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Introduction: Judicial Applications of Artificial Intelligence

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The history of artificial intelligence (AI) has been characterized by a steady expansion of the aspects of human cognition and expertise amenable to computational models. The earliest AI applications were in formal domains, such as theorem proving, that are relatively divorced from the complexity of ordinary human experience. Progress in natural language processing, expert systems, planning, robotics, and qualitative reasoning has extended the range of human experience and behavior addressed by AI. This general trend also characterizes research on AI & law. Early research addressed primarily routine legal domains, such as administrative procedures, that involve the straightforward application of clear-cut rules to uncontroversial facts. Recent research, however, has focused increasingly on more complex and challenging areas of the legal process typified by judicial decision-making. No simple rule-chaining or pattern-matching algorithm can accurately model judicial decision-making because the judiciary has the task of producing reasonable and acceptable solutions in exactly those cases in which the facts, the rules, or how they fit together are controversial.

Judicial decision-making is an area of daunting complexity, where highly sophisticated legal expertise merges with cognitive and emotional competence. Many of the central concepts in the judicial application of the law – such as "justice", "reasonable care", and "intent" – are deeply enmeshed in the fabric of human life. Moreover, judicial reasoning combines diverse cognitive skills, such as assessing facts, interpreting texts, making analogies, and engaging in dialectical interactions. Besides its complexity, judicial decision-making is also characterized by its social importance. It is, indeed, the most characteristic moment of legal experience. Individual cases may involve important interests and deep feelings, and their solution impacts upon the expectations of all legal actors and shapes their understanding of the legal system.

These features of judicial activity justify a cautious approach. The hazards of replacing judicial discretion with a rigid computer model can hardly be overesti-

mated (as stressed by Weizenbaum 1976, Gardner 1987, Berman & Hafner 1989, among others). However, AI research projects in this field have consistently abjured any attempt to usurp the discretionary reasoning of judges. Rather than aiming at the impossible dream (or nightmare) of building an automatic judge, AI research has aimed at developing practical tools to support judicial activities as well as new analytical tools for understanding and modeling judicial decision-making.

1. Modeling judicial tasks

No form of legal reasoning seems to depend more heavily on uniquely human abilities than the decision-making of a judge. Judicial decision-making requires assessing the credibility of witnesses, evaluating the probative weight of evidence, interpreting the meaning and intended effect of legal statutes and other normative authorities and, especially in criminal cases, balancing mercy with justice. How can AI contribute to a process that encompasses such a wide range of knowledge, judgment, and experience?

The answer to this question, like the answer to the general AI problem of building intelligent artificial agents, is that one must begin by identifying the individual tasks that collectively constitute the overall task of judicial problem solving. The information-processing requirements of each of these individual tasks must then be carefully analyzed, and computational methods identified that can satisfy these information-processing requirements. When this analysis is complete, determining appropriate algorithms and data structures to implement the required computational methods is typically relatively straightforward. Finally, a conceptual presentation of the knowledge involved in the tasks must be devised to mediate the input to, and output from, the program and to facilitate knowledge acquisition. Often the most valuable contribution of an AI project is the analysis of the underlying real-world tasks and their information-processing requirements, since it is this analysis that bridges the gap between expertise in the application domain and computer science techniques.

Such an analysis is particularly important in developing automated systems for as complex a process as judicial problem solving. A naive application of a given AI algorithm, such as production rule chaining, neural nets, or decision-tree induction, to a judicial task would be unlikely either to provide informative results or to be accepted, were it divorced from the analysis, the nature of the task, its information-processing requirements, or the necessary computational methods.

To face the forbidding objective of modeling judicial decision-making, AI & law research must draw insights from many disciplines that have also studied judicial decision-making, such as legal theory, legal procedure, psychology, sociology, and organization theory. Legal theory, in particular, has traditionally dedicated the largest part of its methodological analyses to judicial problem solving and offers a rich palette of prescriptive and descriptive models. However, for several reasons

the contributions of these disciplines can only represent a starting point for an AI-oriented analysis of the judicial process.

