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From Jhering to Alexy – Using Artificial Intelligence Models in Jurisprudence

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Abstract

Artificial intelligence has contributed fundamentally to our understanding of reasoning and communication processes, and especially their limits. These insights have deep implications for issues in jurisprudence which depend on a model of ‘correct’ reasoning and argumentation, such as theories of the separation of powers and judicial discretion. Some of these implications are explored in this paper, by using artificial intelligence models to critically evaluate several historically important theories of judicial discretion, including German Conceptualism, American Realism, Hart’s theory of clear cases, Rödiger’s version of ‘legal logic’ and, finally, Alexy’s procedural theory of legal justification.

Keywords: Artificial Intelligence Models, Judicial Discretion, Legal Argumentation

1 On Models

Formal mathematics, especially formal logic, have long been an important modeling tool for some legal philosophers. Artificial intelligence is the study of computer models of individual and group problem solving processes. Combined with techniques from other computer science disciplines, such as multi-media and graphical user-interfaces, methods from artificial intelligence have the potential to make formal models more readily accessible and useful to a broader community.

There are strong interdependencies between the quality of theories of legal reasoning and decision making and the state of technology for building models of cognitive and communicative processes. Though it is true that the quality and limits of a model can only be evaluated relative to a theory, it is equally true that our ability to evaluate theories is limited by the quality of the modeling tools available for discovering, studying and testing their properties. More to the point, the kinds of theories which can be formulated is fundamentally limited by our imaginations. Good modeling tools dramatically increase and sharpen our powers of imagination, enabling theoretical knowledge that was literally unimaginable previously.

To understand how artificial intelligence models can be useful for legal philosophy, it is important to recall a few aspects of models in general. A model can be classified along several dimensions: 1) its purpose, 2) the object modeled, and 3) its analytical, empirical and normative claims.

The purpose of a model can be theoretical or practical. A theoretical model is intended to help clarify the properties of some theory. Rather than proving theorems,

one manipulates the model and observes how it performs. A practical model is intended to be useful in some application, such as planning, design or diagnosis.

Regarding the second aspect, models can be built of any object or system, no matter how abstract or concrete, from the structure of a system of morals to the aerodynamic characteristics of an automobile. It is important to remember that models only share some properties of the objects they are intended to model. The Styrofoam shape in the wind canal is not an automobile.

The analytical claims of a model are its commitments about the structure and relationship of the components of the object modeled. The Styrofoam mock-up of a car makes no commitments about the structure of an automobile's motor or drive train. Whether the claims made for a model are empirical or normative depends on the standard adopted to evaluate the model. In the case of empirical models, the actual behavior of the object modeled sets the standard. In the case of normative models, these roles are reversed. The behavior of the object is judged by comparing it with the ideal represented by the model. Notice that normative models require justification independent of the actual behavior of the object modeled.

Empirical models are of several types. If the goal is to *simulate* the behavior of the object, then it is not sufficient that the model display the same functionality as the object; it must do so in a comparable way. (In AI models of mental behavior, this is called the 'cognitive adequacy' of the model.) Airplanes do not simulate flying birds. In other words, a simulation model is an empirical model which also makes strong analytical claims about the internal structure of the object modeled. If the goal is only performance, then the principle of *Occam's razor* may be used to prefer simpler models. In the history of computers and law, the early *jurimetrics* models were entirely behavioral; they had neither analytical nor normative ambitions. The race of the defendant in a criminal trial may be sufficient to effectively predict the verdict.

Talking about the purpose, object and claims of the model is somewhat misleading, as these are not inherent properties of the model, but are better understood as a relationship between an agent and the model. Thus, when I speak of the purpose of a model, I really mean the purpose intended by some user of the model.

As mentioned above, the subject matter of the field of artificial intelligence is computer models of individual and group intelligence, i.e. of cognitive and communicative processes. Some have claimed that artificial intelligence research may some day enable us to construct intelligent machines, i.e. artifacts which, in some sense, are intelligent. Although provocative, such claims are also highly controversial, and have caused the field of artificial intelligence as much harm as good. My standpoint is that artificial intelligence is about *modeling*, not *constructing*, intelligence. As models of this kind have enormous practical and theoretical utility, there is no need to engage in a debate about the possibility of intelligent machines.

2 Theories of Judicial Discretion

In modern democratic states, political power is divided among the executive, legislative and judicial branches of government. When resolving concrete legal disputes, there is also a division of power between the parties and the courts. What are the limits of judicial discretion? How should it be decided whether these limits have been respected?

