Thirty Years of *Artificial Intelligence and Law: Overviews*

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Abstract The first issue of *Artificial Intelligence and Law* journal was published in 1992. This paper discusses several topics that relate more naturally to groups of papers than a single paper published in the journal: ontologies, reasoning about evidence, the various contributions of Douglas Walton, and the practical application of the techniques of AI and Law.

Keywords ontologies, evidence, argumentation, practical applications

1 Introduction

The other articles in this volume focus on single papers. In this article we look instead at groups of papers, to explore topics which cannot best be represented by a single paper.

The first topic is ontologies, commented on by Enrico Francesconi and Michał Araszkiewicz, which were a topic of research in all three decades. The use of ontologies in computer science began with the seminal paper *The Role of Common Ontology in Achieving Sharable, Reusable Knowledge Bases* (Gruber, 1991). As the title of that paper suggested, ontologies were originally seen as a method for designing knowledge based systems with a view to enabling the knowledge to be shared and reused. But over time ontologies developed as an independently useful way of formalising a conceptualisation of the domain, and exploring and clarifying

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the associated concepts. As the rise of the World Wide Web made vast amounts of legal information readily available ontologies began to be seen as a way of supporting the management and retrieval of this information, and as an essential feature of the Semantic Web (Berners-Lee et al., 2001). The commentary illustrates the development of ontologies by discussing three papers taken from different periods.

The second topic is reasoning about evidence. This was investigated through a series of papers by a group centred on Henry Prakken, Bart Verheij and Floris Bex. The commentary by Trevor Bench-Capon considers the various ways of reasoning about evidence proposed by the group including argument schemes and several hybrid models based on different combinations of argumentation, stories and Bayesian networks.

The third commentary, by Antonino Rotolo, discusses not a topic, but an individual. Doug Walton was an informal logician who developed an influential notion of argument schemes (Walton (1996) and Walton et al. (2008)), which has become an important technique in AI and Law (Atkinson and Bench-Capon, 2021). He also took a significant interest in AI and Law, and was a regular attendee of and contributor to ICAIL and Jurix conferences. Walton was a very prolific writer with at least sixteen books and many journal papers, of which fourteen appeared in *AI and Law* . Walton's contribution to AI and Law is discussed in Section 4.

AI and Law is an academic journal, and the majority of its papers come from the laboratory rather than the market place. The goal, however, is fielded systems providing support for legal applications and legal practitioners, and the journal has always shown a readiness to relate academic developments to practical possibilities. Marc Lauritsen, who provides the final commentary, has been the journal's Technology Correspondent since the very first issue and so is well placed to give an overview of how the journal has covered practical applications, which completes this article.

2 Ontologies in AI and Law: Visser and Bench-Capon (1998), Peters et al. (2007), and Leone et al. (2020). *Commentary by Enrico Francesconi and Michał Araszkiewicz*

Knowledge representation is one of the key topics in AI and Law. In the last thirty years, since the foundation of *AI and Law* journal, different approaches have been proposed and the concept of *ontology*, as well its practical implementation, evolved from its origins within expert systems, until the current trend of using ontologies within the semantic web became a key infrastructure for AI. In this respect, we have identified three relevant papers that appeared in the *AI and Law* journal in different decades to provide an overview of this evolution.

Visser and Bench-Capon (1998) represents an important milestone in the evolution of the concept of ontology, as it is a survey in the knowledge modelling field which gives an overview of ontologies as seen in the early debates in the AI and Law community. The paper discusses four types of knowledge modelling, viewed as formal languages or ontologies: McCarty's language for legal discourse (McCarty, 1989), Stamper's Norma formalism (Stamper (1991) and Stamper (1996)), Valente's functional ontology of law (Valente (1995) and Breuker et al. (1997)), and Van Kralingen and Visser's frame-based ontology (van Kralingen (1995), Visser (1995), Visser and Bench-Capon (1996b), Visser and Bench-Capon (1996a) and

