

A Meta-level Approach to the Analysis of Legal Phenomena based on the Key Concept of Reduction

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ABSTRACT

In this paper we show how the alleged relationship between AI and Law exhibits an example of reductions of a relevant kind. We put forward a methodological approach, based on the key epistemological concept of reduction, to the understanding, explanation and conceptualisation of phenomena concerning legal systems. This approach is appropriate as a meta-analysis of what happens when we work, think and deal with the many several aspects of legal systems, not only from purist but also from pragmatic points of view. We introduce an epistemological vision of relevant Law-AI connections.

1. INTRODUCTION

Artificial Intelligence and Law (AI & Law) is a discipline which in essence covers conceptual and procedural aspects of intelligent systems used as support to legal decision making.

We agree with various authors in that a good number of AI & Law works (particularly long-ago ones) have not paid sufficient attention to legal theory. In many such studies, a legal domain is chosen and rapid prototyping performed. Methodologically speaking, these procedures are “ad-hoc”: the first step consists on fixing a legal domain of interest, the second step in the construction of the intelligent system. Plenty examples appear in our specialized literature. Recently more structured studies are being developed, such as the cognitive approach in [2], the theory based explanation in [1] and others.

Rapid prototyping consists in using and coding reasoning methods able to learn, take legal advice or derive conclusions from legal knowledge. Possible solid questions here are: what are the cognitive processes under these practices?. What do we need to generate and simulate legal reasoning?. What is the legal accuracy of such simulations?. Due to the evident lack of strong high-level methodological studies in the AI & Law field, we concentrate in some epistemological considerations on the relationships between the two AI & Law chief disciplines, Legal Science (Law) and Computer Science (particularly AI.)

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We outline how to postulate microscopic configurations (belonging to the AI field) for macroscopic assertions or prescriptions stated at the main theory level (Law.) This leads us to the idea that AI coding and AI modelling is a sort of construction of explanations of legal matters.

2. Explaining Legal Phenomena through Reductions

In a very general sense, “to explain” designs the process used to make present what it is hidden. In Nagel’s sense [4], the explanation of a theory by means of another theory initially (although not invariably) formulated for objects belonging to another field is a *reduction*. Reductions are said to be homogeneous when they constitute progress phases in a scientific area (i.e. Mathematics, Physics). But when the explanation of characteristics of some given objects is bounded to a set of features of other substantially different objects, the scope of that explanation is difficult to perceive. Such an explanation, when feasible and sound, is called an *heterogeneous reduction*. This is the kind of operations we are interested in.

We employ the expression “legal phenomena” to refer to any sort of legal norms, processes, issues, matters, facts, occurrences, events. Legal phenomena can be ideal or factual, descriptive or prescriptive. An example of a legal phenomenon is: “there exists a probability for the decision given to case A to be applicable to case B.” Another is: “In every charge of murder, the fact of the killing being first proved, all the circumstances of accident, necessity, or infirmity are to be satisfactorily proved by the prisoner, unless they arise out of the evidence produced against him, for the law will presume that the attack would be founded in malice unless the contrary be shown”.

Most explanations of legal phenomena and interpretations of law can undoubtedly be given using expressions, entities and/or methods belonging exclusively to the legal domain (for example dogmatic or jurisprudential interpretation methods). In addition to this kind of explanations (that belong to one restricted area) we consider a variety of legal phenomena can be explained using another theory (the “AI theory” in general) which it has been elaborated to regard qualitatively distinct objects and, by the way, it does not include much of the descriptive terms existing in the main theory (Law.) We establish the following theoretical frame: Law is a macrolevel of discourse (the main theory) and AI a microlevel of discourse.

In what way are heterogeneous reductions reached: when at microlevel techniques are found that imitate some way those legal phenomena and are selected so as to reproduce them. When a certain (generally intelligent) computational result (i.e. “a calculus involving certain legal knowledge”) is found to reproduce a given legal phenomenon (i.e. “a solution to a given legal case”) we

consider the former is an explanation of the latter (the example in fig. 1 is on purpose extremely unpretentious.)

This is the mental model of “how a reduction works”. A reduction is then a function, a “downwards explanation” where the focused legal phenomenon is explained through a counterpart at microlevel. This way we explain legal matters using not the *legal* theory. Reductions should therefore not be interpreted as “speculation on ultimate causes”, nor “causal explanation”, nor “regression” or “involution”, but rather “translation”, some kind of “genetic explanation” where a given system of concepts is (partially or “some way”) transformed in another subsequent one. For that reason the “downwards movement” is an *as* justification and not a “because” justification.

