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Issues in conductive argument weight

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ABSTRACT: The concept of conductive argument weight was developed by Carl Wellman and later by Trudy Govier. This concept has received renewed attention recently from another informal logician, Robert C. Pinto. Argument weight has also been addressed in recent years by theorists in AI & Law. I argue from a non-technical perspective that some aspects of AI & Law's approach to argument weight can be usefully applied to the issues addressed by Pinto. I also relate some of these issues to the work of argument theorist Harald Wohlrapp.

KEYWORDS: conductive, argument, weight, artificial intelligence, law

1. INTRODUCTION

Talk of weighing reasons and arguments pro and con is often heard in everyday speech. The relevant dictionary definition of 'weigh' is, according to dictionary.com, "to evaluate in the mind; to consider carefully in order to reach an opinion, decision, or choice: to weigh the facts; to weigh a proposal." Argument theorists use the concept of argument weight in this quite general *process* sense of the term. For instance, Douglas Walton (2010: 18) comments regarding a specific legal case that "This context includes a sequence of argumentation relevant to that issue that is intended to resolve it by weighing the arguments on both sides." Talk of argument weighing in this general 'process' sense has few if any theoretical consequences and as such is not controversial. What is at issue in theory of argument, and has been for at least four decades, is whether there are more specific theoretical concepts, tools, methods, and insights that pertain to the concept of argument weight and the norms of argument evaluation.

A related concept to that of argument weight is argument *sufficiency*, the third of informal logic's 'evaluation' triad of Acceptability Relevance, and Sufficiency, or ARS. Given its importance, it seems to me that the concept of argument weight has historically received comparatively little attention in theory of argument. According to Ralph Johnson, the same is true with respect to the concept of argument sufficiency: "Almost no work has been done by informal logicians on this [sufficiency] criterion." (2000: 204) Although Johnson's statement is partly based on Hans Hansen's survey of 1990, it seems to me that there is some truth in his statement even today. It is a working assumption of the present paper that argument weight is a major aspect of argument sufficiency, although I shall neither presume nor argue that the terms 'weight' and 'sufficiency' are synonymous in theory of argument. I hope that addressing the concept of argument weight will help to clarify and advance the theory of argument sufficiency.

Zenker, F. (ed.). *Argumentation: Cognition and Community. Proceedings of the 9th International Conference of the Ontario Society for the Study of Argumentation* (OSSA), May 18-21, 2011. Windsor, ON (CD ROM), pp. 1-25.

The concept of argument weight has been developed with respect to conductive arguments principally by theorists Carl Wellman and Trudy Govier. We shall address in Section 2 some issues involving the definition of 'conductive', but for now we can provisionally understand conductive arguments as 'pro and con' arguments. Wellman famously wrote in his groundbreaking *Challenge and Response* (1971: 82) that we weigh reasons by a "repeated thinking through". As has been frequently noted, Wellman's statement is not very helpful and suggests that no useful theory of argument weight can be developed. Some theorists, for example Harald Wohlrapp (2008: 333), have argued at length that the concept of argument weight is not useful in theory of argument. While Trudy Govier (1999: 170) has developed an interesting list of guidelines for conductive argument evaluation, she has also stated (1999: 172) that the putative method for conductive evaluation is "a complex one requiring imagination and sensitive judgment, and open to dispute at many points."

Other than Govier, one of the few philosophers who has addressed the subject of argument weight in recent years is Robert C. Pinto. In his (2010), Pinto initially summarizes and then critiques the work of both Wellman and Govier. He then develops his own account of how the concept of argument weight—and also the concepts of argument *strength* or *force*—should be understood in contemporary theory of argument. I argue in the present paper that (1) Pinto is heading in the right direction on argument weight, and that (2) efforts in the area of artificial intelligence and law provide material that is useful for addressing and extending Pinto's account. Pinto (2010: 22) describes his theory of argument weight and strength as "very preliminary".

It should be noted that the material in AI that I find relevant to the present paper was mostly or entirely developed prior to 2010, the date of Pinto's recent paper on argument weight. The quantity of discourse between AI and non-technical theorists of argument seems to have been slim historically, with the exception of the work of Douglas Walton and perhaps of a few others. The present paper will have achieved much of its purpose if it helps engender a wider discussion of issues in the topic area of argument weight between AI theorists and the broader argument theory community.

The field of artificial intelligence is very large, daunting in its technical complexity, and currently dynamic. I make no presumption to assess its goals and methods here, partly because I lack the technical background required to do so. Fortunately, many articles in AI & Law are somewhat accessible to non-computer-scientists in terms of the general ideas presented.

From a non-technical theorist's perspective, AI & Law has the great intrinsic virtue of being required by its own methodology to continually address real-word complexity in arguments and argumentation. In comparing informal logic with AI, the parable of the blind men and the elephant comes to mind. One blind man grasping only the elephant's ear says an elephant is very much like a leaf; the blind man grasping only one leg of the elephant states that an elephant is very much like a tree trunk, and so on. The point of the parable here is that non-technical argument theorists tend to work with comparatively short and compact arguments, whereas argument theorists in AI typically address extremely complex extended arguments, e.g. all past argued cases relevant to some current case. Another difference is that while informal logicians intensively analyze alternative and nuanced interpretations of natural language expressions, AI theorists apply computer-friendly symbology within an approach that may even abstract from all argument content whatsoever (which can give non-technical argument theorists great pause). In

short, the approaches to argument and argumentation by informal logic and AI are at opposite poles in several key respects. More collaboration between the two quite different approaches to theory of argument could be fruitful. However, collaboration can be a tricky business, and some errors and shortcomings in understandings seem almost inevitable. The present paper is surely no exception to that generality.