van Kralingen (1997)). According to Visser and Bench-Capon, while only the last two are proposed as ontologies and are described in a dedicated ontology language, the others also present a conceptualisation of the legal domain and so can be considered as ontologies *ante litteram*. The paper contributed to the identification of the characteristics of an ontology in terms of defining and formalising their specification. In particular it provides an overview of the formal languages used at that time (Prolog, LOOM, CML, KIF/Ontolingua), all of them able to specify the ontology constituents as classes, attributes, instances, functions, relations and various constraints. An important contribution of the paper is a classification of ontologies in terms of types of commitments: *task* commitments, *method* commitments, and *domain* commitments. Legal ontologies are considered as specific examples of domain commitment ontologies. The paper has also the merit of identifying the areas where ontologies can be effectively applied and the criteria to compare ontologies, in terms of *epistemological adequacy* (the degree to which the ontology resembles the cognitive framework of the human problem solver), *operationality* (the effort required to implement the ontological concepts and relations in a representational language to enable computation) and their *reusability*. Such criteria have represented an effective contribution to the evaluation of ontologies in future works and to the characterisation of the important concept of *epistemological promiscuity*, expressed in works like Breuker and Hoekstra (2004), which criticised a common tendency to indiscriminately mix domain knowledge and knowledge of the process in which it is used. Visser and Bench-Capon's criteria to evaluate ontologies, as well as the proposed programme to develop effective and reusable ontologies in the legal domain, are still valid and used to assess their usefulness in the creation of legal knowledge systems.

Peters et al. (2007) represents, in our view, an important milestone in the characterisation of ontologies, as it effectively contributed to distinguishing types of knowledge representation at different levels of abstraction. In particular, the paper reports the authors' experience in the LOIS project (Peters et al., 2006), aimed at developing a multi-language legal thesaurus, whose structure is based on existing *de facto* standards for semantic thesaurus construction. In particular, it distinguishes the role of *lexicons* in the knowledge representation hierarchy. To this aim, a two-level knowledge approach is proposed. One level is represented by a conceptual model of a domain, e.g. law, structured in the form of an upper-level ontology representing the semantics of vocabulary terms able to provide a language-independent effective means to disambiguate vocabulary terms. The other is the level of a lexicon (or lightweight ontology) composed of lexical items able to lexicalize ontology concepts, associated with specific linguistic information, e.g., nouns versus verbs and syntactic preference, as well as terminological relations (like synonymy hypernymy, antonymy, and thematic relations). The authors characterised such levels using parallels to different knowledge representation systems like foundational or core ontologies (e.g Dolce (Gangemi et al., 2002) and CLO (Gangemi et al., 2005), respectively), with WordNet (Miller, 1995) as an example of lexicon or lightweight ontology. Peters et al. (2007) has also the merit of following the path of Visser and Bench-Capon's paper in clarifying the possible roles of upper-level ontologies, which can be termed "core ontologies", complete and extensible ontologies that expresses the basic concepts of a particular area of knowledge such as Law. In contrast, "domain ontologies", i.e. ontologies for a particular domain in such an area (for example consumer protection law), as well as

"task ontologies" are aimed at supporting individual tasks. Core and domain on-
tologies can be viewed as extensions of each other, and another possible extension
is to associate lexical information with them, exactly what is addressed in the LOIS
project, which Peters et al. (2007) reports on. As for the lexicon, LOIS adopts the
structure of two widely known and used thesauri: WordNet (Miller, 1995), a lexi-
cal database which has been under constant development at Princeton University,
and Euro-WordNet (EWN) (Vossen, 1998), a multilingual lexical database with
WordNets for eight European languages structured along the same lines as the
original WordNet. The construction of these lexicons is carried out using natural
language processing tools on a parallel multilingual corpus of European directives
and corpora of national legislation about consumer law, by selecting terms having
a specific definition. Terms in different languages are aligned, linked by the relation
implemented_as to the implementing term in national legislation, as well as linked
to the upper-level ontology in order to disambiguate concepts. LOIS synsets are
also aligned to the corresponding WordNet synsets. The resulting semantic net-
work has also the merit of anticipating by a few years the widely used approach of
Linked Data (Bizer et al., 2011) to create conceptual and lexical networks in the
semantic Web.

