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AI Approaches to the Complexity of Legal Systems

Models and Ethical Challenges
for Legal Systems,
Legal Language and Legal Ontologies,
Argumentation and Software Agents

International Workshop AICOL-III
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Preface

AI Approaches to the Complexity of Legal Systems, or AICOL, for short, was first organized as a thematic workshop of the 24th World Congress of Philosophy of Law and Social Philosophy (IVR), held in Beijing, China, during September 15–20, 2009. This led to a successful second edition of the workshop, organized as part of JURIX-09 (Rotterdam, The Netherlands, November 16–18). And now this book collects the contributions to the workshop's third edition, which took place as part of the 25th IVR congress, held in Frankfurt, Germany, during August 15–20, 2011.

Work in artificial intelligence and law has been particularly fruitful over the last decade. Besides providing advanced computer applications for the legal domain, with the development of knowledge-based systems and intelligent information retrieval among other things, research in AI and law has yielded innovative interdisciplinary models for understanding legal systems and legal reasoning. These models—highly significant for the philosophy of law and legal theory—include logical frameworks for defeasible legal reasoning and dialectical argumentation, logics for normative positions, theories of case-based reasoning, and computable models of legal concepts.

Today there is a strong need not only to bring research in AI and law to bear on legal theory, but also to foster mutual feedback and interaction among the different lines of research in AI and law. In fact, when different branches develop at a fast pace, we are at risk of squandering an opportunity to exchange knowledge and methodologies.

This is particularly so in multiagent systems and in social-network analysis, which share concepts and objects of study, and yet any overlap between them tends to be merely superficial in practice and theory alike. Multisystem and multilingual ontologies provide an important opportunity to integrate different trends of research in AI and law, including comparative legal studies. Complexity theory, graph theory, game theory, and any other contributions from the mathematical disciplines can help both to formalize the dynamics of legal systems and to capture relations among norms. Cognitive science can help the modeling of legal ontology by taking into account not only the formal features of law but also social behavior, psychology, and cultural factors.

This book is thus meant to support scholars in different areas of science in sharing knowledge and methodological approaches. This is done by highlighting similarities as well as differences among these approaches, and the contributions accordingly seek to capture this interdisciplinary aspect by laying out the scientific ground common to all of the disciplines in question, without any exclusive focus on what the state of the art is in each of these disciplines.

In keeping with this overarching purpose, the discussion is organized into six main parts devoted to each of the six topics addressed in the workshop:

- Models for the Legal System
- Ethics and the Regulation of ICT
- Legal Knowledge Management
- Legal Information for Open Access
- Software Agent Systems in the Legal Domain
- Legal Language and Legal Ontology

In the first part—Models for the Legal System—Sartor presents a new approach to the analysis of compliance with normative systems by taking into account different individual attitudes, ranging from self-interest to altruism, as well as an array of social and moral reasons for action. Araszkievicz presents a coherence-based model of legal argumentation (CMLA) for assessing the doctrine of consistent interpretation developed by the European Court of Justice. New models for the legal system contribute to the state of the art in both ICT and legal theory, since they support the coherent and harmonized development of new technologies.

In the second part—Ethics and the Regulation of ICT—Pagallo discusses the impact of robotics on contemporary legal systems, looking in particular at some legal challenges the information revolution is posing for criminal law, contractual obligation, and tort law. Three new possible theories of robot liability and responsibility are presented, with strong implications for interaction between humans and artificial systems, thus also considering how such interaction can make for added complexity in the legal system. Similarly, the research conducted by Weng and Zhao on networked robots addresses the legal implications of combining unstructured physical environments with virtual ones, discussing the attendant risks as well as the safety and liability issues arising in connection with the use and behavior of such networked robots. The authors argue that we can and should inject core ethical principles into robot technology. Moral issues are an emerging concern, not as a discipline per se but as an element to be integrated into the study of law and ICT in a new complex dimension, a world lying between cyberspace and reality. In this line of thought, Bourcier and De Filippi discuss the complexity of cloud computing and how to manage that complexity through policy. Cloud computing is based on a new business paradigm applied to an already mature technology: the outcome is a completely new legal landscape. Broker servers play a key role in negotiating the best strategy, resolving disputes, and providing the best connection services for each customer profile, while taking privacy and security issues into account. The contribution envisages a new paradigm where cloud-computing nodes are regulated by third-party certification authorities guaranteeing that end users can count on services affording transparency, privacy, and security, including protection from cybercrimes and an anti-corruption policy. This is another scenario where intelligent agents can be designed by building into them rules and principles of moral action.