On the side of non-technical theory of argument, I shall focus principally on Pinto's recent paper and thus indirectly on Wellman and Govier. At several places, I will also suggest how my findings might apply to the work of argument theorist Harald Wohlrapp. Most of Wohlrapp's major work, *Der Begriff des Arguments*, remains untranslated into English, so all my claims in the present paper regarding his work are quite tentative. On the AI side, I shall address principally the work of several theorists who happen to have a past or present affiliation with the University of Liverpool's Department of Computer Science. This group of theorists includes Trevor Bench-Capon, Paul E. Dunne, Katie Atkinson, and Alison Chorley. Giovanni Sartor and others not at Liverpool have been co-authors with Bench-Capon. Dunne and others have very recently published in *Artificial Intelligence* an article titled "Weighted argument systems: Basic Definitions, algorithms, and complexity results." (2011) We shall address some less technical aspects of this article in Section Four.

Although Bench-Capon has published widely in many areas of AI, I shall be particularly focusing on his theory of case-based, value-based reasoning (VCBR). Chorley's dissertation at Liverpool is explicitly an explication, critique, and testing of Bench-Capon's value-based, case-based reasoning. The work of Bench-Capon, Chorley, and others will be addressed in terms of its non-technical claims and presuppositions and not in terms of any of any proofs or software-specific issues. There are a number of other major AI & Law theorists whose work is relevant in the present paper, but addressing their ideas would extend the present paper to an unacceptable length. This list of other important AI & Law theorists includes, but is not limited to: Vincent Aleven (2010), Karl Ashley (2002, 2004), Henry Prakken (2009) with Bench-Capon, Japp Hage (2004), Edwina Rissland (2002, 2006) with Kevin Ashley, and Bram Roth and Bart Verheij (2004). Quite a few of these AI theorists do not explicitly use the term "argument weight", at least not frequently; so some interpretation on my part is involved here.

We shall find that a major connecting theme between argument weight, informal logic, and AI is that of *feature weight*. For instance, Robert C. Pinto on the informal logic side addresses argument weight in conductive arguments using the concepts of *feature importance* and *degree of feature presence*. In AI & Law, the term 'feature' is key to the central theoretical constructs of *factors* and *dimensions*. Douglas Walton, whose work spans AI & Law and informal logic, employs the concepts of dimensions and factors in addressing the evaluation of analogical arguments; and, as we shall see, factors have features as a key component:

> To comparatively weigh up the strength of the one argument as compared to the strength of the opposed argument, we have to bring in something like dimensions or factors that identify the respects in which one case is similar to the other, and have some device for estimating how similar one is to the other by attaching weights to similarity. (Walton, 2010: 7)

An important initial question is how and in what sense the concept of feature weight can be used univocally with respect to both analogical and conductive arguments. A short and

preliminary answer is that rational determination of weight involves an *evaluation* argument and that there are substantial resemblances between the evaluation arguments regarding both analogical and conductive arguments. One such resemblance is the concept of feature weight. In contrast, evaluations of deductive and inductive arguments seem to not involve feature weight, except perhaps in the sense put forward by Frank Zenker (2010) that deductive and inductive arguments can be classified as having equal weights and thus no *comparative weight*.

The present account does not presume that the rational determination of argument weight of a conductive argument can itself involve *only* conductive types of arguments. In my view, rational determination of the comparative weight of individual conductive main argument considerations (argument strands) could involve for example analogical and/or enumeratively inductive arguments. Even if Wellman's definition of conductive arguments as case-based is granted, the single case involves the *main* (conductive) argument, whereas potentially multiple cases can be addressed in non-conductive subarguments supporting individual conductive considerations in terms of their comparative weight. If the determination of conductive weight is to be rational rather than 'intuitive' or 'mechanical', it is at least initially plausible that a variety of argument types might be employed. Of course, what rational determination of 'weight' means is a principal issue to be addressed in the present account.

It should be noted that Trudy Govier may not think that all conductive arguments are case-based, but this dispute may hinge on a perhaps defeasible technical definition of case. If the concept of *case* is understood broadly enough to encompass, for example, 'the case of Newton's physics verses Einstein's physics', then perhaps we could classify all conductive arguments as case-based, although Govier might still disagree. In this quite broad interpretation of the word 'case', the specificity implied involves something like 'a single focus of a chain of reasoning' rather than 'concrete' circumstances in some way. In addressing Pinto's ideas in the next section, we shall also attempt to further clarify the term 'conductive', which has somewhat distinct meanings for Wellman, Govier, and Pinto.

2. R. C. PINTO ON CONDUCTIVE ARGUMENT WEIGHT

The appropriate definition of "conductive" has not yet been agreed to among theorists of argument; many argument theorists choose not to use the term at all. We shall not attempt here to resolve issues regarding the proper definition of "conductive argument", since argument typology seems to be a quicksand area. However, it will be helpful at this point to briefly review the general meaning of term and some of the definitional issues surrounding it.

Wellman (1971) originally distinguished three subtypes of conductive argument as follows: Type One with a *single* pro reason, Type Two with *multiple* pro reasons; and Type Three with *at least one* pro reason and *at least one* con reason. For present purposes, we shall treat Wellman's Type Three 'pro and con' argument as paradigmatic for conductive arguments in general. In other words, we will treat the basic conductive argument scheme as having potentially multiple pro and multiple con reasons. This means that Wellman's Types One and Two conductive arguments are understood as limitations on the provisionally paradigmatic 'pro and con' Type Three scheme. We shall not particular-

ly address the appropriateness of talking of a *reason against* a given conclusion, sometimes called an *anti-reason*.

In his (2010), Pinto concurs in many important respects with Wellman and Govier on the nature of conductive arguments (hereafter generally understood as 'pro and con' arguments). Some main aspects of Pinto's position on conductive arguments are as follows; the wording is my interpretation except for the material in quotes:

- All are convergent in structure with independent main reasons.
- An individual reason can provide only *non-conclusive* support for its conclusion.
- Weighing pros and cons involves "pitting the combined force of the pros against the combined force of the cons." (2010: 5)
- A pro consideration outweighs a con consideration "by neutralizing or mollifying the strength or force which the counter-considerations have to undermine the conclusions." (2010: 6)

Pinto quotes Wellman that pro and con reasons "do not always occur 'neatly in pairs'", Pinto then points out the implication in Wellman that pro and con reasons *sometimes do* occur neatly in pairs.

