stage and require enhancing for ABA to become a widely accepted and applied tool in the real world.

Namely, there is a lack of an application that is easily accessible to users and provides both satisfactory performance and useful visualisations of the argument. The difficulties involved with creating such an application are multifold. These involve the performance of the underlying engine when dealing with large scale real problems, the difficulty a user might face in devising a correct ABA framework for their problem and devising a visualisation system to accurately convey the derivation process to the user. Additionally, the engines themselves are still at an early stage and need to be extended. For example the proxdd and grapharg systems derive the acceptability of a claim based on the “admisability” and “completeness” semantics, but lack the ability to do so in accordance to the “grounded” and “ideal” semantics. Lastly, there is a lack of generalisation of these systems. At their current state they aim at simply resolving ABA frameworks directly implemented into the engine. This restricts the usability of the system to users who intend to use just ABA and have significant knowledge of ABA to device the initial framework of their problem.

The project’s objectives centre around providing solutions to the problems mentioned above by fulfilling the requirement for a web-based argumentation application that will allow users to exploit the existing ABA systems. The web-application should act as a platform that will provide the users with good user experience and the ability to easily and as seamlessly as possible interact with the ABA systems in the back end. Having computed the necessary derivation the user will be provided with the output in a useful and meaningful manner in the form of a visualisation. The end system would be similar to the ASPARTIX system implemented by TU Wien (REFERENCE). Having established the web-application, the project will then seek to enhance the existing systems by enabling them to compute based on some of the missing semantics mentioned above. Potentially the project might look in the development of a simple API for these engines. Lastly, the web-application might be extended to support Abstract Argumentation through its mapping to ABA as described by (TONI REFERENCE) and allow the direct input of decision problems as described in (FAN REFERENCE).