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Judicial Decisions and Artificial Intelligence

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1. Some Remarks About Judicial Decision-Making

In order to start a discussion concerning the possibility of applying AI models to judicial decisions, a necessary preliminary step is to refer to some theoretical frameworks concerning the practice of judicial decision-making and the reasonings made by judges. Of course this is not a matter of free choice or of individual preferences: what is needed is to determine which theoretical approach may produce the relatively best approximation to the empirical phenomenon of decisions made in the context of the administration of justice. This is an extremely complex and difficult problem. On the one hand, the experience of the various judicial systems (and even within a given single system) shows that judicial decision-making includes an almost infinite range of variations. The factors influencing the ways in which judicial decisions are made are numerous and include for instance the format and size of the court (single judge or panels, and so on), the composition of the court (professional and/or lay judges), several procedural rules, the factual circumstances of cases, the form and content of the substantive rules governing the case, the evidence available and the methods and standards used to decide on facts according to the proofs and to solve legal issues according to the relevant rules and principles.

On the other hand, the recent history of the western legal culture has produced a number of different theories concerning judicial decisions. These theories cannot be fully considered here (for a recent account see for instance Larenz & Canaris (1995, 99, 133, 187). However, the problem exists of determining which theory fits best with the experience of judicial decision-making. Of course the answer to this problem depends also upon the way in which such an experience is described and rationalized. In a sense, the theories of judicial decisions are rationalizations of the experience of decision-making. Their number and variety is the consequence of the variety of concrete experiences and of the variety of philosophical and legal approaches to the subject matter of judicial decisions. However, this complexity should not prevent a reasonable choice among the theoretical models of such decisions, in order to assume – as a starting point for further analysis – a model that may

be considered as the relatively best approximation to the reality of decision-making in modern legal systems.

(a) There is no need, however, to choose a whole theory of judicial decision among the pre-existing and "ready made" theories and to assume it once forever as valid in all its details. Rather, it may be useful just to stress some basic points drawing them from the best theories available. One of these points is that the judicial decision can and should be considered as a set of choices among alternative hypotheses of possible decisions (see Roedig, 1969; Taruffo, 1975). The basic idea is that from the very beginning of a judicial process, and then all along its development, several possible "projects" or "drafts" of decision are submitted to the court by the parties, and some other may be built up by the court itself. Every party alleges her own "version" of the case (or even more than one version) and – correspondingly – she proposes a hypothesis (and sometimes more than one hypothesis) for the final decision of the case. When it is vested with such a power, the court may alternatively find out a further hypothesis of decision that is different from the ones that are suggested by the parties. Such a "third way of decision" may then be adopted by the court in order to achieve its final judgment. Generally, therefore, the situation of the court at the moment of the final decision-making is characterized by the existence of several (at least two) possible projects of decision, and by the obligation of the court to choose one of them as *the best* possible decision in that context (see, with specific reference to the judgment about the facts in issue, Taruffo, 1992, 266; Taruffo, 1995).

(b) The choice of a hypothesis of decision is far from being a simple problem because of several reasons. One of these reasons is that a hypothesis of decision is, in fact, a complex set of statements, each statement being a possible answer to a relevant issue or law or of fact. A "case" can be imagined as a cluster of issues that are raised by the parties and possibly also by the court. Such issues may deal with matters of law and/or matters of fact. Every issue may have two or more possible answers. Every combination of all the possible answers to the issues determining a case is a possible "global" hypothesis for the decision of that case. The number of such global hypotheses is theoretically unlimited. Actually only some of them become relevant, and it happens when the parties or the court refer to some specific combinations of possible answers to the several issues of law and fact. In a sense, the group of the hypotheses that are taken into consideration in order to decide a case is a very limited subset of the theoretically possible decisions of that case. Of course such global hypotheses are different not only when they include sets of totally different answers to every legal or factual issue: in order to be different two hypotheses may include even different answers to (at least) one relevant issue (while the answers to the other relevant issues may be the same). However, even two partially different projects of decision form an alternative: correspondingly the court has to make a choice between them.

