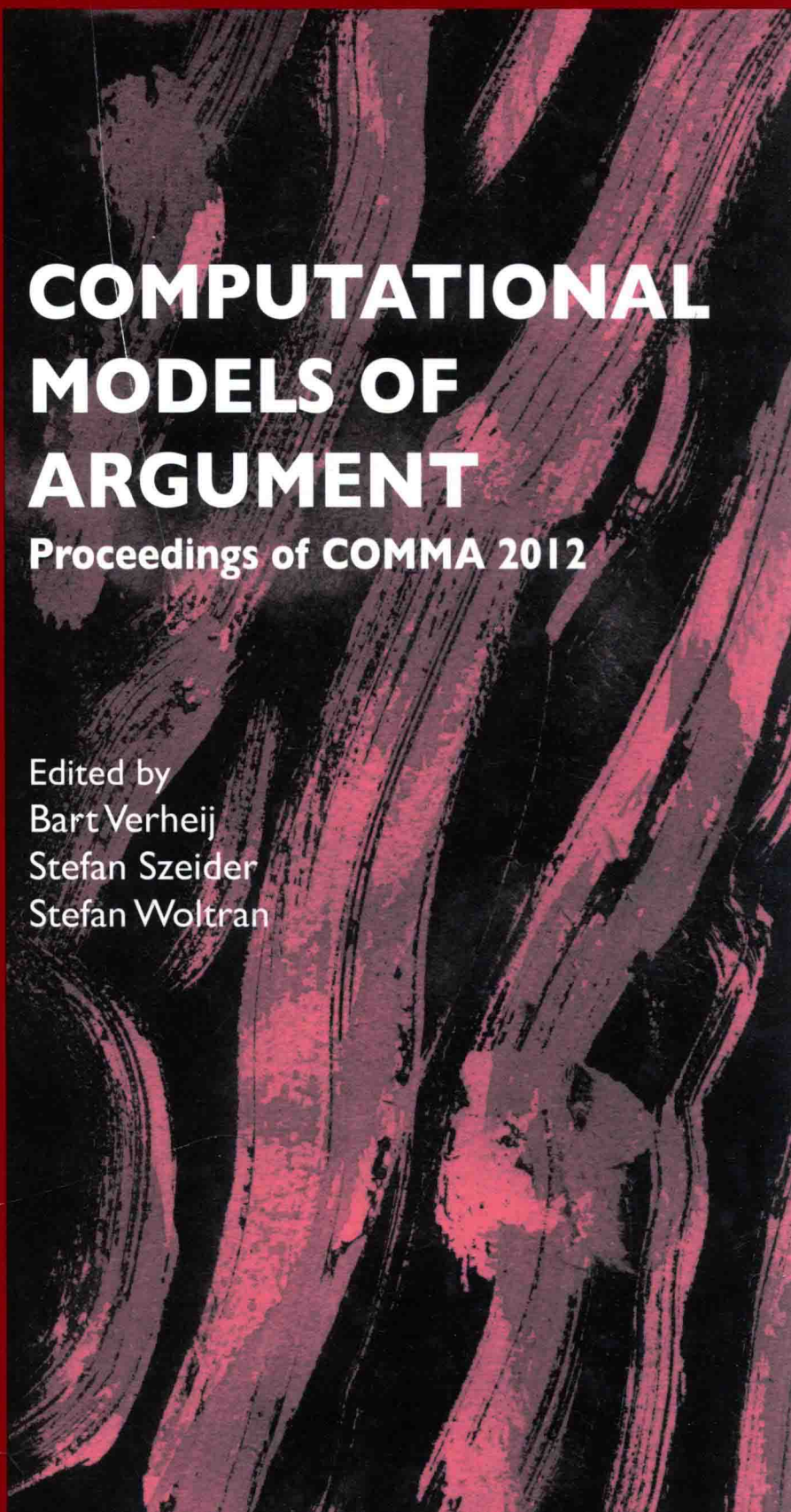
Frontiers in Artificial Intelligence and Applications