Are there methods for constructing decisions which are sure to fall within these limits?

These are old and central questions of legal philosophy. In this section we will use insights from artificial intelligence to evaluate several important theories of judicial discretion, in historical order: German Conceptualism, American Realism, Hart’s theory of clear cases, Rödiger’s proposal for applying the axiomatic method to the law and Alexy’s procedural theory of legal justification.

2.1 German Conceptualism

Mechanical jurisprudence is Roscoe Pound’s term for the conceptualist school of legal philosophy. It was the dominant legal philosophy in Germany during the second half of the 19th century. According to Michael Marx [Kaufmann & Hassemar, 1981, pp. 92–95] its leading figures were Puchta, Windscheid and von Jhering.¹ It is usually understood today as a deductive theory of legal reasoning. According to conceptualism, judges have no discretion. A well trained judge should be able to deduce the single correct solution of a case from the law and the facts.

Conceptualism was prevalent before the development of formal logic, let alone automatic theorem provers using computers, so it was not really ‘mechanical’ in a modern sense. From an AI perspective, conceptualism appears to have more in common with terminological reasoning, in the KL-ONE sense [Brachman & Schmolze, 1985], than with propositional reasoning. Consider this description of the ‘conceptual pyramid’ from Larenz [Kaufmann & Hassemar, 1981, p. 92]:

From level to level the pyramid becomes less wide, but gains in height. ... The ideal of the logical system is completely realized when there is an abstract concept at the top of the pyramid under which all other concepts can be subsumed.

According to Puchta, the law “becomes visible as the product of scientific deduction” using the conceptual pyramid. The complete set of legal ‘sentences’ were considered to be implicit within the closed structure of the conceptual pyramid, just as the theorems of an axiomatic theory are implicit in the axioms.

Puchta named conceptualism “lawyer’s law”, as the professional ‘scientific’ skills of lawyers were required to make explicit the law inherent in this structure.

Although conceptualism is usually ridiculed today, it is interesting to speculate about the interests conceptualist ideals serve. Their emphasis reminds me of the goals of modern software engineering: transparency, maintainability, modularity, and so on. That is, the focus of conceptualism was the structural attributes of a system of laws, independent of the purposes or demands of any particular legal domain.

One way in which artificial intelligence models help us to understand conceptualism and its limits has already been mentioned. Numerous formalizations of the subsumption relationship between terms have been developed in artificial intelligence. These are usually decidable subsets of first-order predicate logic which are in some ways more expressive than propositional logic. Moreover, mechanical theorem provers have been implemented for most of these concept logics. So, if German conceptualism were an

¹Jhering later became a critic of conceptualism and founded *interest jurisprudence*.

adequate theory of judicial discretion, it would now be possible to replace judges by theorem provers of this kind.

Of course it is not possible to replace judges by such theorem provers. Why not? In what way is conceptualism mistaken? Artificial intelligence models make two reasons perfectly clear. The first concerns the so-called 'knowledge acquisition' problem. Even if the subsumption relation were to be mechanized, this would not solve the problems of representing the taxonomies of legal concepts and the facts of the case. Secondly, there is the issue of computational complexity. A good understanding of the complexity of different classes of decision problems had to await developments in theoretical computer science in this century. What the German conceptualist could not have known is just how difficult it can be to prove even apparently simple propositions. We now know, for example, that no procedure exists which can efficiently decide whether or not some arbitrary formula of propositional logic is necessarily true. To appreciate the significance of this, one must keep in mind that propositional logic is one of the simplest formal logics imaginable. One practical consequence of this insight for jurisprudence is that judges *must* use methods which may result in 'incorrect' decisions, at least given the stringent deductive standard of correctness accepted by the conceptualist school.

2.2 American Realism

American realism was an (over-) reaction to conceptualism. The realists, Oliver Wendell Holmes and Karl Llewellyn were the leading figures, take a sociological perspective. The law is what the courts and other authorities decide in fact. Holmes wrote: "The prophecies of what the courts will do in fact, and nothing more pretentious, are what I mean by the law." Realism's preferred theories of the law are those which best *predict* legal decisions. The appropriate methods for studying the law would be those of the empirical social sciences, such as surveys, experiments and statistical models.

