Fuzzy Logic and Judicial Decision-Making: A New Perspective on the Alleged Norm-Irrationalism*

TECLA MAZZARESE**

0. INTRODUCTION

According to a long-lasting and widespread view, judicial decision-making as a matter of fact can be, and as a matter of principle should be, logical-deductive in nature, i.e. judicial decisions can and should be taken following the classical logical rules of inference. Thus, it is rather common to characterize a judicial decision as a syllogism – or, along the more recent and refined analyses, as a chain of syllogisms – which is termed ‘judicial’ not because of some peculiar logical feature, but simply because it is drawn within the scope of judicial activity. Notwithstanding the variety of shortcomings and unsatisfactory features which several scholars have denounced of such a view, the theory of judicial syllogism enjoys a large acceptance since, despite of all criticism, it is still conceived as the main guarantee for the rationality of decision-making, and hence as a necessary means to securing that the highly purported value of legal certainty can be attained. Thus, no surprise that whoever dares to point out problems met by the logical-deductive theory of judicial decisions is immediately blamed as an irrationalist and condemned as a supporter of decisionism and arbitrary subjectivism of judiciary. It is not by chance – just to mention a well-known example – that H. Kelsen’s later standpoint on law and logic has been labelled as an expression of norm-irrationalism'. It is not by chance

* I wish to thank E. Bulygin, P. Comanducci, A.G. Conte, G. De Nova, R. Guastini and M. Taruffo for their stimulating comments and remarks on a first draft of this paper. I already presented some of the theses which occur in it in: Fuzzy Logic and Judicial Decision-Making: The Peril of a Rationalist Fallacy. This research has been carried out with the financial support of the Italian Ministero dell’Università e della Ricerca Scientifica e Tecnologica.

** Istituto giuridico, Strada Nuova, 65, 27100 PAVIA (Italy)

1 As is well-known the term ‘Normirrationalismus’ was suggested with regard to Kelsen’s later standpoint on law and logic by O. Weinberger [1981].
that the debate to which Kelsen's standpoint has given a start is focused on the opposition between norm-rationalism and norm-irrationalism.

On this background, the twofold contention of this paper is to argue that insofar as judicial decision-making is concerned (a) the opposition between norm-rationalism and norm-irrationalism is misleading since it is grounded on arguments which are ideological rather than theoretical in nature, and (b) that fuzzy logic might acquire a relevant rôle in showing a way out from this sterile and deceptive opposition.

Given these two aims, my paper is divided into three main parts. In the first part (§ 1.) I will mention three main sources of problems met by the logical-deductive theory of judicial decisions, and I will refer to the logical-theoretical apparatus of fuzzy calculi as a potential means to deal with, and to account for, such problems. Then, in the second part (§ 2.) I will distinguish two opposite theses concerning the putative explanatory power that the logical-theoretical apparatus of fuzzy calculi can be maintained to have insofar as a suitable account of prominent features of judicial decision-making is concerned. Finally, in the third part (§ 3.) I will concentrate on the sense according to which fuzzy logic can be taken to provide an appropriate theoretical ground which enables us to find a way out from the misleading opposition between norm-rationalism and norm-irrationalism.

1. FUZZINESS AND JUDICIAL DECISION-MAKING

Fuzzy logic has not yet acquired a prominent rôle in legal theory investigations and in particular it is far from enjoying a widespread attention in judicial decision-making inquiries. Thus, in this part of my paper, firstly (§ 1.1.) I will put forward some preliminary remarks which might explain the reason why the formal treatment of fuzziness has been so largely ignored by legal scholars. This undertaking obviously does not amount to either a justification of, or a consent with, such an attitude. Rather, it is meant to be an attempt to point out some assumptions on which the misleading opposition between norm-rationalism and norm-irrationalism relies.

Then (§ 1.2.), turning to a closer inspection to the rôle which fuzzy logic may acquire in dealing with judicial decision-making, I will mention three main sorts of criticism addressed to the logical-deductive theory of judicial decisions and I will concentrate on the potential rôle of fuzzy logic in analysing judicial decision-making both because of the fuzziness of judicial language (§ 1.2.1.) and because of the fuzziness (or more correctly: the approximate nature) of judicial reasoning (1.2.2.).
1.1. Fuzzy Logic: A Neglected Conceptual Apparatus

As far as I know very few legal scholars have paid attention to the import of the recently developed and everyday increasingly developing formal-logical treatment of fuzziness on several issues they work on.

It might be the case that the lack of interest is just apparent, that is not the result of an intended reaction, but a phenomenon simply contingent in nature: fuzzy logic and fuzzy set theory are newborn fields of research dealt with by a relatively confined number of adepts using highly sophisticated logical and mathematical tools. Though sound, this hypothesis is not completely convincing. To be sure, in the Fifties and Sixties the newborn modern deontic logic gave rise to immediate and very confident (at times perhaps even too confident) expectations with regard to its potential heuristic power for traditional as well as for pioneering legal investigations.

Thus, it might very probably be the case that the lack of interest in the formal treatment of fuzziness is real, that is the result of an intended reaction stemming from a steady view, theoretical in nature: according to a deeply rooted opinion, legal scholars neither make any effort to elaborate, nor are fascinated by, conceptual tools enabling them to stress and to take in due account fuzziness. Rather, they look for means allowing them to get rid of it and when such an enterprise cannot be completely successful, they do their best to confining and regimenting whatever – in any legal context – is fuzzy or might convey some sort of fuzziness.

Two arguments supporting this second hypothesis are provided by (i) a plausible explanation the hypothesis at issue can suggest with regard to the radical different reactions to deontic calculi and to fuzzy calculi, respectively, and (ii) the prevailing attitude among logicians towards the formal treatment of fuzziness.