COMPUTATIONAL MODELS OF ARGUMENT

Proceedings of COMMA 2012

Edited by
Bart Verheij
Stefan Szeider
Stefan Woltran

IOS Press

Computational Models of Argument

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Frontiers in Artificial Intelligence and Applications

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Computational Models of Argument
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Preface

The topic of argumentation, already studied in Antique philosophy, has seen major innovations since the advent of the computer age. Software exists for the creation and evaluation of arguments in high-stake situations, such as medical diagnosis and crime investigation; formal systems help appreciate the role of value judgments underlying opposing positions; and one can enter in argumentative dialogues as if playing a computer game.

Since its start in 2006, the biennial conference series on Computational Models of Argument (COMMA) has been a successful forum for researchers studying argumentation using formal and computational tools. In September 2006, the University of Liverpool organised the first edition. In May 2008, the second was held in France, hosted by the Institut de Recherche en Informatique de Toulouse (IRIT). The third edition was organised by the University of Brescia, and held in Desenzano del Garda, Italy, in September 2010. In 2012, the fourth edition of COMMA is held from September 10–12 in Vienna, Austria.

Argumentation can be studied from many angles. One can aim for the building of smart software (the artificial systems perspective), or for a better understanding of the intricacies of human argument (the natural systems perspective), or for the development of an elegant mathematical model of argument (the theoretical systems perspective). Progress in argumentation research is driven by the cross-fertilization and gradual integration of achievements in each of the perspectives (Figure 1).

These perspectives, and more, are present at the conference. The invited speakers at the conference are representatives of this diversity: Trevor Bench-Capon, a philosopher turned computer scientist studying legal applications; Erik Krabbe, who connects two millenia of insights about argument and dialogue, both informal and formal; and Keith Stenning, an experimental psychologist inspired by nonmonotonic logic and artificial intelligence.

The success of the field is illustrated by the increasing number of submissions: in 2006, around 50; in 2008, 60; in 2010, 67; this year, 76. In order to stimulate interaction between researchers with theoretical and practical research aims, in

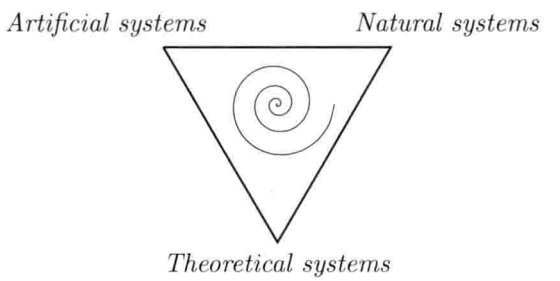

Figure 1. Perspectives on argumentation research.

this fourth edition of COMMA, papers could be submitted both for the regular track and for the innovative applications track, the latter new in this edition. We received 65 regular track papers and 11 innovative applications track papers. 28 of them were accepted as full papers, and 17 as short papers. To further emphasise the importance of implemented systems, we also called for system demonstrations; 13 were accepted for the conference, 3 of them associated with another paper in the proceedings, and 10 described in an extended abstract.

The selection of papers and demonstrations was made on the basis of the scholarly reviews and discussion by the members of the Program Committee and additional reviewers. We thank them all for their hard work. Special thanks go to Adam Wyner for his excellent work as demonstrations coordinator. Finally, we are particularly grateful to all people who helped us in organizing COMMA 2012, in particular Eva Nedoma, Markus Pichlmair, and Friedrich Slivovsky.

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Groningen/Vienna, July 2012

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The Long and Winding Road: Forty Years of Argumentation

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Abstract. In this paper I review my engagement with argumentation over the past forty years. I describe the perspective I brought from philosophy and the Civil Service, and consider a number of aspects of computational argumentation: knowledge based systems, explanation, context, audiences, schemes and models. A key feature of argumentation is that it is an activity which has to be actively engaged with, whereas a proof is an object to be understood and admired.