A very general distinction which may be useful to understand the complexity of hypothetical global decisions is that between *legal* and *factual* issues. Legal issues

are those dealing with the choice of the legal rule(s) governing the case and with the interpretation and application of such rule or rules. Such issues include for instance the reference to written legal provisions, the use of precedents, the use of legal canons, the use of legal arguments, and so forth. In a sense, determining the possible solutions of a legal issue requires dealing with a complex group of related legal questions and to find out the possible answers to such questions. The set of such questions and answers is the "legal context" within which the final decision of the relevant legal matters will be found (see generally Summers & Taruffo, 1991). Factual issues concern the reliability (i.e., the truth or falsehood) of the statements about the material facts of the case. The questions of fact are solved on the basis of the evidence presented, of the proofs emerging from such evidence and of the inferences connecting evidence and factual statements. Assuming that the "issues of fact" are a set of factual statements, each possibly being true or false, one may say that the set of such statements and of their possible values of truth is the "factual context" within which the final decision concerning the facts of the case will be chosen (see Taruffo, 1992, 217, 293; Taruffo, 1995).

(c) The judge's reasoning concerning the various hypotheses about the legal and factual issues has a basically dialogical structure. In fact it is based upon the comparison, the contrast and a final choice among the competing solutions of such issues. There are three major explanations for this dialectical/dialogical structure. An explanation is that most of the hypotheses of decision are proposed by the parties in the course of the proceedings preparing the final judgment. The process may be interpreted as a contest or a conflict between the (two or more) parties: from the point of view of what the parties "say" it is a dialogue. Each party sets forth her own "theory (or theories) of the case" that is made of the groups of statements of law and of fact that are proposed as a valid and reliable hypothesis of decision. Each "theory of the case" often includes also the objections and rebuttals directed against the "theory of the case" proposed by the other party (see Taruffo 1994, 389; Taruffo, 1995, 789). At least in principle, each affirmative or negative statement made by a party is supported by arguments. Many of these statements are in fact answers and objections to the statements made or to the issues raised by an adverse party. The dialectical relationship between the parties is carried on during the whole development of the judicial process. Such an interaction of the parties is the main source of the various hypotheses for the final decision, among which the court will make its choice.

The second explanation of the dialogical structure of the court's reasoning is that the set of hypotheses among which the court has to choose is deeply influenced by the fact that the decision will have effects "between the parties", and that every version of the case proposed by a party is by definition in conflict with the versions proposed by the other party or parties. In a sense, in order to choose a decision the court has "to run again through" the dialogue that has been carried on by the parties. The court shall compare arguments and counterarguments, statements and

objections, affirmations and negations, in order to select the relatively most reliable answers to the legal and factual issues of the case.

The third explanation is that the decision-making reasoning may be interpreted as a dialogue of the judge with herself. It is a widespread commonplace that deciding a case is a complex play of "trial and error". There is some truth in this commonplace, but one should stress that the judge plays this game with herself: the judge starts from a hypothesis (either by deriving it by a party's argument or stating it on her own motion), and then she "tries" this hypothesis in order to check it and to decide whether it is wrong or correct. The "hermeneutic circle" (see e.g., Larenz & Canaris, 1995, 288, 298) involved in every procedure of decision-making has a basically dialogical structure. One may think of a dialogue of the interpreter with the interpreted text, when textual interpretation is involved, or more generally of a dialogue of the decision maker with herself when the problem is of checking the correctness of a hypothesis for a possible decision.

2. Some Remarks About the Justification of Judicial Decisions

After having made the choices that are needed to achieve the final decision, the judge is usually under the obligation to justify such a decision. In all the developed judicial systems the judge is expected to deliver an opinion (usually in a written form, sometimes orally) in which she expresses the arguments supporting her final judgment (see generally Taruffo, 1975, 319).