(i) Fuzzy calculi – contrary to what is the case with most deontic calculi – are not an extension of classical logic, they belong to what are usually

\footnote{Actually the relative confined number of adepts interested in the formal treatment of fuzziness is quite large. Quoting A. Urquhart [1986, p. 107]: “Since its inception in the mid-1960s this subject has seen an explosive growth and there are now hundreds of papers in the area, numerous volumes of conference proceedings and a journal entirely devoted to fuzzy matters”. To be more precise the journals devoted to fuzzy matters are at least two, namely the «International Journal of Fuzzy Sets and Systems», and the «Journal of Fuzzy Mathematics». Bibliographical references of the volumes on fuzziness published in Seventies are provided by M.M. Gupta / E. Sanchez [1982, p. XV]. To be added to such a list, the second issue of volume 30 of «Synthese» published in 1975 whose papers are all dealing with the formal analysis of fuzziness.}
termed "deviant logics," that is to say to those logics in which some of the fundamental laws of classical logic fail to hold (i.e.: are not valid). In view of this fact legal scholars' divergent responses to these two new branches of modern formal logic can be given a very simple explanation.

Insofar as deontic logic is concerned, several legal scholars have been feeling confident to it from the very beginning of its first developments because most of its calculi—being an extension of classical logic—preserve the standards of rationality at which legal theory aims to attaining. Under this respect it is interesting to recall the way G.H. von Wright describes Kelsen's reaction to his first contact with deontic logic in 1952:

[Kelsen] was very excited about the prospects which deontic logic seemed to open for vindicating some basic tenets in his own "pure" theory of law. In particular, he looked for support in logic for his idea that a legal order is of necessity closed, i.e. that there are no "gaps" in the law, and for the idea that a legal order must be free from "contradictions".

Insofar as fuzzy logic is concerned, several legal scholars might be feeling reluctant rather than confident to it since—being fuzzy logic a deviant logic—it is doubtful what sort of rationality (if any) its calculi can convey. Further, because of its specific concern fuzzy logic leads to ascribe importance to what legal scholars would rather try to get free from in any legal context.

3 A clear characterization of the notion of 'deviant logic'—capturing the very core of the problems to which it gives rise—is formulated by W.V.O. Quine [1970, pp. 80-81]: "The kind of deviation [...] to be considered [...] is not just a change of methods of generating the class of logical truths, but a change of that class itself. It is not just a change of demarcation either between what to call logical truth and what to call extra-logical truth. It is a question rather of outright rejection of part of our logic as not true at all" (my emphasis). Quine's analysis of deviant logic at pp. 80-94 makes no mention of the specific issues concerning a formal treatment either of fuzziness or of vagueness—fuzziness and vagueness are often conceived as equivalent notions. A large and manifold analysis of different philosophical problems touching upon ontological, metaphysical, and epistemological features of deviant logic is provided by S. Haack [1974]. Though no explicit mention of fuzzy logic or of fuzzy set theory occurs in this work, still a rich and stimulating analysis of the peculiar problems stemming from a logical treatment of vagueness is provided at pp. 109-125. Fuzzy logic and fuzzy set theory are explicitly pointed out as a paradigmatic case of deviant logics and dealt with to a certain extent in S. Haack [1978, pp. XII, 35, 162-169].

4 To be noticed that von Wright recalls Kelsen's visit—the only one—to Finland, which happened to be just one year later the publication of two of his papers, namely G.H. von Wright [1951 a] and [1951 b] which are usually acknowledged as the official starting point in the field of modern deontic logic.

5 G.H. von Wright [1985, 269].
(ii) In logic – similarly to what happens in legal theory – fuzziness is mainly conceived as a source of troubles and difficulties. Thus, as a matter of fact there is a sort of scepticism towards the attempts of its formalization. The arguments on which such a scepticism is based do not significantly differ from the reasons put forward for the elimination of fuzziness from legal contexts.

Though it is acknowledged that fuzziness is a peculiar feature of natural languages, still several outstanding logicians feel uneasy to take it into account in their formal calculi. That is mainly so, since quoting S. Haack:

an important reason for constructing formal systems of logic is to supply precise canons of validity – a major advantage of formal logic over unregimented informal argument is its much greater rigour and exactness. In view of this point it is not surprising that Frege and Russell should have regarded vagueness as a defect of natural languages, to be banished from an acceptable formal language. [...] This perhaps suggests that it would be appropriate simply to exclude vague sentences as ineligible for logical treatment.

1.2. The potential Role of Fuzzy Logic in Analysing Judicial Decision-Making

The traditional logical-deductive theory of judicial decisions leaves no room for fuzziness: it is simply ignored if not downright denied that fuzziness can be a feature of decision-making both with regard to its constitutive elements and with regard to the patterns of reasoning which lead the decision-maker to take a judicial decision. Thus, a judicial decision is conceived as a logical inference drawn along the syllogistic schema: the norm of the case (i.e. the norm expressed by the conclusion of a judicial decision) being viewed as the logical conclusion of a syllogistic schema where the major premiss (otherwise termed: legal premiss) is provided by the general norm(s) to be applied and the minor premiss (otherwise termed: factual premiss) is provided by the description of the fact(s) at issue.

Though such a conceptual apparatus seems to secure the standards of rationality of decision-making which most legal scholars would never dare to give up, still the traditional theory of judicial syllogism has been the target of several criticisms chiefly focusing on three topics: (a) the problems

---

6 S. Haack [1978, pp. 162-163]. As already pointed out in fn. 3 insofar as the topic at issue is concerned 'vagueness' is often used as synonym of 'fuzziness' and when this is not the case vagueness is undoubtedly conceived as a paradigmatic example of fuzziness and/or as one of its main sources.
stemming from the assessment of the question of law are not given a satisfactory account when speaking of the formulation of the major or legal premiss of the judicial syllogism; (b) the problems stemming from the assessment of the question of fact are not given a satisfactory account when speaking of the formulation of the minor or factual premiss of the judicial syllogism; (c) legal validity (which applies to norms) cannot be taken to have a logical behavior (if any) which is alike the logical behavior of truth (which applies to the propositions dealt with by the traditional syllogistic theory as well as by classical logic).

Now, it seems sound to maintain that the criticisms addressed to the theory of judicial syllogism – focusing on the three above mentioned topics – are rooted on the manifold fuzziness of judicial decision-making (or to be more precise: on the manifold fuzziness of judicial language), and that is so regardless of the different ways such criticisms happened to be expressed or grounded. Actually the criticisms related to the first and second topic (i.e. the assessment of the question of law and of the question of fact) stem from, and can mainly be given an account in terms of, fuzziness of the language in which the question of law and the question of fact, respectively, are formulated. In its turn the criticisms related to the third topic (i.e. the logical behavior of legal validity) can be explained – even if probably not explained away – looking at judicial reasoning in the perspective of fuzzy reasoning, i.e. in the perspective of approximate reasoning whose logical patterns – whatever ‘logical’ can be taken to mean in such a perspective – are deviant from the laws of classical logic.