Although the prediction of judicial decisions is a legitimate interest, and the methods of social science are surely appropriate for this purpose, realism has little to tell us about the limits of judicial discretion. It neither provides methods for deciding legal cases, nor for critically evaluating legal decisions. Lawyers do not argue their case before a court by publicly predicting the judge's decision. Nor do judges predict their own behavior when deciding cases or justifying their decisions. Thus, for this task, realism is of little assistance to an attorney, and even less to a judge. Moreover, realism does not acknowledge that decisions can be wrong. It does not develop criteria for testing the 'correctness' of judgments. To sum up, realism limits its attention to *descriptive* and *predictive* theories of law, to the exclusion of its normative and synthetic aspects.

The main concern of the American Realists was that judges not be unduly constrained by abstract conceptual ideals [Holmes, 1881, p. 5]:

... the felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow men, have had a good deal more to do than the syllogism in determining the rules by which men *should* be governed. (Emphasis added.)

Thus it is clear that realism was not a cynical recognition that judges will decide cases

as they will, where all one can do is attempt to predict and avoid unfavorable decisions. Rather, realism was motivated by the moral conviction that justice can demand the ‘necessities of the time’ be given greater priority than the maintenance of an elegant ‘conceptual pyramid’.

Empirically founded artificial intelligence models of judicial reasoning might be useful complements to statistical, ‘jurimetric’ methods for anticipating judicial decisions. But artificial intelligence models may also be used to help justify normative theories of judicial discretion. In particular, artificial intelligence models of effective problem solving given incomplete and imperfect information, as well as other kinds of practical resource constraints, especially time, may be useful for discovering and justifying normative standards for judicial discretion. For example, artificial intelligence research in the area of ‘nonmonotonic logic’ is developing normative standards for reasoning with incomplete and even inconsistent knowledge. This research well appreciates the insight of the realists that newer information, i.e. the ‘necessities of the time’, can override generic knowledge, including the functional equivalent of the ‘conceptual pyramid’. Lacking normative models of reasoning given resource limitations, the realists prematurely rejected normative standards for judicial discretion altogether. Had the insights from artificial intelligence been available at the beginning of this century, the realists might have been encouraged to continue the search for appropriate standards, rather than claiming, in effect, that no such standards are possible.

2.3 Hart’s Concept of Law

H. L. A. Hart addressed some of the limitations of American Realism in his “The Concept of Law” [Hart, 1961]. The principal claims of Hart’s form of positivism include:

1. The law is a set of rules, which can be identified by applying a fundamental secondary *rule of recognition*. This secondary rule concerns the *authority* or ‘pedigree’ of the primary rules, not their content.
2. At any point in time, the set of valid rules is ‘exhaustive of the law’. Usually, cases are decided by ‘applying the law’. These are clear cases. But, in *hard cases*, those not clearly covered by one of the rules, a judge must decide the case by ‘manufacturing a new rule’ or ‘supplementing an old one’.

The first point asserts that the ultimate source of law is not reason, ethics or morality, but the sovereign power of the state. This it has in common with realism. It is the authority of judges which entitles their decisions to be characterized as law. This view of law is rooted in Hobbes’ philosophy [Hobbes, 1651]. Thus, positivism, in both forms discussed here, cleanly separates legal and moral questions. Legally justified judicial decisions can be morally doubtful.

Importantly, Hart claims to have addressed to a certain extent one of the limitations of realism mentioned above: it provides legal criteria for evaluating the ‘correctness’ of judicial decisions. A judgment is justified either by a demonstration that its decision was reached by an application of valid legal rules, or by showing that the case was ‘hard’, falling outside the range of application of the existing rules. To this extent, analytical jurisprudence is a normative theory of legal reasoning.

However, like realism, Hart's theory is also empirical. Whether or not a rule is *valid* is viewed as a second-order factual question, to be answered by interpreting sources of law, such as statutes and published cases. Pure reason alone is not sufficient. The validity of a rule must be grounded in evidence of some appropriate action, such as the decision of a previous case or the enactment of a statute, by a legal authority. That is, legal rules are validated not by their truth, but by their 'pedigree'.