(a) The justificatory opinion delivered by the judge is supposed to be a "justification" in a proper sense, that is an articulated reasoning expressing the arguments on the basis of which the judgment should appear as valid, reliable, just and reasonable. In a word, the opinion should show that the decision is "reasoned", i.e., well grounded upon "good reasons".

The complexity of the proceeding of decision-making influences the structure and the content of the opinion justifying the decision. This is not to say that there is any kind of direct correspondence or identity between the reasoning of decision making and the justificatory reasoning expressed by the judge in her opinion. On the contrary, it is commonly said that these two reasonings of the judge are structurally and functionally different: decision-making is a sort of "context of discovery" aimed at finding out (i.e., at choosing among alternatives) the correct decision by way of trial and error, hypothesis and control, and so forth, while the justificatory opinion is a sort of "context of justification". It assumes the decision as a starting point, and it is aimed at showing that the decision is "good" on the basis of a set of reasoned justificatory arguments (Taruffo, 1975, 118). However, when a decision is complex, because in order to achieve the final judgment the judge had to make a complicated series of choices among various alternatives concerning several issues of law and of fact, the consequence is that the justification of such a decision is also complex. The judge's opinion shall be made of a complex set of arguments justifying the choices made by the judge about any relevant issue of

law and of fact. If the decision may be imagined as a set of statements, each of them expressing the solution of a relevant issue that has been chosen by the judge, then the justificatory opinion may be imagined as a set of arguments in which one or more arguments deal with each of those statements. A *complete* justification is the one in which every relevant statement included in the decision is expressly and properly justified. A *consistent* justification is the one in which the arguments used do not conflict with each other. A *sufficient* or *adequate* justification is the one in which every statement is well grounded upon good justificatory arguments. A *coherent* justification is the one in which the arguments used fit well with the nature of the issues decided. Thus, the statements expressing the interpretation of the governing legal rules that has been chosen by the judge as a proper and correct interpretation in that case should be justified on the basis of appropriate legal arguments grounded upon relevant legal materials (rules, precedents, canons, and so forth). Correspondingly, the statements expressing the version of the material facts that have been found to be "true" by the judge should be justified on the basis of the relevant evidence, of the standards used to assess the value and credibility of proofs, and of the inferences supporting the final choice of the judge (see generally Taruffo, 1975, 265, 430, 548).

The actual practices concerning justificatory opinions are rather different in the various legal systems. There are in fact several *styles* of judicial opinions according to different traditions and legal cultures (see Summers & Taruffo, 1991, 461). However, the function of such opinions is roughly the same in every legal system. Correspondingly, the basic structure of such opinions tends to be the same, when one looks at the most important features of the judge's reasoning. At least, a general rational *model* of justificatory opinion may be imagined by combining the analysis of the structure of the decision and the consideration of the purpose and function of the justification of a judgment.

(b) A very important feature of many judicial opinions is that they have a *dialogical* structure. Such a feature is more or less evident in the various systems: for instance, it is less visible in French judgments and more visible in Italian judgments, but it exists, at least at a deep level, in every case. Such a dialogical structure of justificatory opinions derives from two main factors that are in part overlapping upon each other.

One of these factors is that the justification of a judgment is – among many other things – also the answer that the judge gives to the parties of the case. This factor is specially clear when the parties are required to set forth their own version of the case in the form of specific "grounds" or issues, because the judge will expressly consider each issue and the arguments proposed by the parties, and he will answer to such arguments by accepting or rejecting them and stating the reasons why he accepts or rejects these arguments. In a sense, therefore, the opinion is a sort of dialogue between the judge and the parties, in which the judge deals with the questions put by the parties and considers the arguments used by the parties to

support the solutions they propose for these questions. Then she gives an answer to these questions and explains the reasons supporting her answer.

