

Argumentation in AI and Law: Editors' introduction

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1. Overview

Argument is central to law: legal disputes arise out of a disagreement between two parties and, since the disappearance of trials by ordeal and combat, such disputes are resolved by the parties to the dispute presenting arguments for their position to an agreed arbiter, who will typically justify the choice of the arguments he accepts with an argument of his own, intended to convince superior courts and the public at large. Given the centrality of argument to law, it is unsurprising that AI systems intended to model legal reasoning have found it necessary to model argument.

This volume contains a collection of papers representing some of the very latest work on argumentation in AI and Law. The papers derive from a workshop run in conjunction with the Tenth International Conference on AI and Law, held in Bologna in June 2005. The papers have since been significantly extended and revised for publication here. In this introduction we will try to provide some of the context in which this work was done. We will not pretend to give a complete survey, but rather to introduce the key concerns and issues relating to argumentation which have arisen in previous work in AI and Law.

Major topics which have emerged as important in AI and Law and argumentation include:

- Arguing on the basis of precedent cases
- Using argumentation to resolve rule conflicts and explore defeasibility
- Dialogue and dialectics
- Argument Schemes
- Determining whether an attack on an argument is successful

We will briefly consider each of these in turn.

1.1. ARGUING WITH CASES

Case Based Reasoning was probably the first major use of argumentation in AI and Law, exemplified by the highly influential HYPO system of Rissland

and Ashley, e.g. Ashley (1990), and its descendants such as CATO, e.g. (Aleven 1997) and CABERET, in Skalak and Rissland (1992). A distinctive feature of these systems when compared to case based reasoning systems from other domains was that the selected matching case only gave a presumptive reason for applying the decision, so that this was subjected to arguments as why it should not be followed, which were in turn themselves subject to critique. A distinctive feature of these systems was the three-ply argument structure used, in which a case is cited, the opponent then argues against the appropriateness of following this case by distinguishing it from the current case or presenting counter examples, which the original proponent also has the opportunity to distinguish. This structure was also used in CATO, and was refined into a set of argument moves and strategies for deploying them in CABERET. The analysis underlying these systems, with its patterns of citation, distinguishing and counter example remain the starting point for much work on argumentation in AI and Law today.

1.2. CONFLICT AND DEFEASIBILITY IN RULE BASED SYSTEMS

The original model for rule based systems in AI and Law was that of proof: legal knowledge was to be represented as a first order theory from which legal consequences could be deduced. The formalisation of the British Nationality Act in (Sergot et al. 1986) was an early and influential example of this approach. Problems were, however, soon encountered, in that formalisation of legal knowledge typically involves a degree of interpretation, so that we arrive at several competing theories; in that the applicability of concepts requires to describe cases was open to question and debate; and in that the inescapable defeasibility of legal rules led to conflicts and gaps in the coverage. Argumentation was proposed in Bench-Capon and Sergot (1989) as a way of resolving these difficulties, but exploration of these ideas increased dramatically in the 1990s, with the work of, among others Prakken (1993), Hage (1996), and Prakken and Sartor (1996). An important idea to emerge from this work was the notion of an argumentation framework, e.g. Prakken (1993), in which the status of arguments was computed relative the other arguments advanced in the context. This approach was boosted by the development of a framework for modelling sets of abstract arguments by Dung (1995). Such frameworks are the starting point for much of the contemporary work on argumentation, not only in AI and Law, but also in AI generally.

1.3. DIALOGUE AND DIALECTICS

The adversarial nature of legal disputes makes dialogue a natural way of looking at them. Dialogue Games were introduced into AI and Law by Tom

Gordon's Pleadings Game in (Gordon 1995), and since have been used by many others. Such dialogue games provide a way of modelling the process of the dispute, as well as producing a context in which claims can be questioned and their defeasibility tested. They have been used both as the interface to legal systems, e.g. (Lodder 1998), and as a way of deriving consequences, e.g. (Prakken and Sartor 1996). Dialogue has, if anything, become more important today, as the increasing popularity of basing systems on communicating autonomous agents has placed great emphasis on such exchanges.

