Argumentation Machines: New Frontiers in Argumentation and Computation

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Argumentation may be defined as the study of different aspects of (human) interactions whose objective is to reach a conclusion about the truth of a proposition or the adoption of a course of action. The aspects in question include the argumentation interaction, which is typically a dialogue; the construction and presentation of arguments for or against a proposition; the interpretation of arguments; the knowledge representation required to build and interpret arguments; theory of rhetoric; and applications such as agent negotiation, legal argument, and decision-support systems.

Argumentation is a rich interdisciplinary area of study, which so far has largely been considered separately by practitioners in different fields. To address this problem, Reed and Norman brought together researchers in argumentation, artificial intelligence, law, linguistics, and philosophy, with the aim of writing a book about argumentation that would foster interdisciplinary work (see the book's Preface).

The book comprises six chapters, each written by a different group of people, which cover diverse areas where argumentation has computational implications. Chapter 1 introduces the book. Chapters 2–4 consider argumentation in the context of multiagent, decision-support, and legal systems, focusing on rhetorical and representational issues that need to be taken into account when implementing such systems. Chapters 5 and 6 address computational aspects of the implementation of argumentation systems. As indicated in its Preface, the book distances itself from logical approaches to argumentation, and instead focuses on natural language interactions and conversational scenarios. The six chapters of the book are outlined below.

"A Roadmap of Research in Argument and Computation," by Reed and Norman, motivates the subsequent chapters and provides background on three main areas of research that are relevant to these chapters: artificial intelligence, rhetoric, and multiagent systems. The discussion is supported by an extensive list of references (although there are some omissions).

In "Argument and Multi-agent Systems," by Norman, Carbogim, Krabbe, and Walton, the authors address issues at the intersection of argumentation and multiagent systems. The discussion starts by contrasting argumentation theory with agent communication along two main dimensions: dialogue-structure/interaction-protocols, and beliefs/commitments. The chapter then proceeds to describe different types of dialogue, argument schemas (Walton 1996), and models of agent dialogue. A recurrent

theme is the argument in favor of commitment-based agent communication instead of belief-based communication.

"Decision Support for Practical Reasoning," by Girle, Hitchcock, McBurney, and Verheij, explores the application of argumentation to practical reasoning systems, proposing a theoretical basis for the design of decision-support systems. The chapter covers several aspects of decision-support systems from an argumentation perspective: argument schemas, decision calculi, reasoning under resource constraints, moral considerations, and deliberation dialogues. It also discusses the design of interfaces and the evaluation of decision-support systems.

"Computational Models, Argumentation Theories, and Legal Practice," by Bench-Capon, Freeman, Hohmann, and Prakken, examines the contribution of computational models and argumentation theories to legal practice. The chapter uses a detailed legal case study to introduce the stages of legal argumentation. It then discusses how argumentation theory contributes to legal argument, and how AI-and-law systems have implemented the different stages of legal argumentation. Particularly noteworthy is the detailed grid that shows the argumentation processes that have been implemented in existing AI-and-law systems.

"The Persuasion Machine," by Gilbert, Grasso, Groarke, Gurr, and Gerlofs, explores the problems and challenges of building a persuasion machine. The main features of the Persuasion Machine described here are its use of argument schemata and its distinction between the logical and rhetorical facets of persuasion. The chapter describes in some detail each step of the argumentation process, focusing on the main components of the machine: the Argument Engine, which analyzes a user's arguments and constructs its own arguments, and the User Image, which represents a user's norms, values, attitudes, and beliefs.

"Computational Models of Rhetorical Argument," by Crosswhite, Fox, Reed, Scaltsas, and Stumpf, uses theories of rhetoric, computational linguistics, and knowledge representation to build a computational model of rhetoric. The chapter's main drivers are the use of rhetorical argument schemata (Das et al. 1997), the central placement of audiences in the argumentation process (Perelman and Olbrechts-Tyteca 1969), and the role and purpose of a system in a given scenario. Of particular interest is the discussion about contextualized knowledge and the formal model developed by McCarthy and Buvač (1998) as a basis for a computational model of rhetoric.

As indicated in its Preface, this book was written in the space of a week, and as such, it is a tremendous achievement. However, its framework may be responsible for a certain "lack of consensus," in the sense that the chapters are quite independent, and there isn't a clear formulation of the fundamental advances in the field. Thus, argument schemas, which are such an advance and pervade the entire book, are briefly reintroduced in every chapter, instead of being presented in one authoritative chapter. Likewise, the last two chapters are similar in their attempt to operationalize the argumentation process, but present different approaches without cross-referencing.