Interestingly, this establishes a link between Hart and Wittgenstein's theory of *language games* (Sprachspiele). In his 'Philosophical Investigations' [Wittgenstein, 1958], the so-called 'late Wittgenstein' was one of the first to recognize that language is behavior; used not just to describe the world, but also to command, to direct, to tell stories, to entertain, to persuade, and so on. Hart, building on Wittgenstein's philosophy, recognized that legal utterances can be of different kinds, definitional, empirical (descriptive) and normative, and that different methods are required for establishing the appropriateness of each kind of utterance, depending on the context of its use. This insight is reflected in his secondary rule of recognition, which as just mentioned, appeals to authority, rather than truth or purely formal criteria, to validate legal rules.

Hart's analytical jurisprudence lies somewhere between conceptualism and realism, with respect to the amount of power it delegates to the judiciary. German positivism, including conceptualism, tries to limit 'discretion' to the point that "all arbitrariness is eliminated, so that the judge's sole task is a purely logical interpretation of the law." [Kaufmann & Hassemer, 1981, p. 90] Whereas realism does not provide any criteria for constraining judicial power, Hart limits judicial discretion to *hard cases*.

To evaluate whether Hart's theory sets acceptable normative limits on judicial discretion, a clearer, more concrete model of his distinction between hard and clear cases is required. Hart identified three related aspects of this problem:

1. The problem of interpreting natural language statutes and cases so as to identify the valid legal rules.
2. The problem of the 'open texture' of legal concepts.
3. The problem of resolving conflicts between valid rules.

Artificial intelligence sheds light on each of these problems. In fact, several models have been developed within the 'artificial intelligence and law' community for the very purpose of trying to help resolve these problems.

Regarding the problem of interpreting and understanding natural language, artificial intelligence work in the area of computational linguistics has been making steady progress. But it is the open texture problem which has received the most attention in the artificial intelligence and law community. See, e.g., [McCarty & Sridharan, 1982; Gardner, 1987; Rissland & Ashley, 1987; Ashley, 1990].

Regarding conflicts between legal rules, Hart was one of the first to recognize the need for defeasible reasoning. The nonmonotonic logic community has developed a great many formal models of defeasible reasoning in the last fifteen years. Several Artificial Intelligence and Law researchers have also focussed on this topic, including [Sartor, 1991; Prakken, 1993; Gordon, 1993].

In my opinion, Hart's theory fails to provide a satisfactory account of the limits of judicial discretion. So long as the above problems remain unsolved, there are insufficient operational criteria for applying the distinction between hard and clear cases in practice.

Moreover, such operational criteria would naturally lead to a procedural perspective on judicial discretion, of the kind to be discussed below in the section on Robert Alexy. Once a procedural account of judicial discretion is accepted, Occam’s razor can be applied to eliminate the theoretical distinction between hard and clear cases.

2.4 Rödigg and the Axiomatic Method

Jürgen Rödigg was a student of the German legal philosopher Ulrich Klug, who in the 50’s founded ‘Legal Logic’ [Klug, 1982]. Klug was the first to argue that ‘standard’ mathematical logic, i.e. first-order predicate logic, should play an important function in a theory of judicial discretion, in a way which is claimed to avoid the pitfalls of mechanical jurisprudence and conceptualism. Klug’s proposal was to use the axiomatic method to represent theories of the law, and to oblige judges to publicly justify their decisions as deductive proofs using such axioms. Rödigg went the farthest to defend this proposal, in [Rödigg, 1980], so I would like to focus on his arguments in this section.

There are two issues I’d like to address here. The first is the value of the idea of axiomatizing the law. The second is the issue of whether or not deductive proof is either necessary or sufficient for limiting judicial discretion.

Briefly, the idea of axiomatization is to represent a theory of the law of some domain, such as contracts or tort law, as a finite set of propositions. The *theorems* of a set of axioms are all propositions in its *deductive closure*, i.e. the propositions entailed by the axioms. An axiomatization of some theory is *correct* only if all theorems are members of the theory to be represented. It is *complete* only if every proposition of the theory is also a theorem.

The proposal to axiomatize some theory of law is not a revival of mechanical jurisprudence, because one need not accept that some theory of the law represented in this way is correct. The conceptualists believed it possible and desirable to represent the ‘one true theory’ of the law in a concept hierarchy. The purpose of axiomatization, on other hand, is to reveal the hidden commitments of some proposed theory of law, to expose hidden premises and make logical dependencies explicit. That is, axiomatization is viewed as a tool for critically appraising theories of the law.