1.4. ARGUMENT SCHEMES

Although much of the formal work on argumentation is based on traditional *modus ponens*, it has sometimes proved fruitful to see the premises on which a conclusion is based not as homogenous, but as playing particular roles in the argument. This is what is essential to the notion of an argument scheme, that instantiating the scheme requires a set of premises of the appropriate types, playing the roles determined by the scheme. A good introduction to argument schemes can be found in (Walton 1996). A popular scheme in AI and Law was that based on the argument scheme of Stephen Toulmin (1959), which in particular distinguishes the data which grounds a claim from the warrant which licences the inference of the claim from that data, and from the absence of facts which, if true, would block the inference. Toulmin's scheme was used in a variety of systems, e.g. Marshall (1989), Lutomski (1989), Bench-Capon et al. (1993), Zeleznikow and Stranieri (1995), and Bench-Capon (1984).

A second important feature of Walton's account of argument schemes is the notion of critical questions. Instantiating an argument scheme gives only a presumptive reason for the conclusion, and each argument scheme is associated with a set of characteristic questions which, if posed, must be resolved if the conclusion is to stand. In HYPO we may see the citing of a case as an argument scheme, to which the critical questions can the current case be distinguished from the precedent case? and is there a precedent case which provides a counter example? as the associated critical questions. In turn, citing a counter example is an argument scheme subject to the critical question can the counter example be distinguished? CATO added a critical question to be posed against the distinguishing scheme: can the distinction be downplayed? More recently argument schemes have attracted an increasing amount of attention, especially argument schemes for witness testimony and expert opinion (Prakken et al. 2003), temporal persistence (Prakken 2002b), and practical reasoning Greenwood et al. (2003). This is an area where we can expect to see much more investigation.

1.5. DETERMINING WHETHER AN ATTACK IS SUCCESSFUL

In the argumentation framework introduced in Dung (1995), attacks on arguments always succeed, and so to defend an argument against it is necessary to defeat the attacking argument. This does not seem appropriate to law, however. In legal disputes it is often possible to admit the validity of an argument, while denying that it is, in some sense, strong enough to defeat the argument it attacks. One way to approach this is to use standards of proof, e.g. (Farley and Freeman 1995), whereby an argument may be accepted according to different criteria: given a low standard of proof a claim can be accepted if there is any argument, attacked or not, which justifies it, while a rigorous proof standard might demand that all its attackers can be defended against.

Another consideration is the burden of proof – which of the parties is responsible for establishing the argument according to the given proof standard. In a dispute different parties may be responsible for different arguments, and different standards of proof may apply to different arguments. A recent exploration of burden of proof can be found in (Prakken et al. 2005).

A different approach involves the attribution of intrinsic strengths to arguments. One way of doing this which has been taken up in AI and Law is to consider the purposes or social values advanced by the acceptance of an argument. This idea has its origins in Berman and Hafner (1993), and has been explored and developed more recently in work by e.g. Bench-Capon (2002), Prakken (2002a), Sartor (2002) and Bench-Capon and Sartor (2003). Such accounts also have to take into account that different people (or different jurisdictions) may afford different priorities to different purposes, and so the acceptability of such arguments may depend on the audiences to which they are addressed. An extension of Dung's argumentation framework designed to accommodate values and audiences is given in (Bench-Capon 2003).

2. Papers in this issue

This issue contains six papers, all of which address the above concerns in their various ways.