We complete this overview of the evolution of the concept of ontology in the
AI and Law domain over the years with Leone et al. (2020) which offers an anal-
ysis of the state of the art in legal ontologies, intended to guide users and law
experts in selecting the legal ontology that best fits their needs. To this end, the
authors provide a comparative analysis of the most recent legal ontologies and
vocabularies, dealing with European or globally applicable legal frameworks. The
analysis makes reference to previous surveys on this matter (Casellas (2011) and
de Oliveira Rodrigues et al. (2019), and it aims to overcome their limitations by
analysing not only theoretical achievements but also the practical use of ontologies,
so much increased in the last few years, fostered by the implementation of Linked
Data principles. The ontologies analysed are classified according to five domains
related to policies, licenses, tenders and procurements, privacy, and cross-domain
ontologies. Ontologies from these groups are analysed with respect to general,
modelling and semantic information. In particular, the modelling aspects refer to
the language and the standard used, as well as the means of construction (manual
or NLP-based), while the semantic aspects refer to characteristics such as ontolo-
gies aimed to cope with temporal aspects, normative aspects, and other models.
Leone et al. (2020) has the merit of providing a updated state of the art concerning
the development and use of legal ontologies, as well as identifying the main char-
acteristics which hinder or promote their reuse on a large scale. In particular, the
authors underline the need of taking especial care with ontology documentation
and ontology evaluation, as well as relying on existing ontologies and ontology
design patterns (Gangemi and Presutti, 2009) in the ontology building process.
Moreover, the paper provides some hints as to how to enhance a legal ontology
building process oriented to the reuse of existing resources, such as metadata for
ontology documentation and legal design patterns, aiming to identify recurrent
knowledge structures.

The three papers we have commented on not only provide an interesting insight
into the state of the art in the field of legal ontologies engineering – each paper
for a different stage of development of the state of the art – but they also provoke
a reflection on the role of jurisprudential conceptual systems in computational

ontologies (Fernández-Barrera and Sartor, 2011); apparently, a more extensive and deepened cooperation between the fields is still ahead, with potential benefits to both.

3 Reasoning about evidence: Bex et al. (2003), Bex et al. (2010), Bex and Verheij (2013), Vlek et al. (2014), Vlek et al. (2016). *Commentary by Trevor Bench-Capon*

The view of the law that one gets from television drama is of dramatic criminal cases. Cross examinations are central, evidence is disputed, and the case usually turns on the revelation of some facts which transform the view of what happened and who is guilty of the crime. The impression one gets from AI and Law is often rather different: much of AI and Law deals with civil cases, such as Trade Secrets, Property Law, and Taxation. Such cases tend to turn on a point of *law*, not *fact*. Often the setting of the cases is a higher court where the facts are not even in dispute. In consequence legal reasoning as addressed in AI and Law has most often been about the interpretation of norms, the closing of gaps and the resolution of conflicts, and the use of precedent cases to form arguments for deciding issues one way or another. But facts are important, and reasoning about evidence to determine them is always needed, whatever the nature of the case. It is, however, fair to say that this aspect has been relatively neglected in AI and Law: when the first of these papers (Bex et al., 2003) appeared there had been, apart from a special issue (Martino and Nissan, 2001), only a single article on reasoning with evidence published in the journal (Jøsang and Bondi, 2000).

Perhaps the most sustained effort to address legal evidence in the *AI and Law* journal is represented by the papers discussed in this section, which report work carried out by Henry Prakken and Bart Verheij together with a series of PhD students: (Bex et al. (2003), Bex et al. (2010), Bex and Verheij (2013). Vlek et al. (2014), Vlek et al. (2016)). Although since (Bex et al., 2003) there has been some more interest in reasoning with legal evidence, including probability based approaches approaches (e.g. Åqvist (2007), Keppens (2012) and Fenton et al. (2014)), a paper on Wigmore diagrams (Unwin, 2008), a critique of the approach of Bex et al. (2010) in Barclay (2020), and a second special issue (di Bello and Verheij, 2020), here we will focus on the papers published by this group, which provide a systematic exploration of many of the issues.

Bex et al. (2003) starts with the observation that reasoning about evidence in not peculiar to law, but is part and parcel of everyday life. They therefore propose to base their approach on "general theories of defeasible reasoning and argumentation". Their starting point is Wigmore's graphical method of charting evidence (Wigmore, 1913), and for the logic they draw on the work of John Pollock (1987), with the goal of systematising the reasoning as a set of argumentation schemes with associated critical questions, in the manner of Walton (1996). The results were then presented visually using the argument diagramming tool Araucaria (Reed and Rowe, 2004). The two main schemes discussed were:

– Argument From Expert Opinion
– Argument from Witness Testimony

There is nothing specifically legal about these schemes: most of our knowledge is acquired either from people we believe should know, either because we see them

as authorities on the topic, or we believe that they have witnessed the events in question. This is, of course, reflected in that matters of fact are typically, at least in many common law countries, adjudicated by lay juries, not trained lawyers.