The second factor favouring the dialogical structure of justificatory opinions is that the judge is required to set forth the reasons grounding her own choices. This is to say that the judge will use arguments of several kinds in order to build up such a justification. The problem is complex, however, because justifying a choice may require a complicated reasoning. On the one hand, the judge should use arguments positively supporting the choice (i.e., the statement resulting from it) which has to be justified. It is necessary in any kind of justification, and it is specially necessary in judicial opinions. On the other hand, a choice is not completely and properly justified if the alternatives that have been rejected are not taken into due consideration. A choice is not "completely" justified if the justification deals only with the reasons supporting the alternative that has been choosen. The decision should be justified also on the basis of the reasons according to which the other relevant alternatives have been rejected (see Prakken & Sartor, 1997, §2.1). In fact, a rejected alternative could have been better than the alternative that has been accepted. In order to show that the decision that has been finally chosen is the relatively best one, the judge should demonstrate that there were no better alternatives available. Also in the context of justification, therefore, and not only in the context of decision-making, the comparison and the critical analysis of all the relevant possibilities is extremely important. This is to say that the judge should confront herself with the other possible decisions and with the arguments possibly supporting such decisions, with the aim of arguing and proving that such arguments were not valid, reliable or persuasive.

3. Judicial Decision-Making and Artificial Intelligence

If one considers the evident features of complexity, variability, flexibility and discretion that are typical of judicial decisions, any approach aimed at interpreting the judicial reasoning according to logical rules and models may appear as doomed to failure. In fact, the history of the logical theories of judicial reasoning is largely a history of misunderstandings, errors, manipulations and defeats (see e.g., Sartor, 1997). The long history of the unsuccessful but numerous attempts to represent the judicial decision as a syllogism or as a chain of syllogistic steps is a very well known example of it. Still at present a large amount of studies is devoted to the problem of connecting logic and decision-making and of building up appropriate logical frameworks for judicial reasoning (see again Sartor, 1997). The distrust in the possibility of a logical formalization of judicial reasoning may be even more intense when the problem is whether such a reasoning may be interpreted and formalized in terms of computerized logic or, more generally, in terms of AI models. On the one hand, one may observe that the main attempts to "computerize" the reasoning of the judge were so rough, and unable to interpret the complex nature of decision-making, that they could not succeed in producing reliable models of

the judge's reasoning (see generally Leith, 1997). These attempts, one might add, are a good proof of the impossibility of interpreting such a reasoning in terms of AI. On the other hand, one may consider that the decision-making procedure is so complex, variable, uncertain, fuzzy and value-laden, that it could never be reduced to logical models. Any logical model, one might say, would necessarily leave aside important features of the decision-making reasoning that cannot be reduced to logical forms. Therefore, such a model would be basically false as a description and inappropriate as a prescriptive model for judges.

In fact, the idea that the judge's reasoning could or should be completely reduced to simple logical models, or to a narrow group of computerized calculi, is clearly untenable. However, the problem is not to find out a ready-made and simple model but to verify whether AI is – or may be – able to interpret the reasoning used by judges or at least some features of such a reasoning. It is rather clear that this cannot be made by means of simple and easy logical models. On the other hand, research in AI is rapidly evolving and already offers a wide and growing inventory of analytical tools: some of them are hopefully fit with the problems of judicial reasoning. Therefore, at present the problem is neither of making *a priori* acts of faith in the all-encompassing virtues of AI nor of making *a priori* acts of disbelief in any possibility of using AI as a means to elicit, interpret and represent the judge's reasoning. Both attitudes, in fact, would be misplaced and unjustified on the basis of the current "state of the art" of AI applied to the problem of judicial decision-making. Rather, one should take into account the emerging trends in this area and consider whether they appear well oriented and possibly fruitful.

It is impossible to make here a detailed analysis of the research made in the last years in the field of AI with reference to several aspects of the judge's reasoning. Moreover, this research is growing and developing almost day by day, so that such an attempt would be rapidly outdated. It may be useful, however, to look in synthetic and general terms at the main directions of this research, in order to sketch some general remarks and evaluations.