1.2.1. Judicial Decision-Making and Fuzziness of Judicial Language. – By ‘judicial language’ I term the set of different languages needed in judicial decision-making to formulate (a) the question of law (the allegedly major or legal premiss of a judicial syllogism); (b) the question of fact (the allegedly minor or factual premiss of a judicial syllogism); (c) the norm of the case (the allegedly conclusion of a judicial syllogism); (d) the justification of the judicial decision itself, when justification is required by the procedural law as a constitutive element of judicial decision-making.

Judicial language – so defined – is a complex of statements belonging to one of the following four different sorts of legal language: (i) legal language *stricto sensu*; (ii) legal dogmatic language; (iii) legal axiological language; (iv) legal fact-finding language*. It is not a difficult undertaking

Needless to say, the terms of the suggested distinction of different kinds of legal language are neither jointly exhaustive nor mutually exclusive.
to show that each one of these legal languages can be maintained to be fuzzy.

(i) Fuzziness of legal language stricto sensu. By ‘legal language stricto sensu’ I term the language in which the norms of a given legal order are formulated. In other words: I mean the set of norm-formulations expressing the norms whose totality constitutes a given legal order. Legal language stricto sensu is the language in which the question of law and the norm of the case of a judicial decision are formulated.

Now, legal language stricto sensu is fuzzy in a twofold sense. To be more precise its fuzziness stems from two different sources: (a) the very way norm-formulations are written down, (b) the complex network of relations which hold (or can be assumed to hold) among different norms expressed by the norm-formulations whose totality constitutes a given legal order.

The first source of fuzziness is due to the way norm-formulations are written down, i.e. the wording of a norm-formulation usually results in a sentence which is fuzzy because of semantical and syntactical reasons.

---

8 A more detailed analysis than the following one of the fuzziness of the four above mentioned legal languages occurs in T. Mazzarese, Fuzzy Logic and Judicial Decisions: The Peril of a Rationalist Fallacy [manuscript].

9 This use of ‘legal language’ simply implies the language-dependent nature of (legal) norms, leaving open the debated question of the linguistic or extra-linguistic nature of norms, and hence of the law itself. The thesis of the language-dependent nature of (legal) norms is explicitly stated by G.H. von Wright [1963, p. 94].

10 These two sources of fuzziness are pointed out by Wróblewski who terms them “fuzziness of legal rules” and “fuzziness of validity”, respectively. (Cf. J. Wróblewski [1983], the same distinction occurs also in A. Peczenik / J. Wróblewski [1985].) Wróblewski’s way to analysing “fuzziness of legal systems” surely influences and conditions my view on the twofold sense according to which legal language stricto sensu is fuzzy, nevertheless in what follows I will not rely too closely on Wróblewski’s paper, trying to develop its insights along a partly different way of reasoning and making use of a different terminology. Similar distinctions to the one under examination are drawn with regard to notions which are very close to the notion of fuzziness, namely: open texture and vagueness. Open texture of legal rules and open texture of law are distinguished and dealt with by H. Hart [1961, chap. 7]; vagueness of norms and vagueness of legal orders are distinguished and dealt with by C. Luzzati [1990 a] and [1990 b, pp. 136-138].

11 This double source of fuzziness of legal language stricto sensu is explicitly pointed out by J. Wróblewski [1983, p. 322] in analysing what he terms “fuzziness of legal rules”. A similar remark occurs also in A. Peczenik / J. Wróblewski [1985, p. 32]. As is well-known both semantical and syntactical problems to which law-texts can give rise are a classical topic dealt with in the theory of legal interpretation at least since the analysis provided by A. Ross [1958, pp. 123-128, pp. 134-135].
Thus, being norm-formulations fuzzy in nature, the same holds true for interpretative statements. Both the legal scholar and the legal official in charge of law-enforcement cannot but deal with interpretative statements which are fuzzy. Their fuzziness might amount to a greater or lesser degree, but the fact that fuzziness of interpretative statements might be weighted according to a scale of different degrees fits very well the kind of data which are the main concern of fuzzy logic.

The second source of fuzziness is due to the complex network of relations which hold (or can be assumed to hold) among different norms expressed by the norm-formulations whose totality constitutes a given legal order. Firstly that is so as a consequence of the fuzziness of norm-formulations themselves: being any interpretative statement of a given norm-formulation fuzzy, the same holds true for the validity statement each interpretative statement conveys\textsuperscript{12,13}. Secondly, fuzziness of validity statements is based on the very complex relations which might be drawn among norms constituting a given legal order. To be more precise the fuzziness of such relations can follow at least from three different sources: (a) validity criteria of a legal norm can give rise to doubts on the lawfulness of a given norm (that is the case of a putative unconstitutional norm as well as of a putative void or voidable contract)\textsuperscript{14}; (b) what usually are called the defects of a legal order – namely: gaps\textsuperscript{15}, normative conflicts\textsuperscript{16}, and redundancy –

\textsuperscript{12} Though in a different formulation, the tenet that any interpretative statement conveys a validity statement occurs in A. Aarnio [1981, p. 426]: “Interpretative statements and norm statements are only two sides of the same coin”, where ‘normative statement’ is used to term “a statement which says something about the content of a valid norm” [ibid., p. 425].

\textsuperscript{13} Such a statement obviously does not amount to maintain that a norm can be more or less valid. It simply points out that the question as to whether a given norm is valid or not can be open to debate and hence that the norm at issue can lead to different fuzzy validity statements. The tenet that a norm can be valid to a greater or lesser degree is maintained by A. Ross [1958, p. 45]: “According to the traditional view the validity [...] of a particular norm is derived from the superior norm in conformity with which it has come into being – in the final instance the law of nature or a presupposed initial hypothesis or basic norm. On such premises, obviously, the concept of validity must be absolute – either a rule of law is valid or it is not. [...] In fact the assertion that a rule is valid law is highly relative. It can also be said that a rule can be valid law to a greater or lesser degree varying with the degree of probability with which it can be predicted that the rule will be applied”.