The formal underpinning is Pollock's defeasible argumentation which "augments the inference rules of classical logic (which he calls "strict reasons") with a set of defeasible inference rules (*prima facie* reasons)". In particular Pollock identifies two ways to reject a *prima facie* reason: *rebuttal*, where an argument has a contrary conclusion, and *undercut*, which offers a reason why the original argument does not apply. Using Pollock's logic gives rise to a set of arguments and attack relations between them, which can be evaluated using the argumentation frameworks of Dung (1995). Five *prima facie* reasons and their undercutters are used: perception, memory, statistical syllogism, induction and temporal persistence. Pollock's schemes are supplemented with some generalisations such as a principle of general knowledge: *"it is general knowledge that ϕ" is a prima facie reason for ϕ.* Finally ways of attacking these generalisations are presented. These schemes are illustrated with a brief outline of the *Umilian* case and a detailed analysis of the *Sacco and Vanzetti* case in which the Wigmore charts from Kadane and Schum (2011) are expressed in terms of the argument schemes.

In their conclusion, the authors mention *anchored narratives* (Wagenaar et al., 1993) as an alternative approach to their argumentation approach. According to this theory legal proof should have the form of persuasive *stories*, anchored in the available evidence by empirical generalisations about what happened. Moreover, these anchors should be progressively refined in a critical testing procedure until they are sufficiently plausible to be accepted. In Bex et al. (2010), this theory is treated not as in opposition to argumentation, but as complementary to it, so that a hybrid theory, embracing both arguments and stories, is presented. In this hybrid theory, proof is seen as a *process*, in which hypothetical stories are constructed and arguments based on evidence or common sense knowledge are used to support or attack these stories. The stories causally explain the facts, and the arguments based on the evidence test the plausibility and coherence of these explanations. The paper is based on Bex's PhD thesis (Bex, 2011), and concentrates on the formal logical version which formed the basis of the sense-making and visualization tool, AVERS, developed by Susan van der Braak (Van den Braak, 2010). The advantages of combining arguments and stories is that while arguments offer a transparent, natural and rationally sound way of analysing and assessing each particular aspect of the case, they tend to lose sight of the "big picture": stories offer us a way in which these particular aspects can be combined into a coherent whole, and it is the plausibility of the whole that takes precedence.

The essence of the hybrid theory is that a logical model of abductive inference to the best explanation takes as input a causal theory and a set of observations, and produces as output a set of hypotheses that explain the observations in terms of the causal theory. The combination of elementary hypothetical statements and a causal theory can be seen as a story about what might have happened. Arguments based on evidence can be used to support and attack these stories. These arguments can themselves be attacked and defeated, thus making it possible to reason in detail about the extent to which a story conforms to the evidence. The coherence of a story is also a subject of argumentation: arguments which are not based on evidence but rather on general common sense knowledge can be given to support or attack a story. In this way, the plausibility of a story (i.e. its conformance with

our common sense world knowledge) can also be discussed in detail. Finally, the stories can be compared according to their coherence and the extent to which they conform to the evidence in a case. The assessment of coherence is based on the two criteria of internal consistency and plausibility. These criteria are similar to those of Pennington and Hastie (1993), but given more rigorous definitions.

In Bex and Verheij (2013), the work on reasoning with evidence, arguments and stories was further connected to more traditional models of legal argumentation and case construction (e.g. Prakken (1997) and McCarty (1997)). In this paper, Bex and Verheij introduced the notion of *legal* (as opposed to factual) stories which provide a coherent, holistic legal perspective on a case. Legal stories identify what needs to be proven but are also selected on the basis of what can be proven, and provide a bridge between factual reasoning, which establishes what happened, and legal reasoning, which determines the resulting legal consequences. This can lead to a shift of legal perspective. In their case study, (the *Wamel* case) murder cannot be proven, so the perspective shifts to complicity to murder which does not require showing who actually pulled the trigger (Bex and Verheij (2013), p273).