My criticism of the idea of axiomatizing the law is that it depends on the questionable distinction between a theory of law and its representation as a set of axioms. No independent theory of some legal domain exists, however, so it is not ever possible to evaluate either the correctness or completeness of some supposed axiomatization. If unacceptable propositions are entailed by some set of ‘axioms’, it is not possible to decide whether this is due to an incorrect axiomatization or a problem with the so-called theory being axiomatized. If the distinction between the axiomatization and its theory collapses, it simply no longer makes sense to speak of axiomatization.

In effect, Klug and Rödigg’s proposal reduces to the claim that judicial discretion can and should be limited by requiring judicial decisions to be justified by deductive proofs. Elliptical arguments should be forbidden; no premises should be suppressed. The decision should be a logically necessary consequence of the published opinion of the judge.

Because the idea of axiomatizing the law lacks merit, the proposal to constrain judicial decisions to be in the form of deductive proofs must be supported in some

other way. For Rödigg, the advantages of this are self-evident; other than pointing out that premises are made explicit by doing so, he makes no effort to justify this claim. Nonetheless, let us subject this assertion to a brief critical examination. Chaim Perelman is of some help here. In [Perelman, 1979, p. 24–35], he describes the development of the doctrine of a separation of powers between the legislative, judicial and executive branches of government, by Hobbes, Montesquieu and Rousseau.

To be brief, two interests are served by the separation of powers doctrine, *equality* and *certainty*. Equality under the law requires the courts be ‘blind’ to irrelevant factors, such as prejudice and the private interests of the judge. Judges should only be [Perelman, 1979, p. 30] “the mouth that speaks the words of law, that is able to change neither the force nor the strictness of the law.” Certainty, on the other hand, requires that legal rights and obligations be predictable. This leads Montesquieu to conclude that the law applied by judges when deciding cases should be the same as the law at the time of the actions giving rise to the conflict.

The separation of powers doctrine played an important role in France after the revolution. According to Perelman [Perelman, 1979, p. 32], it was here that the power of the courts was, as a matter of law, restricted to “correct deduction, without interpretation. Interpretation brings with it the danger that the will of the legislature be subverted.” A law was enacted which required the judiciary to consult the legislature should the applicability of some law to a particular case not be clear. This turned out to be unworkable, however. As the courts frequently invoked the procedure, they became bogged down. More seriously, the rule itself violated the doctrine of the separation of powers, contrary to its very purpose. Not only should the courts not exercise legislative powers, the legislature should not be in the business of deciding particular cases. When this occurs, there is a danger the principle of equality will be violated by a specific law enacted solely to decide the particular case. Thus, the later Code Napoleon was modified so as to *oblige* judges to decide every case, even when the law is unclear or incomplete. This change was explained in an introduction to a draft of the Code, by Portalis, who wrote [Perelman, 1979, p. 34]:

The legislature cannot foresee everything. ... When the law is clear and meaningful, it must be followed; when it is unclear, then the policies and purpose of the law should be clarified. If there is no relevant law, then the case must be judged according to conventional practices and general principles of justice.

Now, what does this short history of the separation of powers doctrine have to tell us about the soundness of Rödigg’s claim that judicial decisions *should* be formulated as deductive proofs? The deductive view of legal reasoning provided a convenient dividing line between the powers of the judiciary and legislature, as proposed by Montesquieu. Had it not been considered possible to decide cases deductively, by merely applying the law to the facts, then the feasibility of Montesquieu’s proposal to completely deny the judiciary legislative power’s may have been seriously doubted.

However, as it became clear that deduction alone is insufficient for deciding cases, for the reasons recognized by Portalis, one might have thought the expectation that decisions should be justified in the form of deductive proofs, applying the law to the facts, would be revised accordingly.

Although this apparently did not happen, for reasons unknown to me, I suspect there are good reasons for *not* insisting legal decisions be justified deductively. Deductive proof is neither necessary nor sufficient to protect the interests of certainty and equality. It is clearly not sufficient, as any proposition entails itself. Merely assuming the decision would not justify it.

A simple example will help to show why deductive validity is not necessary. Suppose one party, say the plaintiff, interprets some statute to mean $A \rightarrow B$, whereas the defendant believes the same paragraph to mean $C \rightarrow B$. Although they disagree about the proper interpretation of the statute, let us suppose they agree that both A and C took place. Thus, no matter which interpretation is accepted, they both must agree that B also holds.