(a) A relevant group of studies is aimed at standardizing procedures used by courts according to computerized models. The goal that is pursued by this research is to facilitate the management of some procedures by the courts by using computers as means to implement such procedures quickly and economically. The basic idea is of having a program corresponding with the relevant features of the procedures involved, so that a procedure may be created and managed by the computer according with this program. In each single case one should only insert the individual data, and the outcome – that is: an order, an act, a decree – should be automatically produced. In some cases some interesting results have been achieved (see Branting, Lester & Callaway, 1997). However, the experience made so far shows that there are problems and limits to deal with in order to develop this perspective of application of AI to the functioning of judicial proceedings.

An important factor, and a significant limit, is that the procedures involved should be simple and able to be repeated in many cases without significant varia-

tions. This is an important condition for the manageability of the program. A simple procedure may be more easily standardized in the form of a computer program for the trivial reason that each step of the procedure has to be translated into a part of the program. The lower the number of the procedural steps considered, the easier is to put them into a software. A further important feature of simplicity is the limited number of alternatives that are possible or should be admitted at any point of the procedure in which a choice has to be made. If at a given point a procedure may be carried on following different paths, one must know in advance which paths may be followed in order to insert them in the program. If such alternatives are two or three rather than some dozens it is much better. It is even better if in a procedure there are few "points of choice" rather than dozens of them. At any rate, each point of choice and all the alternatives admitted for each choice must be defined in advance in order to have a complete formalization of the procedure considered. Some choices may be left "open" (i.e., some alternatives not previously determined may be admitted), but every "openness" entails a lack of efficiency of the system because it requires an *ad hoc* consideration by the user.

The procedure should also be able to apply without significant variations in a relatively high number of cases. If a procedure tends to vary in the concrete cases to which it applies it is difficult or impossible to formalize it in a complete way or to adapt it to the different specific situations. Then the procedure should apply to areas in which concrete cases tend to occur substantially in the same relevant terms. On the other hand, such cases should be rather numerous if the computerized procedure has to be an efficient and economic way to deal with the procedures involved.

These factors of *simplicity, repetitiveness* and *frequency* of procedures in like or identical cases are rather easy to find in several areas of bureaucratic administrations, in private organizations as well as in public agencies. Such situations may be found also in the field of judicial procedures, but here some further problems arise. On the one hand, simple, repetitive and frequent cases exist, but – unfortunately – they are neither the most frequent nor the "normal" situation. The so-called "easy cases" often are not easy enough to be standardized in terms of computerized models. *A fortiori* such a standardization is extremely difficult or impossible to achieve in the "average" judicial case, let alone in *hard cases*. It seems, therefore, that the type of computerization we are considering may be useful but only in a relative narrow area of judicial practice. On the other hand, one must consider that the simplicity of a procedure is not given *a priori,* since it derives from the legal regulation of this procedure. Then the simplicity or complexity of a procedure is determined by the authority that is vested with the power to regulate it. Therefore, in a sense the possibility of translating a procedure into a software program depends upon the choice made by the lawgiver about the type of procedure applied in a given situation. For instance, collection of debts may be made by means of a very simple procedure or a complex one depending upon the lawgiver's choice as to whether it is better to facilitate the satisfaction of the creditor rather than the debtor's defence.

Moreover, the simplicity of the procedure is a matter of degree and of evaluative choices. A "matter of degree" means that there are no absolute and *a priori* standards of simplicity or complexity concerning procedures. Procedures are more or less simple or complex according to a wide number of factors, including the choices of the lawgiver, the behaviours of the subjects involved, the variety of cases, and so forth. Then the level at which AI methods may be applied cannot be determined in advance. Simplicity or complexity of a procedure is a matter of evaluation in several ways. An important evaluative dimension is whether a procedure fits adequately with the nature of cases to which applies. A simple procedure may be inappropriate for complex cases, unless it is flexible enough to be adapted case by case to changing circumstances and to difficult issues. On the other hand, a complex procedure may be inappropriate for simple and repetitive cases because it would be exceedingly burdensome and expensive. A major danger existing in the trend to simplify judicial procedures (eventually in order to standardize them and to translate them into software programs) is, however, that of "losing" the relevant complexity of actual cases or of having procedures that, not being able to grasp and to deal with such a complexity, would lead to inaccurate or inappropriate decisions. Simplicity, in fact, is not a value by itself.