While Bex et al. (2010) brings together two approaches to reasoning about evidence, there is a third approach, widely studied, particularly in the forensic sciences. This is to use probabilities in the form of Bayesian networks which show how evidence changes the probabilities of various hypotheses. The approach has been taken in AI and Law in works such as Shimony and Nissan (2001), Keppens and Zeleznikow (2003), Keppens (2012) and Fenton et al. (2014). The use of probabilities was criticised in Bex et al. (2003), both because of the difficulties in providing the numbers needed to create the network, and because such reasoning blurs some important distinctions such as the relationships between evidence, and the rhetorical, dialectical structure of discourse. None the less they began to to explore the possibilities for hybrid models combining (Bayesian) probabilities with arguments and stories with new PhD students: (Vlek et al. (2014), Vlek et al. (2016), Timmer et al. (2017), Wieten et al. (2019) and van Leeuwen and Verheij (2019)). There had been earlier work on these combinations: Lutomski had presented statistical evidence as Toulmin style arguments (Lutomski, 1989) and scenarios had been generated from Bayes nets in Keppens and Zeleznikow (2003), but there had been significant developments in both argumentation and narrative since those papers were written.

Here we will focus on the papers published in this journal by Vlek, which focussed on combining Bayesian probabilities with stories. The first of these papers (Vlek et al., 2014) provided a design method for constructing a Bayesian network based on narratives, illustrated with an extensive case study of a notorious Dutch murder case. The second paper (Vlek et al., 2016) builds on this work and offers a method for understanding a Bayesian network in terms of scenarios, again illustrated with a case study. Scenarios can be extracted from the Bayesian network, and expressed in diagrammatic or textual form. The scenarios can then be analysed for evidential support, and the quality of the scenarios analysed in terms of completeness, consistency and plausibility (represented by the prior probability). Incomplete and inconsistent scenarios can be rejected, but sometimes implausible scenarios have strong evidential support: thus some implausible elements will be supported by the evidence, whilst other implausible elements represent an evidential gap.

Taken together these four papers represent a range of ways of reasoning with evidence. The first simply attempts to model the standard (non legal) ways of reasoning from evidence to conclusions. The remaining papers present hybrid models, each combing two of the three approaches to evidential reasoning: argumentation, narrative and probability. Evidential reasoning continues to be explored in the journal. Verheij (2017) presented a formalism modelling presumptive arguments about coherent hypotheses that are compared in terms of their strength. Walton (2019) modelled a particular scheme, expert opinion, used to model the testimony of expert witnesses. Barclay (2020) offered a critique of the hybrid argumentation-story model of Bex et al. (2010). Finally there was a special issue (di Bello and Verheij, 2020), which explored various theoretical, computational and empirical approaches to evidence and decision making. Although attempts to model and support reasoning on points of law is likely to remain the central concern of AI and Law, reasoning about evidence is, and will remain, a significant area for exploration.

4 Walton's Contributions to Legal Argumentation: Walton (2003), Walton (2010). *Commentary by Antonino Rotolo*

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When Herbert Hart considered the question "What is law?", he answered saying that the purpose of his *The Concept of Law* was

> "to advance legal theory by providing an improved analysis of the distinctive structure of a municipal legal system and a better understanding of the resemblances and differences between law, coercion, and morality, as types of social phenomena." (Hart, 1994), p. 17.

In doing so, Hart added that his method, which he argued was descriptive, is

> "not tied to any particular legal system or culture, but seeks to give an explanatory and clarifying account of law as a complex social and political institution." (Hart, 1994), Postscript.

Doug Walton has given a tremendous contribution to the AI and Law community. And I am not exaggerating if I say that his contribution is methodologically similar in the AI and Law community to what Hart gave to legal theory in the last decades of the 20th century. Doug Walton was a rare example of interdisciplinarity, in which a deep philosophical analysis was coupled with the search for an explanatory and clarifying account of legal argumentation, and for an accurate account of how the practice of legal argumentation in fact runs (an overview of Walton's contribution in AI and Law is in Atkinson et al., 2020). Doug Walton served for many years as a member of the editorial board of the *Artificial Intelligence and Law* journal, where he published 14 articles since his first contribution appeared in 2003 (Walton, 2003).

Walton's first paper in *Artificial Intelligence and Law* (Walton, 2003) applies his ground-breaking work on *argumentation schemes* (Walton, 1996) and *dialogue types* (Walton and Krabbe, 1995) to an important issue in legal argumentation: *the burden of proof*. This issue has been largely explored by our community in the context of formal models of legal dialogues (e.g. Prakken and Sartor (2007)), where

different types of burdens (such as burdens of claiming, questioning, argument production, persuasion, and the tactical burden of proof) are distinguished and discussed.