Using quite a few of Govier's own examples of conductive argument, Pinto argues, seemingly against Govier, that the various independent reason strands in a conductive argument can be *nonconductive* in type, e.g. inductive generalizations or an inductive analogies. Thus for Pinto, classifying an argument as conductive requires that what is usually called the *main argument* be convergent in structure; but the reasons making up that structure that are weighed against each other may be of diverse types. Pinto (2010: 3) notes in a footnote that Govier should distinguish "between reasons and the propositions or premisses that make up those reasons" and say that "if a conductive argument contains several *reasons* in support of its conclusion, each of those reasons provides non-conclusive support of the conclusion, and does so independently of the other *reasons*." (Italics original) As I understand Pinto, an individual reason can be, and frequently is, an inductive or analogical subargument.

A requirement for all theorists of conductive argument that no individual reason in a conductive argument provides deductive support to the main conclusion, which would of course make all but one reason strand superfluous after interpretation. Apparently for Pinto, an individual reason providing conclusive deductive support could be a single premise, as with an immediate deductive inference; or the individual reason could be provided by two premises in a linked, dependent support relationship. I, for one, find myself in broad concurrence with Pinto's views and distinctions here.

Pinto (2010: 15) claims that Govier's concept of assessing argument weight using *ceteris paribus* clauses is ultimately not useful. He argues that Govier's *exceptions* are themselves *counterconsiderations* that require comparative weight assignment. Quoting Pinto (2010: 15): "In short, we can identify 'exceptions' to a qualified generalization only if we are *already* able to compare the strength of arguments licensed by that generalization to certain other arguments."

In discussing a conductive argument example from Frank Zenker, Pinto (2010: 6) describes one con consideration as a *diminisher,* in Pollock's terms, of the paired pro consideration. Contra Pollock, Pinto does not believe that a *numerical* degree of strength

can be assigned to every argument. Pinto's position (2010: 13) is instead that "the best we can hope for is to make judgments about the *comparative* force or strength of individual considerations or sets of considerations." (Italics original) Addressing Pollock's views with any degree of adequacy is not feasible here. My impression is that Pollock's approach, with his scientific and mathematical background, emphasizes arguments involving factual issues to the neglect of arguments involving values; whereas Wellman focused on value issues to the neglect of arguments involving facts.

In his own outline of a theory of conductive argument weight, Pinto begins with the concept of *open-textured* predicates. Pinto says he finds this concept described in Wellman, but not under that name:

> The three characteristics Wellman ascribes to predicates exhibiting open texture, namely
>
> (1) there are several criteria for application of the term
>
> (2) the criteria can be satisfied to a greater or lesser degree
>
> (3) the criteria may vary in importance
>
> also apply, I think, to the "good-making" or "right-making" characteristics on which we base our ethical or moral appraisals.
>
> It is tempting to think, therefore, that what gives rise to the need to assess relative strength (in the sense of *weight*) of pro and con considerations in conductive arguments is rooted in the fact that the conclusions of arguments involve the application of predicates (normative and/or descriptive) whose applications are based on criteria or "features" exhibiting these three characteristics. (2010: 17-18)

Pinto claims that most of the ten examples of conductive arguments collected from Govier's work involve open-textured predicates.

Given the above critiques and distinctions, Pinto is ready to define *weight* as a technical term in theory of argument:

> The *weight* of a consideration would be a function of (a) the extent or degree to which a criterion has been satisfied and (b) the importance of that criterion. And the overall *force* of any consideration would be a function of the weight of the consideration and the risk involved in relying on that consideration. (2010: 18)

To illustrate what he means by risk, Pinto mentions (2010: 24) Steve Patterson's example of deciding the pros and cons of taking one's snake-bitten child to a hospital immediately, given that the snake's bite was very likely non-poisonous. The consequences of not treating a poisonous bite could be the death of the child. Reasoning with a combination of the probabilities and the utilities of alternative outcomes is quite familiar in decision theory.

Pinto's distinguishing (1) argument *risk* from (2) argument *weight* is an interesting theoretical move that could turn out to be fruitful. I find it difficult to readily accept Pinto's account on this point. We commonly talk of 'weighing the consequences' of an action. The possibility of the child's death is seemingly a consideration in itself. It could be that *risk* in Pinto's sense of the term is important for assessing only *some* kinds of conductive arguments, perhaps predominantly those in practical reasoning. For present purposes, I shall in any case table issues involving the technical terms *strength* (or *force*) and *risk* in Pinto's paper and move on to Pinto's theory of argument *weight*.

In a section titled 'Comparing the force of a single pro consideration to a single counterconsideration', Pinto states that we compare the importance of features in conductive evaluations as follows:

> Let F1 be the feature on which one of those two considerations turns and F2 the feature on which the other consideration turns. If we prefer a situation which has F1 but not F2 to a situation that has F2 but not F1, then we judge the consideration which turns on F1 to be of greater importance than the consideration that turns on F2. (2010: 21)

In Pinto's account (2010: 22), normative features have *degrees of preference*. Pinto's examples of such degrees include "just a bit", "a fair amount", "to a great extent". The comparative importance of a feature is determined, according to Pinto (2010: 19) by our preferring a situation with the feature to one without the feature. This sounds to me similar to Pollock's 'situation likings', but there may be some important differences that would be uncovered in a closer analysis.