If one keeps these remarks in his mind while thinking of judicial procedures, she may easily come to the conclusion that the standardization of procedures in terms of software programs may be applied in the field of judicial proceedings, but it can cover only some narrow areas of judicial practice. Roughly speaking, these are the areas in which the administration of justice is more similar to the bureaucratic administration with regard to the procedures employed and to the repetitiveness of concrete cases. But most civil or criminal cases cannot be reduced to the ideal type of a simple case deserving to be tried and decided by a simple and standardized procedure. Average and complex cases usually require complex procedures, but such procedures in their turn require – in order to be formalized and standardized – such a high level of sophistication in the methods of AI that at present they cannot even be imagined.

(b) Among the significant instances of application of the methods of artificial intelligence there is the attempt to rationalize discretionary decisions. The main field of application of such a rationalization has been the problem of sentencing in criminal cases (see Schild, 1997; Tata, 1997).

The attempt to rationalize the discretionary judgments of courts raises several important issues. One should distinguish, for instance, between *strong discretion* and *weak* or *regulated discretion*. Strong discretion exists when the judge is completely free to choose her own decision within a theoretically unlimited range of alternatives, and to take into account only the peculiar features of the individual case. Weak discretion exists when the judge is relatively free to choose her own decision but such a choice should be made either within a previously determined inventory of alternatives, or within a range of quantitative possibilities with pre-determined minimum and maximum, or even when the judge should make a

discretionary decision according to standards or principles governing the matter. One may speak also of regulated discretion when these limits, rules or standards are provided for and imposed by the law (about discretion see generally Christie, 1987).

There is no need to discuss analytically such a distinction here, nor is it necessary to examine the various types of weak discretion. However, distinctions concerning different kinds of discretion should be taken into account while discussing methods to rationalize discretionary judgments.

It should be considered that strong discretion cannot be rationalized by means of any logical tool or framework. The basic feature of such a discretion, in fact, is just that the judge is vested with the power to decide each individual case just by paying attention to any relevant feature of such a case and by choosing the premises or the standards for the decision with a complete freedom of choice. The judge shall determine case by case which principle, standard, criterion or canon is more appropriate as a basis for such a specific decision. It seems clear that this choice cannot be rationalized *ex ante*, for instance by imposing rules and procedures of choice to the decision-maker, without destroying it or transforming it into anything else, that is into some form of weak or regulated discretion. At most, the judge may be required to justify *ex post* her choices. The judge may make an *ex post* justification of a decision based on strong discretion by stating expressly the standards and criteria she used in order to reach her decision, and by referring to the features of the specific case that she has considered relevant. The judge may show that, given some relevant circumstances of the case and some standards of evaluation, the decision she has made is reasonable and valid according with its premises. The judge might even deliver an *external* justification of these premises by referring them to higher canons of choice (such as moral or political values justifying the assumption of a principle governing the use of discretion in a particular case), and by giving reasons justifying why she considered some features of the case (for instance: the gender or the social condition of a subject) as relevant for her decision. However, this is not an *a priori* rationalization of the decision-making process (which is probably impossible in terms of logical rules and models) but only an *a posteriori* rationalization of a decision in terms of arguments that seem appropriate to present the decision as founded upon “good reasons”. To the extent that such a rationalization can be made by using methods of AI, it belongs to the area of the analysis of the modes of reasoning by arguments (see *infra*, (c)), rather than to the area of the rationalization of discretionary evaluations.