The research question of (Walton, 2003) is summarised as follows:

"A central problem for argumentation studies is how such a defeasible argument, when it is good one, should be binding on a respondent. Should the respondent be free to ignore it altogether, with no penalty or loss of probative weight for his side? There is a burden of proof on the proponent's side. Should there also be a burden of questioning (or challenging) on the respondent's side?" (Walton (2003). p. 1).

Clearly, the question has a practical as well as a theoretical import, which is acknowledged by Walton by also examining it as it occurs in the practice of real-life legal argumentation. In particular, Walton's analysis discusses expert opinion arguments, which are based on a specific argumentation scheme, and which correspond to a presumptive type of argument (and so, a defeasible one). If the respondent fails to question or challenge a strong defeasible argument like one based on expert opinion, is this failure a "fault of rational argumentation"? Apparently, it may happen that a jury rejects such an opinion independently of whether the argument has been challenged by the respondent.

As is well-known, simply asking a critical question does not always shift the burden of proof in persuasion dialogues. In fact, Walton acknowledges that a shift of burden of proof requires in these types of dialogue that a counterargument be provided.

Walton's analysis is specifically developed around the following points:

- "*there is no procedural rule in Anglo-American law that requires the asking of critical questions or the putting forward of counter-arguments in reply to an appeal to expert opinion.* [...] the respondent, whether jury or a cross-examiner, has no burden of questioning or challenging such an argument" (Walton, 2003), p. 37, italics added;
- "*depending on how dialogues are modelled*", a dialogue "can be structured by using this negative kind of commitment as a kind of default"; hence, if the respondent fails to critically question a proponent's argument, this only means that she has to temporarily accept the argument, in the sense of negative commitment (Walton, 2003), pp. 33–34, 37, italics added;
- No burden of questioning thus exists in the strong sense in this context, because presumptive arguments are "more open-ended" than deductive arguments: "they are defeasible, and have to be open to new evidence. *They need to leave the respondent room for asking critical questions before taking on a commitment.* But they also need to leave him room for other moves that might also be appropriate" (Walton (2003), pp35, 37, italics added).

Walton concludes that investigating these problems is a pre-condition "towards a general method for the analysis and evaluation of defeasible arguments, an important goal for both legal argumentation and AI".

The impact of Walton's research on "classics" of AI and Law is exemplified in another article, which was published in the journal some years later (Walton, 2010). The classical topic is *reasoning by analogy in the law*.

Indeed, a rational reconstruction of legal analogy is at the roots of research on legal reasoning (see, e.g., MacCormick, 1978; Alexy, 1989) and it is also a core problem of the beginning of modern age of AI and Law, with the development of systems like HYPO and inquiries on case-based reasoning (Bench-Capon, 2017).

The research contribution of (Walton, 2010) is summarised as follows:

"This paper is about the logical structure of argument from analogy and its relationship to legal arguments from classification and precedent. Its main purpose is to provide guidance for researchers in AI and law on which argumentation scheme for argument from analogy to use, among the leading candidates that are currently available." (Walton (2010), p217).

Once again, the philosophical analysis is made concrete by focusing on real-life scenarios, which, in this article, are well-known cases discussed in the AI and Law community, in particular, *Popov v Hayashi*, a property law case arising from baseball, and well-known cases on possession of wild animals such as *Pierson v. Post*, *Young v. Hitchens*, *Keeble v. Hickeringill*, and *Ghen v. Rich*[1].

"What is the similarity between the wild animals cases and the baseball case that enables an argument from precedent to be drawn from the one to the other?" (Walton, 2010, 228). Walton considers similarity as part of a broader argument from analogy, and the argument from precedent as a species of argument from analogy. In particular,

- the literature presents some argumentation schemes for argument from analogy, which seem to be incompatible, but which are not if "the notion of similarity using story schemes" (Bex, 2009) is adopted;
- the notion of similarity using story schemes allows for identifying qualitative relations between cases, since these are described as set of events or actions in a story; similarity is thus the fact cases share a certain abstract pattern as a story scheme;
- an account of analogy such as the one just mentioned is suitable for being integrated in a framework for case-based reasoning by using a dialogue structure;
- the proposed framework is a formal dialogue model that "represents a process of evaluation in which each side presents arguments to support its own story, and asks critical questions to test and throw doubt on the possibility of the other party's story" (Walton, 2010, 234).