The first two papers investigate the use of argumentation to discover a theory intended to explain a body of case decisions. The paper by Alison Chorley and Trevor Bench-Capon attempts to automate the construction of a theory in the manner of Bench-Capon and Sartor (2003) for the domain of US Trade Secrets Law, previously used in the HYPO and CATO systems. They represent cases in the manner of CATO, using factors, and attempt to

discover a set of defeasible rules and priorities between those rules in terms of the values promoted which will explain as many decisions as possible. The construction of the theory is through a notional dialogue between two parties representing the plaintiff and defendant which employs argument moves based on those theories. Two different kinds of heuristic search, one cooperative and one adversarial are used to explore the dialogue space, and the results are evaluated both in terms of the explanatory power of the theory and the plausibility of the dialogue used to construct it. The second paper by Martin Mozina et al. addresses a more conventional machine learning problem. Whereas in the Trade Secrets domain it is not believed possible to discover necessary and sufficient conditions which will determine the case, in other domains, such as the routine assessment of welfare benefit claims it is often the case that such conditions do (or should) underlie the decisions. This paper attempts to guide a rule induction method by requesting arguments which explain the cases it finds hardest to classify. These arguments are then used to improve the efficiency of the learning, and the naturalness of the rules. The technique represents an improvement over similar induction techniques not guided by examples with arguments. Particularly interesting are the experiments where the data contains a number of incorrectly decided cases, where using argumentation based learning gives a significant improvement. Given the high error rates that often occur in such domains, robustness in the face of incorrect decisions is essential for any practical use of these techniques.

The next three papers relate to agents. As mentioned above, agents provide an attractive architecture when different perspectives or interests need to be represented, or when two systems with different owners are required to interact.

The paper of Maxime Morge proposes a formal framework to support collective decision making in a situation where agents have varying interests, such as might be encountered in, for example, an e-democracy system. The participants in his dialogue are two opposing parties, who deploy arguments to persuade their opponent to their own point of view, and an arbiter responsible for the final decision and for resolving the conflict. As well as the notion of dialogue, Morge makes extensive use of the notion of values to determine the strength of arguments, and uses rankings on these values to characterise audiences.

In their paper Katie Atkinson and her colleagues use agents to represent the different perspectives that can be taken on a case. These agents make use of a particular argument scheme, an extension of the Sufficient Condition Scheme of (Walton 1996), designed to include social purposes, to propose arguments, and then use the critical questions associated with this scheme to construct a value based argumentation framework, which can then be evaluated using the machinery of (Bench-Capon 2003). This argumentation

framework can then be used to determine which arguments the agents will accept, according to their value preferences. This approach is illustrated with a reconstruction of the majority and minority opinions, and some later arguments advanced in commentaries, for the well known case of *Pierson vs Post*. This reconstruction in turns suggests that the decision making is best considered as three linked argumentation frameworks, concerning what the law should be, what intermediate concepts should be held to apply and what the consequences of the applicable intermediate concepts are. The ramifications of this three layer view are then discussed. This paper thus connects three of the key ideas introduced above: argumentation schemes, argumentation frameworks, and the strength of arguments being given by the purposes they advance.

The third paper on agents, that of Pieter Dijkstra et al., describes a particular scenario involving the exchange of information between agents. The application concerns crime investigation, when one police force may possess information which would be valuable to another force, but is unwilling, or prohibited from, releasing this information. The paper gives an architecture for dealing with this situation. Of particular interest is that it involves nesting several different dialogue types, information seeking, persuasion and negotiation, the last two of which can make use of argumentation. The use of agents in this application is critical because the systems are owned by different agencies, each of which will want to program the agents with their own desired knowledge and policies, and for them to represent their own interests.

The final paper, by Paul Dunne, provides a formal basis, again using value based argumentation frameworks, for the analysis of social conventions and, in particular, how they change and evolve over time. The evolution of social conventions is an important study in itself, and one which has become of interest recently in the context of how conventions can be exploited in the societies of agents that will result from the deployment of multi-agent systems. The basic mechanism driving convention change here results from the ability to characterise the agents in terms of their value orderings. As value orderings and the proportion of agents subscribing to a particular order changes, so may the convention. The paper is illustrated with a discussion of changing attitudes shown in a series of United States Supreme Court decisions.

3. Summary

We believe that the papers presented here reflect the diversity and range of work on argumentation in AI and Law. This is an exciting time to be working in argumentation, as much progress is being made both developing old ideas and offering new insights. We believe that argumentation is not

only important for AI and Law, but for AI in general, and because AI and Law has been confronting these issues for some time, it is an area where AI and Law can make a general contribution.

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