\textsuperscript{14} Insofar as unconstitutional norms are concerned, the soundness of such a tenet seems to be denied by E. Bulygin [1991, p. 267], and at least to be conceived as open to debate by J.J. Moreso, Sobre normas inconstitucionales [1993].

\textsuperscript{15} In a paper focusing on the bearing of the conceptual apparatus of fuzzy logic on legal inquires, the case of gaps is explicitly dealt with by L. Philipps [1990].

\textsuperscript{16} Normative conflicts are mentioned as a possible source of fuzziness of legal language
actually give rise to the problem of the allegedly validity of the norms (expressed by the norm-formulations) which happen to be the particular subject matter of such defects; (c) derogation – both in its implicit and in its explicit form – gives rise to problems concerning the validity of the derogated norms. As it is obvious the norms which happen to be at issue in any of the above mentioned problematic situations lead to validity statements which to a greater or lesser extent are fuzzy.

(ii) Fuzziness of legal dogmatic language. By ‘legal dogmatic language’ I term the language which aims at describing to what a legal order, or simply one of its parts, amounts. In judicial decision-making legal dogmatic language is mainly used for the justification of the decision and at times can also be used in the formulation of the question of law.

Regardless of the different theses which can be maintained on the nature, the particular function, and the main features of legal dogmatics, it is undoubtful that its language is fuzzy. What might be open to debate is whether any statement of dogmatic language is necessarily a fuzzy statement, and further to what an extent fuzzy dogmatic statements are fuzzy. But actually neither of these two queries is really to the point, i.e.: neither of them provides a sound argument opposing the claim of fuzziness of legal dogmatic language.

Evidence of the fuzziness of legal dogmatic language is provided by those of its statements which convey evaluations of existing regulations and/or suggestions on the way the law-maker is to improve or modify certain fields of enacted law.

Further and more prominent evidence of the fuzziness of legal dogmatic language is that undoubtedly legal dogmatics’ main concern are both interpretative and validity statements. That is to say statements which – as it has already been stressed – are fuzzy. What might vary (or more precisely: what might be differently perceived or evaluated) being only the degree of their fuzziness.

stricto sensu by J. Wróblewski [1983, p. 328]. A similar remark occurs in A. Peczenik / J. Wróblewski [1985, pp. 30-31]. Remarks on normative conflicts as a source of uncertainty and indeterminacy of legal orders – though without any explicit reference to fuzziness – are provided e.g. by T. Mazzarese [1987, pp. 351-353].

17 Derogation is mentioned as a possible source of fuzziness of legal language stricto sensu by J. Wróblewski [1983, p. 328]. A similar remark occurs in A. Peczenik / J. Wróblewski [1985, pp. 30-31].

18 Both sorts of statements just mentioned in the text are typical of what I termed axiological legal language, but as noticed above, fn. 7, the different kinds of legal language distinguished are not mutually exclusive.
(iii) **Fuzziness of legal axiological language.** By ‘legal axiological language’ I term the evaluative language concerning either the enacted law or the law to be enacted. Legal axiological language plays a prominent rôle mainly in the justification of judicial decisions.

No argument is needed to support the claim that a language evaluative in nature is fuzzy. In particular, insofar as legal axiological language is concerned two main sources of fuzziness can be pointed out. The first one is related to those of its statements which provide an evaluation of existing regulations. That is so since such statements cannot but rely on interpretative and validity statements of the existing regulations dealt with.

The second source of fuzziness is related to those statements of legal axiological language suggesting which new regulations ought to be introduced and/or which existing regulations ought to be derogated in order to achieve a given ethical, or political, or ideological end (goal). That is so - needless to be remarked – since very seldom there is just one way to achieving a given end, to be faithful to, and coherent with, a given ideal. In other words: these so to speak instrumental statements pointing out the putative proper means to attaining a given goal are fuzzy: they amount to proposals whose possible successfulness is a matter of degree very likely to vary to a greater or lesser extent.

(iv) **Fuzziness of legal fact-finding language.** By ‘legal fact-finding language’ I term the language used in judicial decision-making to formulate whatever concerns the so-called fact-finding (fact-ascertaining) and hence whatever concerns the statement and the evaluation of proofs and evidence.

Needless to stress, the so-called fact-finding or fact-ascertaining is the real core of judicial decision-making. To be sure any judicial decision depends upon the very reconstruction of the fact(s) grounding the given legal case at issue. Now, such a reconstruction is the result of several complex relations holding among different elements which very often cannot be but formulated in a fuzzy language. To be more precise what I term

---

19 Needless to notice that the following remarks on legal fact-finding language do not apply to the judicial decisions taken either by the Constitutional Courts or e.g. by the European Supreme Courts since such judicial decisions do not deal with any question of fact.

20 Attention to the fuzziness of the language needed to formulate whatever concerns proofs and evidence in fact-finding is explicitly drawn by M. Taruffo [1992, pp. 204-212]. Taruffo’s remarks – the ones occurring in the few pages of his work just referred to as well as other relevant ones occurring in different parts of his manifold analysis – surely influence and condition my view on the fuzziness of what I termed legal fact-finding language.
legal fact-finding language is fuzzy in a twofold sense, namely it is fuzzy (a) since it is so to speak legal language-dependent, and (b) since it is so to speak common language-dependent. Legal fact-finding language is legal language-dependent in the sense that it relies on, and is conditioned by, legal language stricto sensu; it is common language-dependent in the sense that the different ways to present and to conceive the fact(s) at issue — though legally laden — are formulated in common language.

If the foregoing remarks are correct, then it is rather evident how the fuzziness of (the four legal languages constituting the) judicial language affects, as well as provides a suitable means to account for, the prominent features of the main constitutive components of judicial decisions: (a) the question of law (the allegedly major or legal premiss of a judicial syllogism); (b) the question of fact (the allegedly minor or factual premiss of a judicial syllogism); (c) the norm of the case (the allegedly conclusion of a judicial syllogism); (d) the justification of the judicial decision itself.

(a) Fuzziness and question of law. The assessment of the question of law meets two sorts of problems: the first one concerns the valid norm(s) to be applied, the second one concerns the decision-maker's choice both of the norm-formulation(s) to be taken into account and of the norm(s) assumed to be expressed by the norm-formulation(s) actually taken into account.