To allow a deductive justification of B without choosing between $A \rightarrow B$ and $C \rightarrow B$, one might suppose that their disjunction, $A \rightarrow B \vee C \rightarrow B$, could just be added to the premises. But what would be the legal *backing* for this disjunctive proposition? To show that this disjunction is legally valid, one would have to show that at least one of its disjuncts is an adequate representation of applicable law, which raises the very issue we are trying to avoid. Simply assuming this additional proposition without reference to appropriate legal authority would risk making a farce of deductive justification. Why not, then, simply assume the conclusion, B ?

Instead, let us consider using $\{A, C\}$ alone as an argument for B . Although B is not a logical consequence of $\{A, C\}$, a decision supported with this kind of argument is nonetheless sufficient to subject it to critical review, should it be doubted that it complies with the law. Had the decision been formulated as a deductive proof, review would have consisted of two tasks: 1) checking that the conclusion is indeed a logical consequence of the stated premises; 2) confirming that the premises are not inconsistent; and 3) checking that each premise is sufficiently backed by legal sources or evidence. The procedure for checking an elliptical argument is different, but not necessarily more difficult. It is an *abductive* process of finding an acceptable explanation for the decision. That is, additional propositions must be found which, together with those stated in the judgment, allow the decision to be deduced. In other words, the responsibility for justifying the decision is divided between the trial and appellate courts. To overturn the decision an appellate court has the burden of finding an interpretation of the law which is inconsistent with the judgment.

Why would we want to shift some of the burden of justification to the appellate courts? Competing with equality and certainty is the interest of resolving conflicts at least cost, by avoiding nonessential issues. Consider the example above. Requiring the court to make a choice between these two interpretations, just for the purpose of constructing a deductive justification of its decision, would make poor use of the court's limited resources. Further, a decision on this point would be premature; it would be better to wait for a case in which the outcome turns on a choice between these interpretations, as such a case would presumably place the issues, the pros and cons of each choice, in sharper relief.

Early legal logicians like Klug and Rödiger were led astray by the then popular view, at least among many mathematical logicians, that first-order predicate logic was a universally applicable model of correct thinking. Artificial intelligence has taught us to appreciate the importance of resource limitations for practical reasoning. Models of

practical problem solving from artificial intelligence will be of great use in helping us to find realistic standards for evaluating the acceptability of judicial decisions.

2.5 Alexy's Theory of Legal Argumentation

In this section, we examine one final approach to limiting judicial discretion, Robert Alexy's theory of legal argumentation [Alexy, 1989]. The main tenets of this theory are:

1. Legal argumentation is a specialization of general *practical discourse*.
2. Practical discourse is a kind of language 'game'. The rules of the game are designed to assure that each participant has a fair and equal opportunity to express his views and opinions.
3. The decision made after such a discussion is right, correct and *just* if and only if these procedural rules have been obeyed.
4. The procedural rules are not limited to *a priori*, analytical constraints on rationality, such as logical consistency, but may take practical constraints of the context into consideration, such as particular resource limitations.
5. Moreover, these rules may themselves be made the subject of debate and revised, if necessary.

For the purpose of delimiting judicial discretion, Alexy's theory shifts the focus of our attention from the properties of the argument justifying the judgment to the process by which the judgment was reached. The limits of discretion are respected so long as the procedural rules have been obeyed. The correctness of a judicial decision is made dependent on the events leading up to it, in particular the actions of the parties involved in the dispute. Notice also that the theory imposes obligations not only on the judge, but also on the parties. The discourse rules regulate the behavior of all participants, of which the judge is but a distinguished member with a particular role.

Just what kinds of procedural rules does Alexy propose? His book contains a seven page appendix listing all of them. Let me just give a few examples:

Here are several general purpose discourse rules:

1. No speaker may contradict himself.
2. A speaker may assert only statements which he believes.
3. Each speaker must, on demand, justify an assertion, unless he can justify withholding the justification.
4. A participant may make an issue out of any assertion.

And here are some rules particular to legal argumentation:

1. Every judgment must be justified by at least one general legal rule.
2. The judgment must be logically entailed by the general legal rule and the other propositions of the argument.
3. If it is unclear whether or not a condition of some rule of law is satisfied by the facts of the case, a rule must be asserted which decides the issue.

4. Every canon of interpretation that is possibly relevant shall be taken into consideration.
5. Every relevant precedent case shall be mentioned.