This book is aimed at diverse audiences, which include argumentation theorists, computational linguists, AI researchers, and law researchers. From the perspective of AI and computational linguistics, I found that the book provides a good coverage of qualitative-reasoning approaches to argumentation. However, it either dismisses or ignores quantitative and probabilistic approaches. Specifically, chapter 3 gives a somewhat ill-advised critique of decision calculi in the context of decision-support systems, and fails to mention anytime algorithms (Dean and Boddy 1988) in the context of reasoning under resource constraints. Probabilistic reasoning as a way of combining and weighing alternatives is mentioned only once in the book. Worse yet, the

field of user modeling is ignored: The authors coined the term "user image" to represent what most of us know as a user model (Kobsa and Wahlster 1989).

From a methodological point of view, an underlying assumption seems to be that rule-based and qualitative reasoning should be used for selecting among alternatives at each stage of the argumentation process. In addition, as stated above, the book focuses on a schema-based approach to argumentation, as a counterpoint to previous work, which has focused on "structural components of argumentation in a highly logical style" (chapter 1). Clearly, the study of schema-based argumentation is a worthwhile endeavor. However, it would have been better if the book had, at least in part, considered a combination of these approaches, rather than swinging completely to the "rhetorical approach only" side.

Despite these criticisms, I believe that this book represents a generally useful, although somewhat biased, account of the field of argumentation. As an AI and computational linguistics researcher, I found the argumentation perspective on multiagent, decision-support, and legal systems particularly illuminating, as well as the discussion on contextual knowledge. Also, an appealing feature of the book is its consideration of research issues, with most of the chapters including a rather detailed section on future areas of research.

I would recommend this book to graduate students or researchers who intend to work in argumentation. However, at the same time, I would suggest reading the book critically and complementing it with material about quantitative and probabilistic methods and user modeling.

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Ingrid Zukerman is an associate professor in computer science at Monash University, Melbourne, Australia. Her areas of interest are discourse planning, argumentation, plan recognition, question answering, and agent modeling. Zukerman's address is School of Computer Science and Software Engineering, Monash University, Clayton, Vic 3800, Australia; e-mail: Ingrid. Zukerman@infotech.monash.edu.au.

@inproceedings{Reed2004ArgumentationMN, title={Argumentation Machines, New Frontiers in Argument and Computation}, author={C. Reed and Timothy J. Norman}, booktitle={Argumentation Machines}, year={2004} }. C. Reed, Timothy J. Norman. Published in Argumentation Machines 2004.Â This book represents the first coherent published work in bringing together various branches of artificial intelligence with argumentation and rhetoric, and, as such, aims to play a key role in the establishment of a new field of scholarly research. The volume not only offers in-depth assessments of existing research, but also represents a substantial advance in the state of the art, and lays out a roadmap for future work in this newly emerging cross-disciplinary field. Argumentation mining aims at automatically extracting structured arguments from unstructured textual documents. It has recently become a hot topic also due to its potential in processing informatio...Â 2004. Computational models of rhetorical argument. In Argumentation Machines (Argumentation Library), Chris Reed and Timothy J. Norman (Eds.), Vol. 9. Springer, Netherlands, 175--209.Google Scholar. Aron Culotta, Andrew McCallum, and Jonathan Betz. 2006. Integrating probabilistic extraction models and data mining to discover relations and patterns in text. In Reed, Chris and Norman, Timothy (eds.), Argumentation Machines: New Frontiers in Argument and Computation. Dordrecht: Kluwer, 15â€"54. Parsons, Simon, and Jennings, Nicholas R. (1996).Â Reed, Chris (1997). Representing and applying knowledge for argumentation in a social context. AI & Society 11 (3â€"4): 138â€"154. Reed, Chris (1998). Chris Reed's Publications. Note that in every case, you should obtain agreement from the copyright holder before downloading. 2020. Jo, Y., Mayfield, E., Reed, C. & Hovy, E. (2020) "Machine-Aided Annotation for Fine-Grained Proposition Types in Argumentation" in Language Resources and Evaluation Conference (LREC 2020). Visser, J., Lawerence, J., Reed, C., Wagemans, J. & Walton, D. (2020) "Annotating Argument Schemes", Argumentation, . Sort by: year | type. Oct 28, 2020 05:58. 2019. Gemechu, D. & Reed, C. (2019) "Decompositional Argument Mining: A Gener You can write a book review and share your experiences. Other readers will always be interested in your opinion of the books you've read. Whether you've loved the book or not, if you give your honest and detailed thoughts then people will find new books that are right for them. 1.Â 1 A Roadmap of Research in Argument and Computation Chris Reed and Tzmothy J. Norman 1.1. Introduction 1.2. Research in Argument and Computation 1.3. Conclusions. 2 2 12.Â ARGUMENTATION MACHINES. up a post with the Medical Research Council, for whom he worked on clinical decision making and computer-based decision support systems. In 1981 he joined the Imperial Cancer Research Fund's laboratories in London, where he set up the Advanced Computation Laboratory.