The first sort of problems concerning the valid norm(s) to be applied in deciding a given legal case stems from, and can be acknowledged and analyzed in terms of, the fuzziness of legal language stricto sensu and partly — insofar as it is made use of — in terms of fuzziness of legal dogmatic language. That is so since the valid norm(s) to be applied can be — to a greater or lesser extent — open to debate inasmuch as its (their) interpretative statement(s) and/or its (their) validity statement(s) are concerned.

The second sort of problems concerning the decision-maker's choice of the valid norm(s) to be applied actually pertains more to the fuzziness or approximate nature of judicial reasoning as such than to the fuzziness of the very language formulating the assessment of the question of law.

Nevertheless in what follows I will not rely too closely on Taruffo's remarks, trying to develop the insights they convey along a partly different way of reasoning and making use of a different terminology.

21 Either of the two expressions 'legal language-dependent' and 'common language-dependent' clearly resembles, and on purpose refers to, the expression 'language-dependent' as it is used in characterizing the notion of (legal) norms. See above fn. 9.
(b) Fuzziness and question of fact. The assessment of the question of fact – as it is the case for the assessment of the question of law – meets two sorts of problems: the first one concerns its very formulation, the second one concerns the decision-maker’s choice of a given formulation (or to be more precise: of a given fact-description) among different possible ones.

Obviously the sort of problems to which the very formulation of the question of fact gives rise stems from, and can be acknowledged and analyzed in terms of, the fuzziness of the legal fact-finding language.

The sort of problems related to the choice of a given fact-description in order to assess the question of fact pertains to the fuzziness or approximate nature of judicial reasoning.

(c) Fuzziness and the norm of the case. The formulation of the norm of the case (i.e. of the norm expressed by the conclusion of a judicial decision) can be fuzzy to a greater or lesser degree. That is so as for any other norm-formulation, i.e. as for any statement of legal language stricfo sensu. To be more precise, the norm of the case can give rise to uncertainty with regard to the interpretation of its formulation and with regard to its very lawfulness, this latter possibility arising when it is open to debate whether its statement meets or fulfils all the procedural and material legal requirements.

Needless to be remarked, the decision-maker’s statement of the norm of the case (i.e. the norm expressed by the conclusion of a judicial decision) rises the central core of problems insofar as the fuzziness or approximate nature of judicial reasoning is concerned.

(d) Fuzziness and judicial justification. Insofar as the judicial decision-maker ought to justify its decision (namely ought to show on which grounds the statement of the norm of the case as well as the statement of the question of law and of the question of fact relies), it cannot but make use of fuzzy statements which have to provide good reasons in support of its choices. Thus the decision-maker is likely to use widely and largely legal dogmatic and legal axiological language in order to show why its choices are better grounded on and/or closer and/or more correct than other possible ones with regard to the wording of the law-texts and/or to the general principles of law and/or to the will of the law-maker and/or to some of the possible different legal policies and/or values.

It seems sound to maintain that fuzziness or approximate nature of judicial reasoning pertains also to the decision-maker’s choice of the very
way to lay down the justification of a given judicial decision. That is simply so because how good a good reason can be taken to be in justifying a given choice obviously depends — once again — on a choice which is a function of a fuzzy set of fuzzy variables.

1.2.2. Judicial Decision-Making and Fuzziness of Judicial Reasoning. — Thus far the remarks put forward in § 1.2.1. lead to two main tenets: (a) all the constitutive components of judicial decision-making are formulated in a fuzzy legal language; (b) each constitutive component of judicial decision-making not only is formulated by means of a linguistic expression which is fuzzy to a greater or lesser degree, but further it can be understood as the result of a fuzzy or approximate pattern of reasoning. In an even more synthetic way the remarks of the preceding paragraph can be summarized in the thesis that each constitutive element of judicial decision-making is a fuzzy result of a fuzzy or approximate pattern of reasoning.

Now, the second of the two above mentioned tenets demands for some comments since differently from the first tenet — it has not yet been supported by any explicit argument. To be sure it has been left to the status of a plausible hypothesis to explain the problems related to the nature of the decision-maker's different choices at any stage of judicial decision-making. The main argument supporting the hypothesis at issue is that at any stage of a judicial decision the decision-maker actually deals with fuzzy data belonging to fuzzy sets.

The reasons why this holds true for the assessment of the question of law and for the assessment of the question of fact have already been put forward in dealing with the fuzziness of legal language *stricto sensu* and the fuzziness of legal fact-finding language, respectively. A further argument supporting the fuzzy or approximate nature of judicial reasoning in assessing the question of law and the question of fact is provided by the very requirement to justify both of them. Living aside the fuzzy nature of justification itself, and the fact that not all legal regulations of judicial decision-making requires it, what is worth stressing here is that justification would be not only superfluous but plainly useless if not on the ground of the approximate nature of judicial reasoning. If judicial reasoning would be likely to follow necessary and cogent logical laws, what might ever be the need to require the decision-maker to provide good reasons for its choices in assessing the question of law and the question of fact? Indeed if judicial reasoning could be taken to follow only necessary and cogent logical laws, then whoever would be able to see — without any need to resort to the
decision-maker’s justification of its own different choices – whether a judicial decision is right or wrong.

If the foregoing remarks are sound, then they hold true a fortiori for the very statement of the norm of the case (i.e. for the norm expressed by the conclusion of a judicial decision).

So far, even taking for granted the fuzzy or approximate nature of judicial reasoning, a further problem still waits to be taken into account, namely the third sort of criticism addressed to the logical-deductive theory of judicial decisions: legal validity (which applies to norms) has a logical behavior (if any) which is not alike the logical behavior of truth (which applies to the propositions dealt with by the traditional syllogistic theory and by classical logic). Thus, the question that is still to be answered is: can the acknowledgement of the fuzzy nature of judicial reasoning be of any help in solving the problem at issue? Or, to put it in other words: do fuzzy calculi explain away this crucial deficiency of the logical-deductive theory of judicial decisions?

Actually such a question can be given two different answers along two divergent perspectives to look at fuzzy logic. Both the two competing views on fuzzy logic and the two different answers that they respectively convey for the question at issue will be the concern of the second part of this paper.