I have discussed in detail two of Walton's papers which show how he used his notion of argument schemes to analyse both procedural issues and specific forms of legal argumentation. As always his analysis was grounded in the careful analysis of examples drawn from actual legal practice. In other contributions to the journal he explored arguments about evidence (Bex et al. (2003) and Walton and Zhang (2013)), other procedural issues such as presumption (Walton, 2008) and deliberation (Walton, 2006), and other particular schemes such as argument from fairness (Walton, 2014) and expert opinion (Walton, 2019). His most significant contribution, however, is his introduction and popularisation of his notion of argumentation schemes and critical questions, which has now become a standard tool for analysing reasoning in AI and Law (Atkinson and Bench-Capon, 2021).

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[1] See Section 9 of Sartor et al. (2022), elsewhere in this issue, for a discussion of different approaches to representing *Popov v Hayashi*.

5 Practical Applications of AI to Law: An Overview *Commentary by Marc Lauritsen*

One of the privileges of being on the Journal's masthead is getting copies of its issues without having to pay. Reading them can be tricky for non-subscribers. Although access to articles has improved greatly over the years, with an increasing proportion being open access, the availability of on-line institutional subscriptions, and the posting of submitted versions on personal web pages, in the main the journal is academics talking to academics, and it is not widely read by practitioners. But I am the proud owner of a complete set of issues. Writing this article provided a good occasion to browse through twenty-nine years of them - over a hundred physical volumes.

I have been gratified to serve as one of the Journal's 'technology correspondents' since the inaugural issue in 1992. (Richard Susskind shared that designation for many years.) The intention has been to help report on real-world developments[2]. So far that has amounted to a mere two 'technology reports' from me, although I've also contributed a book review and several other articles.

My first report, in the first issue, looked closely at two commercial document automation products, CAPS and Scrivener (Lauritsen, 1992). I especially like its poetic ending[3]. The second covered a variety of work product retrieval systems Lauritsen (1995).

5.1 Looking Back

Although the tone of the journal is predominately academic, many papers are motivated by eventual practical application of the ideas they discuss. Here is a quick tour through some of the 'practical' highlights in the Journal so far.

Richard Susskind provided a useful preface (Susskind, 1993) to a technology report about PHAROS in volume 2 (Harbidge and Catchpole, 1993). That volume also included a report on the Australian IKBALS project (Zeleznikow et al., 1993) and a report on linking hypertext (the forerunner of the world wide web) with KBS, which featured some handy screenshots (Soper and Bench-Capon, 1993). Volume 4 saw a technology report by Robert Macneel on the Intelligent Summoner project (Macneel, 1995). Volume 5 had a report by Anja Oskamp and Maaike Tragter about automated legal decision support, including three Dutch case studies (Oskamp and Tragter, 1997) and Volume 6 included a special issue on judicial applications of AI edited by Giovanni Sartor and Karl Branting (Sartor and Branting, 1998).

Volume 10 featured fond recollections of Donald Berman (Hafner and Rissland, 2002), a founding editor-in-chief of the Journal, along with Carole Hafner (who was

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[2] I've also tried to stimulate practitioner involvement in the biannual AI and Law conferences.

[3] "Today's commercial practice system tools – well evolved from the modest beginnings of document assembly yet only suggestive of what artificial intelligence ought to be able to deliver – provide a kind of Jacquard loom upon which to weave some of the fabric of lawyering. Perhaps these tools can inspire more intelligent systems in the same way that loom inspired computer pioneer Charles Babbage." Thirty years later, my impression is that we've indeed seen plenty of inspiration, but not nearly enough positive impact yet on how law is practiced, in large part due to artisanal intransigence.

herself remembered in volume 24 (Bench-Capon, 2016)). Both were dear friends and dedicated to practical uses of AI to improve law and legal education. The volume also had a special issue on practical applications, Kennedy et al. (2002), including Hokkanen and Lauritsen (2002) on *Knowledge Tools for Legal Knowledge Tool Makers*. Anja Oskamp and I added a sobering reflection on *AI in law practice? So far, not much* (Oskamp and Lauritsen, 2002).

In Volume 13 Emilia Belluci and John Zeleznikow provided a thoughtful case study of the Family Winner program (Bellucci and Zeleznikow, 2005), as part of a special issue on on-line dispute resolution, (Lodder and Zeleznikow, 2005). Volume 14 had part one of a special issue on e-government and e-democracy (van Engers and McIntosh, 2006), which included a report on the Parmenides project (Atkinson et al., 2006). Part two of this special issue appeared as the first issue of volume 15. (Another popular "e" – e-discovery - got attention in a special issue in volume 18 (Ashley et al., 2010).) Legal education saw rare explicit attention in volume 14, when Kevin Ashley contributed *Teaching a Process Model of Legal Argument with Hypotheticals* (Ashley, 2009).