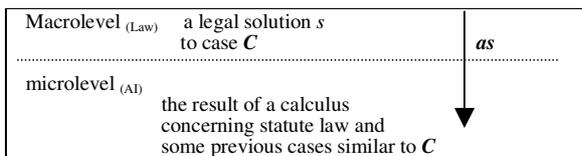


Figure 1. Explanation of a legal solution as an AI procedure.

From a procedural perspective, one part in the reduction denotes a legal phenomenon, the other part shows what it has to be computed to achieve it. From a declarative perspective, each of the elements in the reduction when regarded single-handedly has its own known meaning within its primary discipline. But when considered as a totality the resultant “reduction object” is of a different quality of the objects being explained and the objects used to explain; it belongs neither to Law nor to the AI fields, but to an interdisciplinary and almost imprecise (let us call it) *AI & Law* domain.

3. Syntax and Correctness of Reductions

The passage from a phenomenon at macrolevel to a statement at microlevel constitutes a straightforward reduction as shown in fig. 1. Such explanation can also be stated as a classical *if-then* conditional, i.e. “*if* there is a result of a calculus concerning statute law and some previous cases similar to case *C* *then* there exists a legal solution to *C*”. This conditional solves an epistemological gap: the legal meaning such automated result has. Written as a conditional, a reduction establishes a precise unidirectional connection not only in a (legal) “accuracy” sense (as pointed out in [3]) but also in a (logical) correctness sense. Both the “*as*” notation and the “*if-then*” notation are variants (in the sense of an *abstract syntax*) for the same reduction operator.

Why this kind of Law-AI heterogeneous reductions cannot be stated as bi-conditionals: if we do this, we may understand reductions constitute a form of explanation through inclusion. A bi-conditional (e.g. “there is a result of a calculus concerning statute law and some previous cases similar to case *C* *if and only if* there exists a legal solution to *C*”) guarantees legal accuracy when the microlevel counterpart appears in any macrolevel context substituting the phenomenon being explained, but this is not the case: AI skills or propositions have no accurate legal sense when inserted in a legal context. Law cannot be explained through AI propositions. Some of these only postulate microscopic configurations for legal matters.

Other reduction operations are:

- When explanations are given at a very low level, reductions become “technological” rules, instrumental directives establishing

fixed actions. Generalisation/specializations of reductions form “chains of explanations” in the classical way.

- Composition of reductions: reductions cannot be expressed as ad-hoc unjustified logical-legal compositions of pre-existing reductions: both logical soundness and legal accuracy must be guaranteed; lastingly reductions are always legal-sensitive: must pass legal verification controls. An example of a reduction composition is: “given *C* and p_1 substantially similar cases **and** given *s* as a statute-derivable solution to *C*, *then* there exists a probability *w* for the decision given to p_1 to be applicable to *C*.” This issue leads to what we call *the interdisciplinary validity problem in AI & Law*.

4. Synthesis

The reduction strategy has been found useful (although not complete) in mainly every scientific and research field. Combined with main logical operations, it is simple to use and widely well-recognized. The meta-level approach presented includes the detection of “purely downwards” heterogeneous reductions (i.e. reductions not stated as bi-conditionals). The reduction constructor may be used as a core of more structured cognitive models and methods for the AI & Law discipline for the reason that it concentrates its efforts in revealing instances of reduction relationships between the two main areas of interest (i.e. intelligent techniques selected so as to reproduce legal phenomena.) These tips show how main theoretical concepts facilitates clarification processes and help to outline fundamentals in new areas and topics. Although we may be tempted to reinvent the wheel through the creation of new and sophisticated conceptualisations, we believe harder conceptual constructions should be carefully developed and validated not only inside the areas of interest –Law and AI– but also with respect to main methodological and epistemological guidelines.

5. Current Work

We are focusing on the following topics:

- The explanation (via reductions) of *relationships* at main theory level (i.e. a relationship among legal phenomena). An example of such a kind of connection is: “a solution *s* to case *C* improves the jurisprudential trend in the sense of *s*”.
- A deep characterization of the *interdisciplinary validity problem*. This is a methodological issue. The accuracy of reductions can be verified only when faced to the expected results using methods belonging exclusively to the legal side.

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