2. Fuzzy Logic and Judicial Decision-Making: Two Opposite Theses Confronted

Quoting an undoubtedly happy expression by N. MacCormick “to decide is not to deduce”22. Simple and plain as it may sound, this expression actually hits the target: indeed it puts in a nutshell the crucial problem of any attempt to account for judicial decision-making by means of a formal-logical apparatus – i.e. the crucial problem of any attempt to support the looked forward rationality of judicial decision-making on the steady ground of formal-logical analysis. That holds true for the formal apparatus provided by the classical logic, and for the formal apparatus provided by any of the so-called non-classical logics – be it an extension of, or rather a deviation from, classical logic. That is to say that not only the traditional theory of judicial syllogism but fuzzy logic as well has to confront itself with this very problem.

22 N. MacCormick [1989].
Now, contrary to what might be thought to be the case, though clear and pregnant MacCormick's formulation of the problem does not lead to a unique solution to what might be taken to be the rôle (the explanatory power) of a formal-logical apparatus in accounting for judicial decision-making. As a matter of fact that is what actually happened with regard to the logical-deductive theory of judicial decisions, and that is what is likely to be going to happen with regard to fuzzy logic.

Though up today very few papers have explicitly paid attention to the formal apparatus of fuzzy logic in analysing judicial decision-making, two different attitudes towards its potential rôle on such a matter can be already distinguished. These attitudes can be characterized by means of the two opposite following theses:

(a) Fuzzy logic allows us a rational reconstruction of judicial decision-making since it provides the logical tools to overcome the criticisms addressed to the logical-deductive theory of judicial decisions.

(b) Fuzzy logic does not allow us a rational reconstruction of judicial decision-making since – because of its peculiar features – it confirms rather than overcoming the criticisms addressed to the logical-deductive theory of judicial decisions.

Though opposite such theses share a common claim: the formal apparatus of fuzzy logic is more suitable than the formal apparatus of classical logic for capturing and dealing with some prominent features of judicial decision-making. Notwithstanding the question as to whether legal validity has any logical behavior is still to be answered, the soundness of such a claim has been largely supported by the arguments put forward in § 1.2.

Needless to say, the soundness of such a claim does not provide any proof supporting either of the two theses, and as far as I know neither of them has been explicitly maintained. Still M. Taruffo's and L. Philipps' analyses dealing with fuzziness and judicial decision-making put forward arguments which might be taken to support either of the two theses of the dilemma under examination. Notwithstanding neither Taruffo nor Philipps take a steady stand in favour of one of the two theses, still Taruffo's analysis is likely to rely on an assumption which leads to maintain the first of the two theses, while Philipps' analysis is likely to ground the second one.

---

23 It is worth noticing that the formulation of the two opposite theses stems from remarks which are so to speak abductive in nature. That is so because of the very few works dealing with the matter under examination and moreover because none of such works I know explicitly maintains either of the two theses even though both of them – at least implicitly – seem to be taken as plausible or potentially correct.
2.1. **Fuzzy Logic as a Means to Securing the Rationality of Judicial-Decision-Making**

To be sure Taruffo is a convinced – even if not always a convincing – supporter of the rationality of judicial decision-making. The main reason why his claim for rationality is not always convincing might sound paradoxical since it is supplied by the very analysis – usually careful and manifold – which Taruffo himself provides of most of the problems standing in the way of the achievement of the standards of rationality he purports to be attained. Now, Taruffo’s view on fuzzy calculi fits very well this peculiar feature of his way of looking at judicial decision-making. Having taken for granted that insofar as fuzziness is concerned the best strategy to securing the rationality of judicial decision-making is to get rid of it, and further having acknowledged that such a strategy often cannot be successful, Taruffo is likely to maintain that when such a strategy cannot be successful, the logical apparatus of fuzzy calculi can be taken to be a suitable means to securing the rationality of judicial decision-making.

The paradigmatic opposition between rationalism and irrationalism is the key point both with regard to the way Taruffo formulates the problem and with regard to the way he suggests its possible solution. The formulation of the problem related to the cases in which data conveying fuzziness cannot be eliminated runs as follows:

The problem is [...] to see whether in such cases a *rational procedure* is nevertheless possible [...] or whether the occurrence of such data condemns to *indeterminacy* and to *subjectivism* any pattern of reasoning grounded on the propositions in which such data occur (my emphasis).

---

24. The same remark holds true with regard to other convinced supporters of the rationality of judicial decisions. Now, it is worth stressing that the paradox of claiming for rationality of judicial decision-making being aware of the difficulties which stand on the way to attain it is only apparent. Actually such a paradox vanishes if due attention is paid to the fact that the claim at issue is grounded on ideological rather than theoretical or explicative arguments. The ideological nature of such a view on judicial decision-making at times is not even hidden or concealed, but explicitly stated and maintained. That is so e.g. in M. Taruffo [1992, pp. 42-50]. I will come back to the ideological nature of the claim for rationality and for the possibility of a formal-logical analysis of judicial decisions, below § 3.3.

The suggested solution is to make use of the formal apparatus of fuzzy set theory since it shows

the possibility to draw rational procedures whose concern are vague concepts. In other words: vagueness as such is not a source of subjectivism or irrationalism; it is simply a widespread and often unirreducible feature of natural language which demands for a "special" logic in order to be formalized, but that does not exclude a priori any possible rationalization. [...] Reasoning on vague notions is approximate and not precise, but this does not imply that it is irrational or unreasonable since vague notions can lead to logically determined functions (my emphasis)\(^26\).

Now, such a view on fuzzy calculi and their bearing on the analysis of judicial decision-making is misleading (a) because at least implicitly relies on, and can lead to, what can be termed a form of rationalist fallacy, i.e.: whatever can be accounted for in terms of a formal-logical apparatus conveys rationality; and (b) because the opposition between rationalism and irrationalism does not apply to what is the very peculiar feature of fuzzy logic.