An important thing to notice about these rules is that they make the participants responsible for raising issues. Assertions can be made without justification, so long as another participant does not question the assertion. Issues which could have been raised, but were not, cannot affect the justice or correctness of the resulting decision. It is this property of Alexy's theory which avoids the limitations of Hart's analytical jurisprudence. The clearness of a case does not depend on an objective or literal theory of meaning, but on the behavior of the actual participants. That is, a term is clearly applicable to the facts if the parties do not make an issue out of its applicability. Consensus determines clarity.

At this level of abstraction, I find myself in agreement with Alexy's general thesis. However, the particular set of discourse norms Alexy proposes do suffer from several problems. Notice, e.g., that decisions must be justified by a deductive argument. I have already argued that this later condition should not be mandatory. Here, Alexy adopts the conventional point of view, and prohibits elliptical reasoning.

Next, consider the rule that a participant may only assert statements he or she believes. The utility of this rule for limiting judicial discretion seems quite restricted, as subjective beliefs are not subject to direct inspection.

The rules are insufficiently precise. They may be as difficult to interpret and apply as the substantive law of some legal domain. Using these rules directly to regulate a legal proceeding will lead to frequent and unnecessary discourse-theoretical arguments about their intended meaning.

They are too general. Alexy does not distinguish between different types of legal proceedings. Different rules of procedure are applicable to, for example, pleading, discovery, trial and appeal. There is more than one type of legal game.

The rules fail to take resource limitations seriously. Rules such as "Every canon of interpretation that is possibly relevant shall be taken into consideration" and "Every relevant precedent case shall be mentioned" need to be interpreted so as to assure that a court proceeding comes to close within a reasonable period of time.

They fail to distinguish the roles of different players. The discourse rules applicable to a player should depend on his or her role in the proceeding, such as judge, attorney, plaintiff, defendant, or jury.

Finally, and most importantly for our purposes, it is unclear whether these norms achieve the proper balance of power between the courts and the legislature. The rules apply to all speakers, regardless of their role. No attempt is made to distinguish the roles of the branches of government.

These problems with Alexy's theory — its dependence on the conventional deductive model of validity, its abstractness and insufficient precision, its neglect of practical constraints on reasoning and its failure to distinguish roles — may be overcome by making use of computer science models of communication and group problem solving.²

²My Pleadings Game model of civil pleading is a first step in this direction [Gordon, 1993].

What distinguishes theoretical computer science from mathematics in general is its concern for modeling *processes* and *procedures*.³ Artificial intelligence is a branch of computer science focusing on the modeling of cognitive and communication processes, on individual and group problem solving.

Analytic legal philosophers open to formal methods have been unduly limited by their focus on predicate logic as a normative model of correct reasoning. Predicate logic formalizes only the *relation* of necessary consequence. As a model of the process of practical reasoning it is of limited utility. The early legal logicians like Klug were misled by the then prevalent view that predicate logic was in some way a universally applicable model of 'correct thinking'. But computer science was at that time a young field and one could not have expected its results to have been widely known outside of the field, let alone by researchers in the humanities. By now the field has matured to the point that there are a variety of well understood models of processes which could be of greater interest to legal philosophers.

3 Main Points

From Jhering to Alexy, we've seen that artificial intelligence models can help shed light on theories of judicial discretion. In the case of German Conceptualism, modern formalizations of the subsumption relationship between terms help make the limitations of this deductive model of argumentation clear. Conceptualism fails to acknowledge the problems of knowledge acquisition and computational complexity. The American Realists went too far in rejecting all normative limits on judicial discretion. Artificial intelligence models of reasoning with incomplete and uncertain information, such as those developed in the field of nonmonotonic logic, may lead to normative models of legal reasoning which respect the need, recognized by the realists, for flexibility in the face unforeseeable circumstances. Great progress towards finding a satisfactory account of Hart's notion of open textured concepts has been made by Artificial Intelligence and Law researchers in about the last 10 years. And a clearer understanding of Hart's idea of defeasible reasoning is another product of AI research on nonmonotonic logics. Klug and Rödiger's view of the role of logic for justifying judicial decisions suffered from the universality claim of some mathematical logicians regarding first-order predicate logic. Modern 'non-classical' logics being developed in artificial intelligence for modeling practical reasoning under ordinary circumstances are needed for finding realistic standards for judicial decisions. Finally, procedural accounts of legal reasoning, such as Alexy's, would be much clearer if they would make use of the analytical tools developed within computer science for modeling processes.

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³'Computer science' is actually a poor name for the field. It is as if mechanics would be called 'automobile science'.

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