The third part—Legal Knowledge Management—is focused on the ways in which computational applications can be implemented on a bottom-up approach,

offering empirical evidence on which basis to sustain theoretical models. The contribution by Tiscornia et al. looks at the case law of the Italian High Court and of selected administrative and lower courts for the purpose of explaining the criteria of legal argumentation used in balancing competing legal rights and values: the authors apply natural-language tools to a sampling of 300 cases in an effort to understand the underlying approach to legal argumentation in treating a range of topics, with a view to helping legal practitioners go about their work. Winkles and Ruyter investigate the role of citations in the case law of the Supreme Court of The Netherlands for the purpose of detecting semantic information concerning the quality of the case law in the top-ten list: they look at 376 cases and 15,053 citations, and the outcome is visualized in a graph allowing legal practitioners to better understand the different ways cases relate to one another. Palmirani and Ceci present a contribution intended to promote the use of OWL2.0 properties for modeling and capturing judicial arguments as set out in case-law texts marked up in Akoma Ntoso: they combine three levels of ontology (argumentation, core, and domain ontology), focusing on the last of these to illustrate their working methodology. The research in this third part relies importantly on natural language tools in detecting, extracting, and qualifying legal knowledge to support future applications based on the Semantic Web. Boella et al. present a paper where legal semantics contribute to improving Web services. The authors introduce the Eunomos software, an advanced management system for legal terminology that helps expert users keep abreast of relevant law on any given topic. In the effort to formalize rules on top of the semantic level, Francesconi presents research where RDF/OWL is used to describe legal provisions and their interrelationships. More to the point, he presents an implementation of Hohfeldian relations and illustrates the approach by walking us through an example.

The fourth part—Legal Information for Open Access—presents research intended to develop new legal-information systems incorporating legal models, formalized legal knowledge, and ethical policies. Francesconi and Peruginelli investigate open access phenomena as an outgrowth of the digitization process, addressing important priorities in the production and dissemination of knowledge. They focus in particular on a project to build an open digital archive on the Web for legal informatics in the new digital era, considering that the dissemination of knowledge must be in the service of scholars and scientists, and not the other way around. In the same vein, Casanovas and Plaza propose an open access model for the content and publications put out by legal information institutes/by the Legal Information Institute of (LII) of the Cornell Law School, discussing some moral and legal issues that cannot be ignored in dealing with privacy and intellectual property.

In the fifth part—Software Agent Systems in the Legal Domain—we consider how these software tools can be designed in such a way as to embody legal principles and values, and how their behavior can be adjusted accordingly. Smith et al. offer a technical solution for combining normal and non-normal logics for dealing with the idea of collective trust. Laukyte discusses the different ways

that software agents for multi-agent systems are conceived in law, AI, and software engineering, pointing out how the concept is narrowly defined in each of these three areas of practice. She thus introduces the idea of software agents as boundary objects, a sociological approach on which the three communities in question can find common ground and interact in developing an adequate model for MASs. Vincent and Zeleznikow discuss knowledge representation and work out an information system designed to support judges in sentencing: they describe the nature of sentencing in the Australian state of Victoria and the corresponding method of judicial decision making, while also considering argumentation in relation to procedure and to cognitive decision making models. Boer and Van Engers present a model-based diagnosis of the complex social systems in which large government bodies operate: their purpose is to identify areas and instances in which agents may play a problematic role in multi-agent systems.

The final part of the book—Legal Language and Legal Ontology—considers techniques for natural-language processing as a bridge between text and semantic Web annotations and ontologies. There is still much work to be done in this area in closing the gap between the legal terminology for specific legal concepts and the corresponding ontology classes. This has been attempted using FrameNet, a highly formalized tool that accordingly lends itself to this sort of endeavor. Palmirani et al. build on this approach in a novel way by using NLP tools to qualify normative modificatory provisions in legal texts marked up using the NormeInRete XML standard: they take a specific class of modificatory provisions (suspension of a norm’s efficacy) and subject it to linguistic and legal analysis to show how such knowledge can be formalized through a linguistic tool such as FrameNet and then used by a semantic interpreter. Bertoli and Chishman also use a FrameNet database, but for semantic tagging and for developing a multilingual lexicon. The authors describe the initial steps in the development of a lexicographic project aimed at building a legal frame-based lexicon for Brazilian legal language. Myška et al. take a different approach in an effort to simplify legal language and make possible a better understanding of what the law says, so as to minimize noncompliance. They investigate two possible approaches intended to make legal language simpler and easier to understand for nonlawyers. However, a case study on the Creative Commons computerized system suggests that, in this case, simplifying the legal language does not necessarily reduce the level of uncertainty in the law. Very much driven by the same goals are Fernández-Barrera and Casanovas, who proceed on the basis of legal-domain semantics to provide simplified tools that citizens can use to query the case law pertaining to consumer rights. Their research was conducted as part of the ONTOMEDIA project, aimed at designing a semantic platform enabling users and professional mediators to meet in a community-driven Web portal.

June 2012, Bologna

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