Indeed in fuzzy logic everything is fuzzy: the data dealt with (i.e. the fuzzy predicates and/or propositions), the set of truth-values made use of as well as any of the truth-value belonging to such a set, the inference rules made use of, the very results which can be drawn following such fuzzy inference rules. Quoting a plain characterization provided by L.A. Zadeh:

Perhaps the simplest way of characterizing fuzzy logic is to say that it is a logic of approximate reasoning. As such, it is a logic whose distinguishing features are (i) fuzzy truth-values expressed in linguistic terms, e.g., true, very true, more or less true, rather true, not true, false, not very true and not very false, etc.; (ii) imprecise truth tables; and (iii) rules of inference whose validity is approximate rather than exact. In these respects, fuzzy logic differs significantly from standard logical systems\(^27\).

\(^{26}\) M. Taruffo [1992, p. 208]: "[la] possibilità di costruire procedimenti razionali aventi ad oggetto concetti vaghi. La vaghezza, in altri termini, non è di per sè un fattore di soggettivismo o di irrazionalità: molto semplicemente è un carattere assai frequente e spesso irraddrucibile del linguaggio che richiede una logica “speciale” per essere formalizzato ma che non esclude a priori ogni possibile razionalizzazione. [...] Il ragionamento su nozioni vaghe è impreciso e approssimato, ma ciò non implica affatto che si tratti di qualcosa di irrazionale o di non ragionevole, poiché nozioni vaghe possono dar luogo a funzioni logicamente determ innate".

\(^{27}\) L.A. Zadeh [1975, p. 407].
2.2. Fuzzy Logic as an Explanatory Model of Judicial Decision-Making

Taruffo neither disregards nor denies that fuzzy logic is a logic of approximate reasoning. Actually he mentions this characterization of fuzzy logic. Nevertheless, insofar as its bearing on judicial decision-making is concerned he is inclined to emphasize its formal logical procedures that might seem to guarantee as such the standards of rationality he deems to be attained. In other words, as already noticed, Taruffo’s analysis is very likely to lead to a rationalist fallacy. Just the other way round, though on the base of a truly confident attitude towards the significance of this new branch of formal logic for legal inquiries, Philipps’ view does not seem to convey, nor to be tempted by, any form of rationalist fallacy.

My claim that Philipps’ view does not convey any rationalist fallacy, and further that it is likely to ground the thesis that fuzzy calculi can be understood as mere explanatory models of judicial decision-making follows from a plain observation. Philipps’ confidence in the applications of neural networks as well as of fuzzy logic stems from the tenet that such applications can allow us to reproduce a very peculiar feature of (judicial) decision-making, i.e.: to range over a scope — more or less wide as the case may be — of different possible and plausible results.

Thus, for example, after having sketched a rather complex legal case concerning a will, Philipps comments as follows the result provided by a computer working with a neural network:

Here the computer has decided in an autonomous way. It was not told which way was to be followed — as it is the case with usual programs — or which result was to be attained — as it is the case with Prolog program. Its result is not even the only obviously exact result, it is just one plausible solution (my emphasis)\(^28\).

Such a statement can be taken as a proof that what is at issue with the neural networks — but the same holds true with fuzzy calculi — is not any alleged rationality of the result attained, nor its allegedly capacity to securing legal certainty, but rather its being one of the plausible (or even one of the most plausible) decisions which might be taken with regard to a given legal

case. Further evidence can be taken to be other statements of Philipps' like the following:

What the nets provide is also typically required by jurisprudence, i.e.: decisions based on similarity and on the ground of a global impression which is the result of a variety of imprecise factors even insofar as their definition is concerned. It follows that in the single cases such factors can be more or less pregnant to a degree which cannot be exactly measured²⁹.

In a word, the main concern of neural networks as well as of fuzzy calculi is to reproduce different patterns of reasoning and taking decisions along a fuzzy set of fuzzy variables. That is to say to provide different possible explanatory models of different possible ways of reasoning and taking decisions.

3. NORM-RATIONALISM / NORM-IRRATIONALISM OPPOSITION REVISITED FROM A FUZZY LOGIC PERSPECTIVE

The two different perspectives to look at fuzzy calculi which lead to the theses of the dilemma dealt with in § 2. enable us to distinguish two divergent possible ways to look at the very problem standing in the way of any attempt to account for judicial decision-making by means of a formal-logical apparatus: the problem that MacCormick summarizes as “to decide is not to deduce”.

Insofar as fuzzy logic is concerned the two divergent ways to look at the problem at issue can roughly be sketched as follows:

(a) Who maintain the thesis expressed by the first horn of the dilemma (i.e. fuzzy logic allows us a rational reconstruction of judicial decision-making) cannot but restate one of the different answers that the problem has already been given with regard to the logical-deductive theory of judicial decisions, although the answers will be based on the different logical apparatus of fuzzy calculi.

(b) Who maintain the thesis expressed by the second horn of the dilemma (i.e. fuzzy logic does not allow us a rational reconstruction of judicial

²⁹ L. Philipps [1990, p. 822]: “Denn was die Netze leisten, wird typischerweise auch von der Jurisprudenz verlangt: Entscheidung nach Ähnlichkeit und auf Grund des Gesamteindrucks, der sich aus einer Vielzahl von Faktoren ergibt, die schon von der Definition her wenig bestimmt sind und dabei im Einzelnen in einer nicht genau meßbaren Weise mehr oder weniger stark ausgeprägt sein können”.

decision-making) can convincingly assert that the problem at issue does not rise with regard to fuzzy calculi for the very reason that they are conceived as possible explanatory models of different possible patterns of reasoning resulting in a decision.

3.1. Remarks on the First Possible Way to Look at the Problem

Insofar as fuzzy calculi are conceived as a means to securing the rationality of judicial decision-making and to attaining legal certainty, they cannot but confront themselves with the same criticisms addressed to the logical-deductive theory of judicial decisions: the validity of the norm of the case (i.e. the norm expressed by the conclusion of a judicial decision) is not a matter of logical deduction, but rather a matter of factual decision\(^{30}\). Further, for the very reason that – alike judicial syllogism, though on the base of a different logical apparatus – they are conceived as a means to securing the rationality of judicial decision-making and to attaining legal certainty, the way to deal with the criticisms at issue will necessarily reproduce one of the different answers which have already been suggested with regard to the theory of judicial syllogism. That is to say, just to mention some example, that the formal apparatus of fuzzy logic can be understood either (a) as a means to justify the validity of the norm of the case on the base of the validity of the general norm(s) issued by the law-maker\(^{31}\), or (b) as a means to provide a rationalization \textit{ex post} of a judicial decision once it has already been taken\(^{32}\), or (c) as a rational constraint confined to the internal justi-

\(^{30}\) H. Kelsen [1965, 1968, pp. 1484-1485, Engl. tr. 1973, p. 241] states the problem as follows: “It is undoubtedly possible for the general norm ‘All thieves should be punished, i.e. sent to prison’ to be valid, since created by way of legislation, and for the statement ‘Smith is a thief’ to be true, and even to be asserted by the competent court, while the individual norm ‘Smith should be sent to prison’ is nevertheless not valid, because the competent court has [...] failed to posit it”. That is to say quoting N. MacCormick [1989]: “Deciding (like claiming) is an act of will and acts of will are not ever in any sense determined by logic. Decisions are made not deduced. To decide is not to deduce”.

