

Elements of Argumentation

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Preface

Logic-based formalizations of argumentation that take pros and cons for some conclusion into account have been extensively studied over a number of years, and some basic principles have now been clearly established. These formalizations assume a set of formulae and then lay out arguments and counterarguments that can be obtained from these assumed formulae.

More recently, attempts have been made to refine these formalizations in order to more closely capture practical argumentation as used in the real world. This has led to techniques for selecting and reforming the more appropriate arguments and counterarguments for use in problem analysis and decision making. These techniques identify the better arguments based on (1) taking into account intrinsic aspects of the arguments such as their relative consistency, the exhaustiveness of the consideration of counterarguments, and the relative similarities between arguments and (2) taking into account extrinsic factors such as the impact on the audience and the beliefs of the audience.

The aim of this book is to introduce the background and techniques for formalizing argumentation in artificial intelligence and, in particular, to cover the emerging formalizations for practical argumentation. This coverage includes considering how arguments can be constructed, how counterarguments can be identified, how key intrinsic and extrinsic factors can be analyzed, and how these analyses can be harnessed for formalizing practical argumentation. As a part of this coverage, we aim to elucidate and formalize some of the key elements of argumentation.

This book focuses on argumentation by an agent presenting a case for some claim. This involves providing an initiating argument for the claim; then providing undercuts to this argument; and then, by recursion, providing undercuts to undercuts. Each undercut is a counterargument that

contradicts the premises of an argument. This approach to argumentation can be described as monological as opposed to dialogical.

In monological argumentation, there is a set of possibly conflicting pieces of information (each piece of information is represented by a formula) that has been collated by some agent, or pooled by a set of agents, and the role of argumentation is to construct a constellation of arguments and counterarguments pertaining to some particular claim of interest (i.e., the subject of the argumentation). The presentation of arguments by an agent may then be for the agent to analyze some pieces of information for his or her own purposes (auto-argumentation) or to present them to some audience (e.g., a politician giving a speech to members of an electorate, a journalist writing an editorial in a newspaper, a clinician explaining a treatment plan to a patient, etc.).

In contrast, dialogical argumentation is conducted between two or more agents and involves more complex issues of multi-agent interaction, dialogue protocols, and strategies. This book does not cover dialogical argumentation. However, it is clear that progress in formalizing monological argumentation is necessary for developing better dialogical argumentation systems.

The intended audience for this book consists of researchers interested in the knowledge representation and reasoning issues surrounding argumentation, either to study existing formalisms or to apply and adapt techniques for real problems. The intended readers are therefore in artificial intelligence and computer science. In addition, it is hoped that the book may be relevant to a wider range of readers in logic, philosophy, linguistics, and cognitive science and that it could be used as a primary or secondary text for advanced undergraduate and postgraduate courses in logic and argumentation. Readers will be expected to have had some exposure to classical propositional and predicate logic, though appendix C is a review to remind the reader of the basic concepts and notation. No other prerequisites are assumed.