In what he describes as a "very preliminary proposal" (2010: 22), Pinto introduces the concept of *degree of feature presence* as follows:

> Let D1 be the degree to which feature F1 is present and D2 be the degree to which F2 is present. In determining whether we prefer situations which have F1 but not F2, etc., we determine whether—other things being equal—we prefer F1 in degree D1 to F2. If we do, then we count the consideration that turns on F1 in degree D1 to have greater weight than the consideration that turns on F2 in degree D2. The greater the "extent to which we prefer one combination to the other" (e.g. "just a bit", "a fair amount", or "to a great extent") , the greater the relative weight we accord to that set of considerations in comparison with the other set of considerations ("slightly more weight", "moderately more weight", or "considerably more weight. (Pinto 2010: 22)

Pinto in effect is ranking relevant feature instances by their *comparative quantity* in some respect. A good paradigm case might be considering the feature of a salary raise in a job offer. The idea is that the salary component carries increasing argument weight with progressively higher level salary offers. This feature could be characterized as 'the more the better', but other types of arguments might maximize weight in terms of a middle ground or even of a minimum quantity, e.g. with spousal stress levels involved in moving to an alternative job. While the degree of spousal stress involved would have to be assessed, estimations of the degree of the feature would take place within a value ranking of spousal welfare verses income and career maximization. These value rankings would seemingly be Pinto's 'importance' factor. Pinto seems to identify 'preference' and 'importance' in this theory context.

So far so good, but we have of course not yet come very far. For example, we need to ask how argument weight would work with a more complex array of features and with multiple interacting values. Reality consists of situations with typically complex feature packages. Pinto acknowledges (2010: 24) that he is "not at all confident" that his account of weight and risk can serve to assess argument force (or strength) when "large sets of considerations are at stake".

A number of argument theorists in AI & Law have attempted to develop theoretical constructs that are applicable to extended arguments and dialogues with large sets of considerations. Some of these constructs, most specifically those called *extended argumentation frameworks*, also involve assessing argument weight, although not always employing exactly that term. One example of an extended argumentation framework is Trevor Bench-Capon's (and others') value-based, cased-based reasoning (VCBR). In later sections, we address the general concept of extended argumentation frameworks from a

non-technical perspective and try to see what light they might cast on issues of conductive weight as understood in informal logic.

Before presenting Bench-Capon's theories in more detail, it will be helpful here to make a few limited characterizations of the AI approach in theory of argument, focusing primarily on AI & Law and case-based reasoning. Case-based reasoning in AI and Law involves developing *theories of the case*. In the practice of law, a theory of the case can be used to *explain* the precedent cases, to *justify* a judgment in the present or current case, and to *predict* a pending judgment on the current case and, in a sense, on all future relevantly similar cases. A lawyer's closing argument in a trial is commonly called 'presenting the theory of the case'.

From an informal logician's point of view, this mixing of explanatory, justificatory, and predictive purposes appears conceptually suspect; and admittedly there are serious issues at play here. On the other hand, the concept of argument weight has proved so resistant to theory for so many years that striking off in an uncertain but potentially valuable new direction has a kind of general pragmatic warrant.

Another objection to the present direction of inquiry might be that legal cases are principally addressed by *analogical* argument schemes and that AI theorists are basically just chaining analogical arguments in their computer applications. It might be held that addressing a large number of such schemes in one extended argument is a useful technical device that nevertheless has little or no deep import for theory of argument. While this could turn out to be the case, it seems to me that case-based reasoning in AI could be more complex than is reflected by the idea of just chaining analogical schemes. Douglas Walton (2005: 144) has written that the problem of "how to analyze the precise relationship that holds between CBR [case-based reasoning] on the one hand and, and argumentation schemes and diagrams on the other…has not, so far, been studied in argumentation." This area of study may turn out to be a very fruitful one, and we obviously should not assume one outcome or the other at this time.

We turn to the work of Trevor Bench-Capon and others in the next section. I shall also be suggesting that much of Bench-Capon's work might be generalizable to the theory of everyday reasoning, argument, and argumentation.

3. BENCH-CAPON'S VALUE-BASED, CASE-BASED REASONING

Much of the present section is designed for those who are not already familiar with the more prominent literature of AI & Law. We shall work mostly with a very widely discussed theory of the case in Trevor Bench-Capon's work, the 'hunting wild animals cases'. For a succinct account of the three cases in the 'hunting wild animals' theory of the case, we could do no better than to quote Douglas Walton's summary (2005: 145):

> In all three cases, the plaintiff (P) was chasing wild animals, and the defendant (D) interrupted the chase, preventing P from capturing those animals. The issue to be decided is whether or not P has a legal remedy (a right to be compensated for the loss of the game) against D. In the fox case, Pierson vs. Post, P was hunting a fox on open land in the traditional manner using horse and hound, when D killed and carried off the fox. In this case, P was held to have no right to the fox because he had gained no possession of it. In the ducks case, Keeble v Hickeringill, P owned a pond and made his living by luring wild ducks there with decoys, shooting them, and selling them for food. Out of malice, D used guns to scare the ducks away form the pond. Here P won. In the fish case, Young v Hitchins, both parties were commercial

> fishermen, While P was closing his nets, D speed into the gap, spread his own net, and caught the fish. In this case D won.

The Young case involving fish is the current (or 'problem') case that is not yet decided. The Pierson case involving the fox and the Keeble case involving ducks are already-decided cases that function as precedent cases in the 'hunting wild animals' example.

In case-based reasoning (CBR), relevant cases are initially characterized by their *relevant features*. The general concept of relevance here deserves more attention than we will be able to provide here. We shall only lightly touch on issues regarding the language used in feature descriptions, e.g. the category structure applied in terms of levels of abstraction chosen for the description.

In Bench-Capon's account (2003), a *feature* becomes a component of a *factor* when the feature becomes the antecedent of a *rule* expressed as a conditional; the consequent of that rule is the *outcome* favored by that particular feature. For example, if a feature of a case is that the plaintiff did not at any point in the events described possess the hunted and disputed wild animal, then that feature would favor the defendant. The net effect of converting features to factors is, in the language of conductive argument theorists, sorting features into pros and cons for a given case.