Keywords. argumentation, explanation, justification

1. Introduction

As a student I studied Philosophy. Thus while my mathematician wife became familiar with proofs and theorems, I encountered only arguments. The study of modern epistemology for, example, begins with Descartes *Argument from Illusion*, and takes us through Kant's *Transcendental Argument* to Wittgenstein's *Private Language Argument*. Similarly philosophical theology, the topic of my PhD, concerns arguments: the existence of God is discussed through the *Ontological Argument*, the *Cosmological Argument* and the *Teleological Argument*: to see these arguments as intended to be proofs is to make a significant blunder, as I argued in [14]. Whereas proofs are passive, things to be understood, arguments are things that must be engaged with, accepted, adopted, *bought*, as we used to say. A proof is complete in itself, an argument only becomes complete when an audience accepts it. Wittgenstein said that the purpose of philosophy was to show the fly the way out of the fly bottle. Not to remove the fly, or to break the bottle, but to *show the way*. To escape the fly must take the route for itself. So too, an argument has an effect only when it is used by its audience. Thus the Argument from Illusion can ensnare us, but the Transcendental Argument shows us how we can escape from scepticism, and the Private Language Argument can rescue us from solipsism if we let it.

Having completed my PhD, I went to work as a Civil Servant, as a trainee policy maker. In those days policy making was thought to be a rational activity and so civil servants would prepare sets of arguments, both for and against various policy proposals, which the Minister would consider and choose between. Of course these arguments were not always about questions of fact: there were political arguments and arguments designed to appeal to various interest groups as well. The decision was always made by the Minister, and would, properly, reflect the aspirations and interests of the party he or she represented. Moreover the argument that convinced the Minister, would not always

be the argument the Minister used to sell the policy to the Public. This gave more useful lessons in practical argumentation, and in the crucial role of the audience and its preferences. For a variety of reasons I left work on policy and moved into computing, first as a programmer analyst and then looking at the potential for using knowledge based systems in Government. And this in turn took me back to academia, and Imperial College.

2. Knowledge Based Systems

At Imperial College the Logic Programming Group conceived of knowledge based systems as sets of *axioms* from which consequences could be *proved*. With my background they appeared somewhat differently. Essentially we had a set of heuristics gathered from an expert, and these heuristics would provide reasons to believe certain conclusions. The whole enterprise was thus based on a particular style of argument, namely Argument from Expert Opinion. While conclusions could be justified in terms of the rules in the program, the rules themselves could only be justified by the quality and authority of the expert. The use of Negation as Failure made relevant another form of argumentation, Argument from Ignorance, which when used improperly gives rise to the fallacy *argumentum ad ignorantiam*. The conditions for its proper use can be given a logical justification by completing the database, but the necessary Closed World Assumption was sometimes inappropriate for particular systems where it was, none the less, used. Moreover it is a feature of logic programs that they can generate justifications for propositions *and* their contraries. In argumentation terms this is a good thing - the program can be seen as an generating arguments both for and against propositions. So my picture of a legal knowledge based system was of a program to generate arguments for and against some claim, among which it was up to the users to choose what they believed. The lack of prescription and the responsibility of the audience were thus both respected. This view was expressed in [10], which suggested that what was needed for an intelligent system would be "a representation in computer intelligible terms of what it is that makes an argument persuasive", reasons why an argument should be accepted or rejected by a given adjudicator. Generating the arguments was relatively straightforward: supporting the choice between them was where the challenge lay.

3. Explanation

The importance of the user choosing between the pro and con arguments generated by the program, meant that explanation of the reasoning - the provision of the arguments - moves from a nice additional feature to the core of knowledge based systems. But the state of the art in explanation in 1990 had barely moved on from MYCIN: the question *how?* posed of a conclusion of the system would elicit the rules and facts used in its derivation. Moving from proof to argument meant moving the user from a *passive* consumer of proofs to a *proactive* participant in an argument, and this meant engaging in a dialogue. The basis for such dialogues was available in the logical dialogue games of Mackenzie [19] and Hamblin [17][1]. These, however, were games based on natural de-

[1] I am grateful to David Moore for introducing me to this work and its potential for application to explanation of KBS.