First, these disciplines do not provide the precision and the thoroughness that is required of a computational model. In this first regard, AI & law research has the potential to produce a new, more articulate, and rigorous representation of the judicial practice. Such a representation, while supplying the background for computing applications, can also provide a substantial contribution to the theory of the judicial process and of judge-made law.

Second, the available models of judicial activities focus only on a few central judicial activities, such as evaluating factual evidence and interpreting the law, and disregard many ancillary judicial activities, such as producing documents and accessing information. These ancillary tasks may in fact be the activities most amenable to AI & law techniques.

Although the history of research in judicial applications of AI has been relatively brief, AI & law has already obtained substantive results in both the directions of research just mentioned. Contributions addressing the most central features of judicial reasoning and judge-made law include the study of case-based reasoning. In case-based reasoning, AI & law has provided new, powerful theoretical models of aspects of judicial reasoning that integrate and develop the insights of legal theory. Contributions to the analyses of ancillary activities include various projects addressing preliminary or complementary judicial tasks (e.g., jurisdictional screening, drafting routine court documents, procedural tracking) or focusing on the objective of helping *pro se* and other parties to successfully interact with the courts (e.g., by assisting in the drafting of petitions and citations).

2. The papers in the special issue

Within this special issue we have tried to cover several different directions of current research concerning AI and the judiciary, including descriptions of prototypes and applications, formal analysis of the basic aspects of judicial reasoning, and methodological analysis of judicial decision-making.

The opening paper by Karl Branting, James Lester, and Charles Callaway, entitled “Automating Judicial Document Drafting: A Discourse-Based Approach”, addresses a task that is ancillary to judicial decision-making but which has a significant impact on the workload of judicial offices: the drafting of routine ancillary judicial documents. Branting et al. propose a model of documents that makes explicit the goals that documents are intended to achieve and the stylistic conventions to which they must conform. This model, termed the *document grammar* model, can be used to automate the construction of new documents. Branting et al. describe a representative class of judicial documents – appellate jurisdictional show-cause orders – illustrate how show-cause orders can be represented in terms of a document grammar, and describe an implementation of a prototype document planning

system that uses a document grammar to automate the drafting of new show-cause orders.

The problem of the assistance to judges in the exercise of discretionary judgment already addressed in contributions such as JEDA (Pethe et al. 1989) and LawClerk (Branting 1993) is considered at length in Uri Schild's paper "Criminal Sentencing and Intelligent Decision Support". Schild's contribution focuses on decision support in criminal cases, a problem which is highly controversial in many countries. The paper first addresses the legal and political background of criminal sentencing and the objective of sentencing policies. Schild argues that the primary objective of sentencing systems should not be to impose some superficial measure of uniformity, but rather to help the judge to balance uniformity (and fairness) with the classical objectives of punishment (retribution, deterrence, prevention and rehabilitation), in the framework of the policy of the legislator. Sentencing systems should not substitute for the judge, but rather provide information or alternative suggestions for human choices. Schild provides a critical review of various computer systems for sentencing support, including algorithmic, rule-based, case-based and model-based systems, and relates these systems to different sentencing policies. Finally, he describes a prototype case-based sentencing system and compares case-based to statistical and rule-based approaches.

The problems of support to sentencing is also addressed by Cyrus Tata in the paper entitled "The application of Judicial Intelligence and 'Rules' to Systems Supporting Discretionary Judicial Decision-Making". Tata focuses primarily on ways to assist the exercise of judicial discretion in penal cases, with special reference to a system intended to assist Scottish High Court Judges in the process of criminal sentencing. After discussing various policies for sentencing, particularly those reforms that are intended to produce uniformity and consistency by restricting judicial discretion, he analyses various systems for sentencing support. Tata focuses on systems that are intended to provide the user with information about the range of penalties passed by the court for similar cases in the past. For the selection of relevantly similar cases, he argues that classifications based on doctrinal categories are inadequate. He advocates instead a "schematic holistic representation", a broad classification reflecting the mental schemata used by the judges for comparing criminal histories.