As an example of a *factor* for Bench-Capon, we can start with the feature of pursuing one's own livelihood. If the plaintiff was pursuing his own livelihood during the incident in question, then the rule would be: 'If the plaintiff was pursuing his own livelihood, then find for the plaintiff." In Bench-Capon's computer-oriented nomenclature, which we shall largely not use, the rule would be 'If pLiv, then P' where 'P' means 'find for the plaintiff'. Another potential factor would be: "If the defendant was pursuing his own livelihood, then find for the defendant," i.e. in Bench-Capons method "If dLiv, then D'. Below, I will use F-1, F-2, etc. for feature designations, and V-1, V-2, etc. will be used later for value designations. This is closer to Alison Chorley's conventions than Bench-Capon's. My account above skips over some technical details and formulations that are seemingly not key for the present inquiry.

The following summary, which is of my own construction, is intended to present most of the main points of Bench-Capon's system as applied to the 'hunting wild animals' case. The meaning of these terms will hopefully become clearer after we consider a sample theory of the case.

- A *factor* is a feature that is antecedent of a *rule,* with the consequent being the *outcome* favored by that feature. [Example: if the plaintiff is not in possession of the hunted animal in dispute, then decide for the defendant.']
- Each factor promotes a *value*. [Example: The factor of owning the land where the hunt takes place promotes the value of the enjoyment of property rights.]
- Each rule *promotes* the value associated with its factor.
- Rules are *prioritized*, i.e. are in a rank order such that each rule defeats all lower ranking rules.
- Each rule potentially *defeats* all subsequent rules in the prioritized list.
- A rule that is not defeated by any other rule *explains* the outcome of a case.
- A new *rule preference* may be established from the outcome of a decided case.
- A new *value preference* may be derived from a newly established rule preference.

- A new *rule preference* may be derived from an established *value preference*.

Rule preferences and value preferences are rankings. A ranking could be regarded as the precursor of weighting or even as the first level of weighting in the sense that each rule outweighs all lower rules in that same list, etc. We shall address adding numerical weightings to rankings shortly in the work of Alison Chorley. It should be noted that Bench-Capon himself seems to rarely use the term 'weight' or its cognates.

For the case above described by Walton from Bench-Capon, we would have the following factors:

- F-1: The plaintiff was pursuing his own livelihood at the place and time of the disputed incident, so find for the plaintiff.
- F-2: The plaintiff owned the land on which the disputed hunting incident took place, so find for the plaintiff.
- F-3: The plaintiff did not at any point possess the hunted animal in the dispute, so find for the defendant.
- F-4: The defendant was pursuing his own livelihood at the place and time of the disputed incident, so find for the defendant.

Now we can take a look at the construction of a theory of the case using the example of Theory 4b in Bench-Capon's account (2003: 112).

The first step in building a theory of the case is constructing the *case descriptions* of all cases involved. Below, the current, undecided case is in large caps; the precedent cases are not in large caps. In the right-most column are the case outcomes, either P for plaintiff or D for defendant. Note that the current, undecided case is listed twice in order to display both potential outcomes, 'P' and 'D'. The asterisk in the grid indicates the presence of a pro factor in the case; and number sign indicates the presence of a con factor in the case. The table and designations are of my own construction and are designed to assist non-technical readers.

Case Name	***F-1 (pro-P)***	***F-2 (pro-P)***	***F-3 (pro-D)***	***F-4 (pro-D)***	***Case Outcome***
Pierson			#		D
Keeble	*	*	#		P
YOUNG	*		#	#	P
YOUNG	*		#	#	D

Table 1

In Bench-Capon's system, a *factor* supports a *value*. Values in legal contexts for Bench-Capon are commonly understood as *social values* which have roles in justifying positive laws. Using my examples based on Walton's account of Bench-Capon, we have the following value-support relationships:

Feature (Factor)Present	***Social Value Promoted***
Pursuing one's own livelihood (F-1, F-4)	More social productivity (V-1)
Owning the land on which incident occurred (F-2)	Enjoyment of property rights (V-2)
Not being in possession of the animal (F-3)	Less litigation (clearer laws) (V-3)

Table 2

Theory 4b of the case in Bench-Capon's account (2003: 112) is portrayed in the grid below, which uses display conventions of my own construction. The theory supports ('explains') finding for the defendant, so the line with YOUNG being found for the plaintiff drops out (greyed out), a detail which seems to me helpful for less technical readers but does not appear in Bench-Capon's paper. Note that F-2 is shaded out, another graphic move of my own invention, because it is not applied in this particular theory. For additional theories of the case including Theories 1, 2, 3a, 3b, 4a, and 4b, see Bench-Capon's account. Here is this theory of the case presented in a grid and then in words, both being my constructions:

Case Name	***F-1 (pro-P)***	***F-2 (pro-P)***	***F-3 (pro-D)***	***F-4 (pro-D)***	***Case Outcome***
Pierson			#		D
Keeble	*	*	#	#	P
YOUNG	*		#	#	P
YOUNG	*		#		D

Table 3

(1) *Rule preference* established by the Keeble case outcome: *F-1 is prior to F-3*.
(2) *Rule creation*: Merge primitive rules F3 and F4 into one rule: *F3 and F4*
(3) *Add an 'arbitrary' value* (see below): *V-3 and V-1 merged is prior to V-1*.
(4) *Create a rule preference from the above value preference*: *F3 and F4 merged is prior to F1*. F-4 is substituted for the first occurrence of V-1, and F-1 is substituted for the second occurrence of V-1, since V-1 is supported by both.

The rule in the fourth line of the above account is said to *explain* the D outcome in the Young case. The logic of Bench-Capon's account is that F-3 and F-1 are each defeated; the merged F 3 and F4 rule is undefeated. Bench-Capon lists one other value preference in this case, V1 prior to V3, derived from rule preference F-1 prior to F3. Combining the two value preferences yields an ordering on values: (V-3 and V-4) > V-1 >V-3.

The term "arbitrary" in line three is in this context a technical term indicating that the preference in question is not derived from another case. However, the inference on line 3 above is not arbitrary in the everyday sense of that term. Line three above is based on a defeasible presumption that adding a new value to an existing value increases the net value—i.e. that achieving two positive values is superior to achieving only one of those two values, unless there are exceptions involving value conflicts. As Pinto mentioned (2010: 23), one may prefer chocolate ice cream and also vanilla in that order, while rejecting the two together in one bowl.