Even our most theoretical pieces often touch on highly practical questions of policy making, such as those involving privacy. The thorny question of whether delivering intelligent legal advice systems could constitute the unauthorized practice of law was taken up by Oriola in volume 18 (Oriola, 2010). Taal et al. (2016) provides a rare example of an article with all the authors working outside academia. *AI for Justice* was the theme of a special issue in volume 25 (Bex et al., 2017). Henry Prakken offered a review of argumentation support tools in volume 28 (Prakken, 2020).

5.2 Practical reflections

So, what should we understand by 'practical'? There are of course many different senses and degrees of practicality. Even the most abstruse articles that have appeared in the Journal often include information and ideas that can be put to eminently practical uses. Our informal sense, though, is that the practical is more technology and engineering than 'science'; more than theoretical but not necessarily non-experimental. Used in the 'real world' but not necessarily commercial. It may have to do with the practice of law, the practice of software development, or the practice of legal education. It includes content that relates to practical lawyering and judging activities like research, drafting, investigation, advocacy, and argumentation.

One basic challenge for a top-tier academic journal like ours is maintaining high standards of scholarship while also helping to advance the productive use of AI in the legal field. Most practitioners don't have the time or inclination to follow theoretical developments. Most theoreticians have limited interest in practice. (To revisit an old trope, once we figure out how to make machines do something interesting they are no longer seen as very 'intelligent'. Reports of successful applications and commercial developments accordingly tend to be less interesting from an academic point of view[4]). Most practitioners (of law, software development, or

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[4] One of the most successful practical developments was Mead and Johnston's Softlaw. There were ICAIL papers, Johnson and Mead (1991) and Dayal et al. (1993), but never anything

teaching) frankly find large parts of our content quite unintelligible. So they don't know whether they might find it interesting. And most academic regulars seem to gloss over practical news not directly related to their scholarship.

5.3 Looking Forward

Law is a highly practical business, including when used to accomplish illegal and unjust things. The world is desperately in need of smarter tools for getting legal work done.

We're still at a very early stage of nearly all of the topics and agendas thematized in our journal's already long history. Yet we are also at another of those times when interest in legal tech is booming, both in venture finance and in academia. The Stanford CodeX project[5] is one epicenter. Suffolk and Northwestern universities are just two examples of the many others[6]. Collaborations among researchers, government organizations, vendors, and lawyers are increasingly seen in the UK and elsewhere[7]. The practical uses and implications of machine learning in law are surging, and some attention has been paid in the journal's pages[8], There is also a renewed interest in the idea of 'law as code'[9].

Someone needs to write thoughtful reports about these things! Reader, that could be you. More practical contributions – in the multiple senses mentioned above – would help a great journal be even greater. Successful experiments and applications should be celebrated; dismal failures should receive no less attention.

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in the journal, perhaps because it had already become commercial before the journal was launched. Softlaw became Ruleburst before being taken over by Oracle and now exists as Oracle Policy Automation (https://community.oracle.com/tech/apps-infra/discussion/4107512/opa-product-history-question). This is an example of how, once commercial, systems drop off the academic scene.

[5] https://law.stanford.edu/codex-the-stanford-center-for-legal-informatics/

[6] See https://suffolklitlab.org/ and https://www.law.northwestern.edu/student-life/events/law-and-technology/

[7] See e.g. https://news.liverpool.ac.uk/2019/12/18/ai-and-law-expert-to-feature-in-royal-institutions-christmas-lecture/

[8] A prime example is Medvedeva et al. (2020) (discussed in Section 6 of Villata et al. (2022), elsewhere in this issue). Limitations of this approach are widely discussed from a variety of perspectives, technical, philosophical and legal: e.g. Bench-Capon (2020), Bex and Prakken (2021) Steging et al. (2021), Bibal et al. (2021) and Medvedeva et al. (2022). Its very compatibility with the rule of law is questioned in Suksi (2021).

[9] The idea dates back at least to Kowalski and Sergot (1985) but remains current in papers such as Kowalski and Datoo (2021) and Shein (2021). There was also a recent workshop on *Programming Languages and the Law 2022*, https://popl22.sigplan.org/home/prolala-2022.

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