The article of Henry Prakken and Giovanni Sartor addresses the representation of precedents and the application of case law. It builds upon previous research (particularly the HYPO project by Kevin Ashley and Edwina Rissland) to provide a general framework for legal precedent that integrates results from case based reasoning and formal dialectics. Prakken and Sartor view judicial opinions as articulate (multi-argument, multi-step and multi-level) dialectical structures and strive to preserve this articulation in their formal representation. They therefore represent each precedent as a collection of arguments, any portion of which can be cited in new disputes according to a dialectical protocol. The protocol provides heuristics that replicate the basic non-deductive moves of case based reasoning (such as

analogizing and distinguishing a precedent). Finally, the paper presents a method for assessing conflicts between precedents that generalizes HYPO's on-pointness ordering and allows it to be combined with other choice criteria. The model developed by Prakken and Sartor is intended to provide both a formalized theory of certain aspects of judicial law-making and a formal foundations for certain aspects of computer programs for case-based reasoning.

The contribution by Philip Leith, entitled "The Judge and the Computer: How Best 'Decision Support' ", both complements and contrasts with the views developed in the other papers of this special issue. While those papers adopt a cautious, but positive and constructive, attitude towards AI applications in the judiciary domain, Leith stresses the limits of some AI technologies. He first discusses some earlier expert systems (such as Prospector, Dendral and Mycin), arguing that they were not accepted by the intended users because they were not based upon a recognition of users' needs, function, and role. He further argues that AI & law applications are bound to make the same mistake and therefore to being rejected by their users. He stresses that discretion is valuable to the judges, so that every attempt to reduce it through computers will be resisted by the judiciary. Moreover, his view is that formalization (such as is required in the construction of a consistent rule-based knowledge-base, sufficient to solve future cases) is fundamentally incompatible with the judicial function in the most interesting areas of law. This thesis is argued for from a rule-sceptical point of view, according to which legal rules are only created by agents of the legal process (judges and barrister), sentencing is a social process characterized by the negotiation between those agents, in the framework of social pressures and expectations, and under resource constraints.

The article by Michele Taruffo, which concludes this special issue, provides a link between current jurisprudential research on judicial reasoning and of AI & law. Taruffo views each case as a cluster of linked legal and factual issues, each of which can be given different solutions. From this perspective the situation of the court at the moment of its final decision is characterized by the existence of several possible projects of decision and by the obligation of the court to choose one of them as the best possible decision in that context. Taruffo observes that the idea that the judge's reasoning could or should be completely reduced to simple logical models is untenable. However, he observes that the failure of simple logical models does not impair, but rather makes more valuable, AI & law research, which has succeeded in going far beyond such simple models and which offers a wide and growing inventory of analytical tools, some of which seem to fit judicial reasoning. He focuses then on the automation of judicial discretion, distinguishing different forms of discretion and discussing the contribution of AI to the treatment of each of them. Finally, he addresses the problems of the logic of judicial justification, where he points to the advantages that legal theory can derive from computational dialectics.

3. Conclusion

The short history of AI for the judiciary, while emphasizing the difficult challenges that AI & law has to face, also displays the variety of solutions which our discipline has so far provided. As a reply to those challenges, AI & law has developed increasingly sophisticated models and techniques that address many of the concerns of the critics of earlier AI models, including case-based reasoning, formal dialectics, theory construction, neural networks, formal argumentation and negotiation, intelligent document assembly, and tools for supporting discretional decision-making. These achievements are useful and important for the judiciary, because they provide a deeper and clearer understanding of some aspects of judicial problem-solving, and an effective support to the judges and their collaborators.

Judges, squeezed between tightened budgets and increasing demands for justice, are desperately trying to maintain the quality of their decision-making process while coping with time and resource limitations. Flexible AI tools for decision-support may promote a sufficient degree of uniformity and efficiency in judicial practice, while supporting a rational exercise of judicial discretion (and so possibly help to prevent, for example, the draconian rigidity of compulsory sentencing guidelines). In the same way, AI may help to reconcile flexibility, efficiency and accuracy in complementary tasks, such as the drafting of various judicial documents.

In conclusion, we believe that the judiciary is in the early stages of a transformation in which AI technology will make the judicial process faster, cheaper, and more predictable without compromising the integrity of judges' discretionary reasoning. We hope that the papers in this volume exemplify some of the directions that this transformation will take.

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