As illustrated above in Bench-Capon's account, a precedent case or set of cases establishes values which may in turn be applied to new cases. Some of the new cases may be precedent-setting and thus alter, in large or small ways, the established value preference (ordering/weighting) and thus the deciding of additional new cases. Thus cases and values are in a dynamic two-way, dialectical interchange. (Ashley, 2004) It seems to me that values themselves are not typically characterized in any kind of meaningful compendium, so it seems to me fair to say that the record of cases and their outcomes—using 'cases' in the most general and wide sense of the term—is the most accessible complete record of a society's values. We will touch on this point again in section five of the present paper.

A chief value Bench-Capon's approach is its scalability to complex arguments involving multiple features and values and cases. His theory of the case 4b as described above is fairly short and uncomplicated, so one might ask in what sense does it represent any theoretical advance. I think the short answer is that the same systematic approach is applicable to contexts involving a large number of relevant cases. As such, it may function as a theoretical model for some important aspects of general reasoning. If so, such a model might also serve to significantly clarify some important normative issues in the general theory of argument.

Our understanding of Bench-Capon's system of value-based case-based reasoning, as well as its applicability to Pinto's work on argument weight, can be further developed by looking at an evaluation and test of Bench-Capon's system in a dissertation by one of his students, Alison Chorley. In the present paper, we can address only a small fragment of Chorley's analyses and findings in her dissertation. Bench-Capon has himself further addressed his theory of values and cases in his (2000), (2001), (2003) and (2009), possibly among others.

Whereas Bench-Capon's value-based, case-based reasoning (VCBR) ranks *factors*, the specific aspect of Chorley's account which we shall address here also sorts factors into *dimensions*. The concept of dimension had previously appeared in various forms in the work of a number of theorists including Rissland and Ashley (2002). Dimensions are prominent in HYPO software where 'dimension' means approximately 'issue' or 'issue area', according to Chorley. In describing the HYPO understanding of dimension, Chorley writes (2006: 65) that a dimension "can be seen as a collection of factors which all relate to a given issue". For instance, if a company were suing for damages due to its trade secrets having been revealed by another party, then a high level of security measures having been taken by the company with information to protect would be a factor favoring that company's case. However, a low or negligible level of security regarding trade secrets would favour the defendant's claim that they acquired the trade secret through legal means. In the same context of suing regarding trade secrets, *Disclosure-in-a-Public Forum* by the plaintiff would be an extremely strong pro-defendant factor, since

many outside parties could have learned the trade secrets through legal means. On the other hand, *Disclosure-to-some-Outsiders* would be a much weaker pro-defendant factor, since many companies protecting their trade secrets often must selectively disclose them to some outsiders in the normal course of business. These examples will hopefully become clearer after we consider below a list of factors and dimensions in Chorley's account.

Whereas dimensions in HYPO are understood as defined by issues, Chorley understands the concept of dimension as intrinsically involving a value (2006: 66):

> This similarity of values to dimensions is the basis of the extension to values described by Bench-Capon and Sartor in [10], and we will follow their account and arrange our factors according to the extent to which they promote the value to which they relate. For example, *F10-Secrets-Disclosed-Outsiders* and *F27-Disclosure-in-Public-Forum* can be seen as points on the social value scale of taking *Reasonable Efforts*, with *F27-Disclosure-in-Public-Forum* being stronger than *F10-Secrets-Disclosed-Outsiders*. In making this move, however, I am departing considerably from the HYPO conception of dimension, and changing the focus from how the facts of a case are represented to a measure of the contribution to an issue made by a factor.

In "changing the focus" to "the contribution to an issue made by a factor", Chorley appears to be linking factors to importance or values in somewhat the same general way as we saw Pinto do in his (2010), as referenced above.

Below is one of Chorley's tables displaying five dimensions with multiple factors per dimension; all the dimensions are in the domain of trade secrets law. The classifications "Normal", "Weak", and "Knock-out" are weightings from the IBP model which Chorley describes (2006: 59) as "a predictive program based on CATO." "IBP" stands for "Issue-based Prediction" and is explained and evaluated by Bruninghaus and Ashley (2003). In this table, each italicized heading is an issue and, for Chorley, a value.

Confidentiality Agreement Type (CA)	
F4 Agreed Not To Disclose (p)	Normal
F5 Agreement Not Specific (d)	Normal
F13 Non Competition Agreement (p)	Normal
F21 Knew Info Confidential (p)	Normal
F23 Waiver Of Confidentiality (d) l	Normal
Reasonable Efforts Type (RE)	
F1 Disclosure In Negotiations (d)	Weak
F6 Security Measures (p)	Normal
F10 Secrets Disclosed Outsiders (d)	Weak
F12 Outsider Disclosures Restricted (p)	Normal
F19 No Security Measures (d)	KO
F27 Disclosure In Public Forum (d)	KO
Legitimate Means Type (LM)	
F3 Employee Sole Developer (d)	Normal
F11 Vertical Knowledge (d)	Normal
F15 Unique Product (p)	Normal
F16 Info Reverse Engineerable (d)	Weak
F17 Info Independently Generated (d)	Normal
F20 Info Known To Competitors (d)	KO

F24 Info Obtainable Elsewhere (d)	Normal
F25 Info Reverse Engineered (d)	Normal
Questionable Means Type (QM)	
F2 Bribe Employee (p)	Normal
F7 Brought Tools (p)	Normal
F14 Restricted Materials Used (p)	Normal
F22 Invasive Techniques (p)	Normal
F26 Deception (p)	KO
Material Worth Type (MW)	
F8 Competitive Advantage (p) KO	KO
F18 Identical Products (p) Normal	Normal

Table 4: Weak, normal and knock-out factors (Chorley 2006: Table 4.8)

You can see in the names of the dimensions above how they could be taken to encompass both issues and values at the same time.