When weak or regulated discretion is involved, it seems that there is more room for an *ex ante* rationalization of discretionary choices. In fact, in such cases there are pre-existing standards and criteria of decision which determine *ex ante* the borders of judicial discretion and some rules or guidelines governing the choices of the judge. In other terms, there is a set of prescriptions to follow, or a set of alternatives to choose, that define the context in which the discretionary decision shall be made. It is just the case of criminal sentencing when the law determines,

for instance, a maximum and a minimum of imprisonment for each type or crime, or it prescribes that the judge should refer to some factors (such as age, social and mental conditions, prior convictions, attitude to commit future crimes, and so forth), while determining the size of the criminal sanction in a given case. Sometimes a "tariff" is used as a means to regulate the court's discretion in sentencing (see Schild, 1997, §6.2.1.). The usual standards for sentencing can be even more detailed and better defined if all the relevant standards are combined in a precise, complex and sophisticated set of analytical rules producing more detailed classifications, according to which every case may find its own appropriate pigeonhole in which the "proper" sentencing may be determined.

Building up complicated combinations of standards and principles, and analytical classifications aimed at defining sub-sets of cases (and perhaps several layers of subsets determined *per genus et differentiam*), is theoretically possible. Perhaps it is a functional way to rationalize the decision of the judge at the moment of sentencing, since the judge is supposed to be able to put the single case into the proper and exact pigeonhole, in which – so to say – a label saying for instance "6 months" or "20 years" will be found. Perhaps such a method may be useful, if the purpose is to maximize the rationalization of the judge's discretion in determining the proper criminal sanction. It may even be unavoidable if the methods of AI have to be used as means to rationalize the judge's evaluations, at least to the extent that these methods require a previous precise determination of the alternatives among which the judge will choose her decision in the individual case. In fact, some programs aimed at applying AI methods to sentencing seem to have a feature in common: this feature is that, explicitly or implicitly, by law or by logic, by statute or by practice, many hypotheses are stated by combination of the relevant standards of evaluation, and a more or less wide inventory of alternatives is under the judge's eyes. The main idea is that the judge will choose one of such alternatives, within a context in which any case should theoretically find its own proper "pigeonhole", and therefore its own proper sanction, inside a consistent and well-organized set of situations. Such a classification is the result of a rational and logical combination of the standards and principles applying to sentencing in that legal system.

However, this system tends to produce extremely complicated combinations (see Schild, 1997, §3.2.). A further problem is that, in order to be classified or referred to a typical situation, individual cases should be considered as "similar" and corresponding to a type (see Tata, 1997). But this does not solve the problem of judicial discretion, because such a discretion will be used when the judge determines whether a case is similar to another case or whether a case fits with a type.

We may concede, at any rate, that there may be efficient AI methods to rationalize the judge's sentencing. However, the danger is of eliminating the judge's discretion rather than rationalizing it. In fact, AI methods may be efficient insofar as they reduce or eliminate the vagueness, the fuzziness, the open texture and the indeterminacy of the standards governing the practice of sentencing. Such a

reduction or elimination may even be considered as a positive change in the field of criminal law, to the extent that it may increase uniformity and foreseeability (and then certainty and equality) in sentencing, and correspondingly it may decrease or eliminate subjectivity, uncertainty, variability and even inequal treatment in sentencing. From this point of view this may even be considered a reasonable or rational change, if it is assumed that values such as uniformity, and so forth, should take the place of case by case evaluations.

The main point is, however, that under the label of rationalizing the use of discretion in sentencing what is actually done is a chance in criminal policy that is achieved by reducing or excluding the judge's discretion. Reducing or excluding discretion in sentencing is not a problem of method, nor is it simply an instance in the application of AI: it is basically a problem concerning the policy of sanctions in criminal law. This problem involves a number of complex issues such as: should general standards prevail or not upon the consideration of the peculiar features of the person involved? to what extent should judges be trusted in using discretion in a given legal system? which guarantees may or should be enacted in order to prevent abuses of judicial discretion? And so forth. Anyone can perceive that these are extremely important problems the solution of which affects the life and liberty of people.