\(^{31}\) H. Kelsen [1965, 1968, pp. 1484-1485, Engl. tr. 1973, pp. 244-245] maintains that the syllogistic schema can be a suitable means to represent the fact that: “the validity of the individual norm posited by the court can be justified by means of the validity of the general norm posited by the legislator”.

\(^{32}\) This view is maintained e.g. by A. Aarnio [1977, pp. 57-58]: “the judgement is rationalized \textit{ex post} by demonstrating that the legal fact concerned may be subsumed under the general rule to be applied. The inference syllogism, however, has another, in actual fact more important limitation. The important aspect in proving a decision correct is not only that is obtained from the premises, it is quite as important to \textit{justify the premises used}”. 
fication of a judicial decision\textsuperscript{33}, or (d) as a means to show that the norm of the case is justifiable\textsuperscript{34}.

3.2. Remarks on the Second Possible Way to Look at the Problem

Insofar as fuzzy calculi are conceived as possible explanatory models of different patterns of reasoning whose result is a decision, the tenet that the legal validity of the norm of the case is not a matter of logical deduction, but rather a matter of factual decision is no longer a problem to explain away, since it is rather the very subject matter fuzzy calculi aim at explaining. As already stressed, as a logic of approximate reasoning fuzzy calculi do not aim at securing the certainty of the results attained - i.e. in the case of judicial decision that a given result is the valid norm following from given premisses - but rather at providing a logical tool enabling us to reproduce and to distinguish different patterns of (judicial) reasoning which can lead to different results.

3.3. Concluding Remarks

Now and then in this paper I claimed that fuzzy calculi can be viewed as a means to find a way out from the misleading paradigmatic opposition between norm-rationalism and norm-irrationalism as it is used in analysing judicial decision-making. The main reason why I find misleading such an opposition is not that - quoting F. Waismann - "that which is the living spark of rationalism is irrationalism"\textsuperscript{35}. The main reason - as I already explicitly pointed out - is that insofar as judicial decision-making is concerned such an opposition is grounded on arguments which are ideological rather than explicative in nature.

\textsuperscript{33} This view is maintained e.g. by J. Wróblewski [1974, p. 46]: "The justification by syllogistic form is the internal justification, because it does not test the soundness of premisses. The role of the external justification is, of course, enormous, but it cannot be explained by formal logical tools".

\textsuperscript{34} This view is maintained e.g. by E. Bulygin, \textit{Cognition and Interpretation of Law} [in print]: "A judicial decision is justifiable according to the law if it follows logically from legal norms and the description of the case. Justification is a logical operation, which is essentially deductive in character, that is, it can be reconstructed as a logical inference, in which from a set of premisses a conclusion is reached which states that certain legal consequences are applicable to a particular case. This inference shows that a decision to apply those consequences to this particular case is legally justified".

\textsuperscript{35} F. Waismann [1951, p. 143].
Insofar as the traditional view on judicial syllogism is concerned attention to the controversies which are ideological in nature is drawn by J. Wróblewski who writes:

On the level of the ideology of the judicial application of law the opposite theses of the controversy concerning the rôle of legal syllogism can be reduced to the two elementary formulas: [a] The judicial application of law should follow legal syllogism, because this is the way to realize such fundamental values as legality, security and certainty; [b] The judicial application of law should not follow legal syllogism, because judicial decision ought to be based on evaluation aiming at the optimal adequacy between the law and the requirements of 'the life' (in the widest meaning of this term) in the solution of a concrete case 36.

Now, such a characterization of the opposite theses – ideological in nature – on the rôle of judicial syllogism seems to disregard that the two theses rely on a common presupposition which actually is very problematic, namely: that judicial application of law can "follow judicial syllogism". Now, contrary to such a presupposition, the very problem – preliminary in nature – is whether judicial syllogism is at all a suitable conceptual means to account for judicial decision-making. That is to say, quoting once again J. Wróblewski, that

syllogism as a schema of reasoning is a suitable way for justifying judicial decision as a rational decision, provided the use of logical forms for judicial reasoning is granted (my emphasis) 37.

Now, if attention is focused on explicative rather than on ideological arguments, then fuzzy calculi can be understood as a suitable means to show that judicial reasoning is an approximate reasoning and that is so because of several prominent features of judicial language. Thus far nothing which is of necessity rational or irrational is involved. In the same way nothing which has to do with rationality or irrationality is involved in a computer which on the base of a particular neural network and of a special training can provide – once it has been given a particular theme to work on – a fuga whose style is just J.S. Bach’s style 38.

36 J. Wróblewski [1974, p. 37].
37 Ibid., p. 38.
38 This specific application of neural networks is mentioned by L. Philipps [1990, p. 822-823].
REFERENCES


Bulygin E., Cognition and Interpretation of Law. In: Gianformaggio L., Paulson S.L. (eds.), Cognition and Interpretation of Law, Torino, Giappichelli. [In print.]

Gupta M.M., Sanchez E. (eds.) [1982], Approximate Reasoning in Decision Analysis, Amsterdam, North-Holland.


Luzzati C. [1990 a], La vaghezza delle norme, Milan, Giuffrè.


Mazzarese T., Fuzzy Logic and Judicial Decision-Making: The Peril of a Rationalist Fallacy. [Manuscript.]


Taruffo M. [1992], La prova dei fatti giudizi, Milan, Giuffrè.


Wright (von) G.H. [1951 b], An Essay in Modal Logic, Amsterdam, North-Holland.