Of present interest to us Chorley's is work on weighing dimensions and factors. She writes:

> "Each dimension, like each value, can have a different weight because some dimensions might be considered more important than others. Also, because a dimension consists of a range of points of differing strengths, the weight can be varied to give each point a different portion of the dimension weight." (2006: 67)

In other words, the approach here is that values are weighted, i.e. defined against each other in terms of comparative importance, and then factors associated with each value are in turn weighted in terms of the extent to which each supports its value. Chorley considers a number of other approaches, but this one is most pertinent to our present concerns.

The presumption that each factor supports only one value is implemented using what Chorley calls *simple* dimensions; allowing a single factor to support multiple values requires *complex* dimensions. Chorley discusses both versions of dimensions at length. We shall confine ourselves to simple dimensions in the interest of brevity, although complex dimensions seem more adequate to the real world.

One of Chorley's principal questions is: "Can we use the notion of dimensions to produce a *principled* means of assigning weights to factors?" (2006: 67) Chorley runs a number of experiments with both unweighted and weighted theories. Such experiments can be developed based on a subset of past relevant cases and then tested by 'retrodicting' other past cases and, conceivably, predicting new cases. One of Chorley's most important findings is as follows:

> When I used weights for the factors I found that the method which assigned weights according to where the factor appeared on the dimension performed the best, supporting the idea that factors promote values to different degrees and that these factors can be ordered using dimensions." (2006: 47)

One of her methods was to assign numerical weights to dimensions (values) that had been rank ordered by outcomes in case law. The value ranking she uses is, based on the initials

in the value headings in her table 4.8 are: CA >LM > RE > (MW,QM). For the literal meanings of each abbreviation, refer back to her Table 4.8 above, for example "RE" meaning "Reasonable Efforts". The '>' symbol expresses rule priority. The value rankings are based on factor rankings which were derived from the relevant cases in case-based law. To assign numerical weights, she starts with assigning 0.1 to the least preferred values MW and QM. Then each higher value in term is assigned a number equal to the double of the previous lower weight, plus 0.1. So this would give us 0.3 for RE, Reasonable Efforts. There is an unavoidable arbitrariness to initial numerical weight assignments, but the offsetting factor is that the theory is tested and the weightings are subject to a rational process of confirmation.

Next Chorley creates a numerical scale for factors under each dimension. For example, using the dimension or value weight of 0.3 for RE, Reasonable Efforts, the factor scale for that dimension is conceived of as twenty 'slots' ranging from 0.3 to -0.3. The positive end of the spectrum is pro-plaintiff, and the negative end is pro-defendant.

Plaintiff End Weight				***Defendant End Weight***			
Slot	1		0.30	Slot	10	F1	-0.03
Slot	2		0.27	Slot	9	F10	-0.06
Slot	3	F6	0.24	Slot	8		-0.09
Slot	4	F12	0.21	Slot	7		-0.12
Slot	5		0.18	Slot	6		-0.15
Slot	6		0.15	Slot	5		-0.18
Slot	7		0.12	Slot	4		-0.21
Slot	8		0.09	Slot	3		-0.24
Slot	9		0.06	Slot	2	F27	-0.27
Slot	10		0.03	Slot	1	F19	-0.3

Table 5: Dimension weighting for the Reasonable Efforts Dimension (Chorley 2006: Table 5.9)

Based on a specific domain, and with admittedly a very limited amount of experimentation, Chorley found that the theoretical approach involving weighting factors within weighted values performed the best compared both to other methods of weighting and to unweighted theories.

The placement of various factors in the above table's slots is based on non-numerical weight quantity assignments derived from the IBP system's work on precedent cases. Factors F19 and F27 are knockout factors for the defence; F6 and F12 are normal factors for the plaintiff; and F1 and F10 are weak factors for the defence. It is very interesting to compare these three IBP categories as applied by Chorley to the heretofore mentioned degrees of preference according to Pinto: "just a bit" [weak?], "a fair amount" [normal?], and "to a great extent" [knockout?]. Bringing in numerical weights is admittedly problematic because one faces an indefinitely large field of optional constructions; on the other hand, the numbers do have some grounding in the verbal categories and also facilitate working with complexity in a way that non-numerical quantity categories just cannot provide.

As noted, Pinto understands argument weight as based on the *importance* of a feature and its *degree of presence*. I think there are at least two distinct respects in which Chorley's system could be viewed as an improvement on Pinto's initial ideas (although

Chorley's work preceded Pinto's). First, it develops Pinto's account in that for her importance involves values which are themselves ranked and thus weighted in some way. Second, Pinto's *degree of feature presence* relates features to value/importance support, but only for certain more quantitative features for which 'more is better'. Chorley's account, based in most respects on Bench-Capon's, provides a more comprehensive approach to how features support values.

Hopefully the above account accurately provides the general flavour of Bench-Capon's and others' value-based, case-based reasoning. Value-based, case-based reasoning in AI is one of a several *extended* argumentation frameworks (VAFS). These extended argumentation frameworks are extensions *of abstract argumentation frameworks* (*AAFs*). In the next section, we shall try to further address Bench-Capon's work by situating it within a group of several other extended argumentation frameworks as discussed in a very recent article by Dunne on argument weight in AI.

4. AI'S EXTENDED ARGUMENTATION FRAMEWORKS AND WEIGHTING

In their "Weighing argument systems: Basic definitions, algorithms, and complexity results" (2011), Paul E. Dunne *et al* develop a theory which is intended to subsume the four different types of extended argumentation frameworks that have appeared thus far in AI. Dunne is at the University of Liverpool's Department of Computer Science along with Bench-Capon, but the latter is not a co-author of this paper.

The four broad types of extended argument systems that Dunne *et al* examine are as follows.