(c) A further and rather new field for the application of AI methods is the analysis of judicial reasoning focusing upon the arguments used to make and to justify decisions. It is not necessary to make here a detailed analysis of the research made in this area (see for instance, Hage, 1996; Freeman & Fairley, 1996). It is worth stressing, however, that this research deals with some of the most interesting topics of the judge's reasoning, such as the use of precedents (see Prakken & Sartor, 1997), the dynamics of interpretive arguments (Sartor, 1994), the use of arguments and the solution of their conflicts (see Prakken & Sartor, 1996; Kowalski & Toni, 1996; Sartor, 1997, §10.2), the structure of chains of arguments (see Sartor, 1997, §9; Sartor, 1994), and so forth. In order to deal with the complexity and the varying structure of judicial reasoning, such research employs appropriate logical tools such as non-monotonic logic and special formalizations.

So far this area of research is far from providing with a complete analysis of judicial reasoning, nor does it include a detailed set of logical frameworks applying to all the relevant features of judicial decision-making and of the justification of judicial decisions. There are, however, some relevant reasons of interest in this dimension of analysis.

First of all, this research finally sets aside a number of logical models that proved to be unsuccessful and unreliable in the history of the legal culture concerning judicial decision-making. The most important victim is the syllogistic model, but it should not be regretted: it has always been an unreliable picture of how judges make and justify their decisions (see e.g., Taruffo, 1975, 126, 149). Moreover, this research shows that the judge's reasoning cannot be reduced to simple, one-sided, deductive, repetitive, fixed, pre-determined and all-encompassing logical models

of any kind. On the other hand, they show that judicial reasoning is open to logical and rational analysis although it cannot be interpreted in terms of elementary logic. A relevant consequence is that the traditional rigid alternative between deduction and irrationality is clearly wrong and misleading. A decision can be rational and logically founded even when it is not (as it usually happens) deductive.

The type of analysis we are considering is based upon the use of several logical tools. Also because of this, however, it pays due consideration to the complexity and the heterogeneity of the judge's reasonings. In fact, one of the flaws of the traditional theories of judicial decision-making is that they presume to interpret extremely complex phenomena just by using very simple and rough tools (such as the principles of basic logic or the relics of philosophy that lawyers studied at the high school). As we stressed above, on the contrary, there are several factors of high-level complexity both in judicial decision-making and in the justification of judicial decisions. Such complexities require, in order to be properly understood and explained, the use of sophisticated logical and analytical tools. In fact, the modern theory of judicial reasoning becomes more an more complex as it tends to deepen the study of the actual features of such a reasoning in logical and rational terms (for a significant example see Peczenik, 1996).

If a judicial decision is conceived as the outcome of a cluster of choices concerning the solution of legal and factual issues, a rational analysis of such a decision should deal with the logic of rational choices as they are made in the peculiar context of the administration of justice. Thus, for instance, the rational structure of reasoning concerning facts, evidence, inferences about factual statements, and so forth, requires to be analyzed with appropriate conceptual tools. Some of these tools may be drawn, with some adaptations, from the inventory of the concepts used to computerize the flow of information or the flux of knowledge (see for instance Taruffo, 1995, 804). Similarly, the complex structure of the reasoning by which the judge makes his choices concerning the determination, the interpretation and the application of the legal rules governing the case may be studied by means of the logic of rational argumentation and of the logic of deontic or prescriptive statements.

More specifically, it seems that the models of non-monotonic logic and the analysis of the defeasibility of arguments fits very well with the dialogical structure of the judge's reasoning that has been stressed above (see *supra*, §1c and 2b). Advancing arguments and counter-arguments is one of the fundamental factors of judicial proceedings and, correspondingly, of judicial decisions as well. Therefore, understanding the dynamics of such proceedings and decisions requires the use of appropriate logical tools. The study of the modes of arguments and of their dialectical conflicts seems to be specially promising both for realizing how decisions are actually achieved and justified and for extending the use of AI methods in the area of judicial reasoning (see specially Prakken & Sartor, 1997, §4, 6; Sartor, 1997, §8, 11; Prakken & Sartor, 1996).

As we have stressed above, this research is still at its beginning and the purpose of building up a complete AI theory of judicial decision-making is very far from being achieved. However, it seems clear that the use of diversified and flexible logical models is a promising way of dealing with the practice of making and justifying rational decision in the judicial context.

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