- Preference-based argumentation frameworks (PAFS) of Amgoud and Cayrol;
- Value-based argumentation frameworks (VAFS) of Bench-Capon;
- Resolution-based argumentation frameworks (BAFS) of Baroni and Giacomin; and
- Extended argumentation frameworks (EAFS) recently proposed and analyzed by Modgil. (2011: 481)

Dunne (the '*et al*' being assumed from here on) states that "all of the above frameworks extend conventional argument models with weights that are attached *to arguments*. An alternative—which we explore in the remainder of the present paper—is to attach weights to the *attacks between* arguments." (2011: 460)

All of these four frameworks are said to extend Dung's concept of *abstract argumentation frameworks* (AAFs) as developed in his (1995). Dung's paper is foundational for a great deal of subsequent work on AI in theory of argumentation. I cannot address its highly technical aspects due to my lack of technical background. What is relevant to us here is that all of the AAF extensions examined by Dunne in his (2011) are described as involving issues of weighing. Before we can say much about *extended* argumentation frameworks, it will be helpful for the sake of non-technical scholars like myself to briefly address abstract argumentation frameworks in general.

The idea of an AAF sounds initially quite implausible to many non-technical theorists of argument, in part because basic AAFs actually abstract from all argument content. As Baroni and Giacomin express it (2009), AAFs involve "abstracting away from the structure and meaning of arguments and attacks". The only relationship among

arguments in Dung's original conception of 1995 is the *attack* relationship, which is symbolized by an arrow from the attacking argument to the attacked argument. In AAFs, all attacked arguments (claims in the context of argument) are presumptively successful, unless the attacking claim is in turn attacked. If one argument is attacked by another, the attacked argument is presumptively defeated, unless its attacker is in turn attacked by another argument. There is thus an obvious sense in which AAFs provide one theoretical interpretation of presumption-based argumentation.

An example might be helpful here. Let's say that in an AAF two arguments are symbolized as 'a' and 'b'; a single arrow from 'a' to 'b' expresses 'a attacks b'. So if we add a new attack, 'c attacks a', to the first attack, then 'a' is defeated. Argument 'b' is now undefeated because its defeater, 'a', was attacked; and 'c' is also undefeated because it is not attacked. So the undefeated set of arguments from the original set would be composed of 'b' and 'c', which is called an 'extension' of the entire set. There are several types of extensions which I should not try to characterize. Argument graphs for AAF's take each argument as a node and often show a great many attack relations in a cyclic graph using arrow symbols and argument nodes. The effect for even fairly short argumentation sequences can be a visually off-putting 'spaghetti bowl' of arrowed lines.

What an AAF minimally accomplishes, in my 'outsider's' formulation, is the identification of all claims in a (typically) complex discourse that are acceptable in the sense that they consistent with each other and not defeated (attacked) by another claim in that discourse that is itself is not defeated (attacked). There are several levels of complexity here involving different types of 'extensions', i.e. argument sets; but it seems best here to leave those distinction to technical specialists. Overall, the AAF analysis seems useful for analyzing some complex dialogs with respect to internal consistency and structural relationships among the arguments; its potential for expert knowledge systems, such as medical diagnoses, and other intriguing applications is fairly clear.

The nature of the relevance of AAFs to the general normative theory of argument is a major theoretical issue in itself. It is widely recognized that, as Baroni and Giacomin (2009: 26) put it, that "the gap between a practical problem and its representation as an abstract formalism is patently too wide and requires to be filled in by a less abstract formalism". Extended AAF's such as Bench-Capon's are designed, according to my understanding, to address some widely recognized pragmatic and theoretical inadequacies of AAF's.

In Dunne's (2011), a quite generalized approach to argument weighting is developed which is intended to encompass the other four extended systems and go beyond them in significant respects. Dunne (2011: 458) proposes an adjustable "inconsistency budget" quantity for weighting. The inconsistency budget concept solves a major problem in AI in that there can be for some sets of argument more than one set of undefeated arguments, which means the issue is undecided. Or, the outcome of abstract argument framework analysis could be an empty of set of undefeated arguments, which again means the issue is undecided. Having two sets of rationally approved answers or having none at all are obviously severe theoretical and practical shortcomings.

The inconsistency budget number can be pragmatically adjusted so as to reduce or increase the number of rationally acceptable claims in a set of interlocking arguments. Thus the argument set can be adjusted so as to produce a single rationally approved outcome. In effect, the inconsistency budget removes some attacks by de-weighting them a

bit. Whether this is more than a technical, pragmatic, intra-system move is a key issue which is being addressed currently in AI. Dunne's paper at minimum indicates that weighting has become recognized as a significant issue area in AI. His proposal to weight *attacks* rather than arguments suggests to me an implicit move toward informal logic's emphasis on the *inherent contextuality* of arguments and to the *inherently comparative* nature of argument weight. Of course, an informal logician would often want to bring in a lot more context than just the opposing reasons.

Although it is not practical to address the matter adequately here, it seems to me that Pollock's *diminishers* also signify a step toward viewing argument weighting as essential. Pollock (2009) argues against the normative accrual of arguments, instead arguing that the whole-argument strength on the pro side should be understood as equal to the strength of the *weakest* argument in the set of pro arguments for the given conclusion. In his (2009), John Pollock wrote that "Most of the different theories of defeasible reasoning differ in their assignments of degrees of justification only in how to handle inference/defeat loops *while making the assumption that all degrees of justification are either 0 or 1*." (Italics original). It seems to me that this assumption is questionable and is actually being questioned by an increasing number of AI theorists. We shall return to Pollock shortly, but briefly, in considering argument accrual below. Extended argumentation frameworks are a comparatively new development in AI, and it seems to me that they have significant potential interest and value for theory of argument.

5. SOME TENTATIVE CLAIMS ABOUT ARGUMENT WEIGHT

As mentioned above, a primary goal of the present paper is to encourage a wider acquaintance with AI, and especially AI & Law, within the wider argument theory community. We have covered a lot of ground in a very much 'overview' fashion. In the question-answer format below, the so-called 'answers' are intended to function as conversation starters rather than as purportedly well-grounded views.

5.1 What is argument weight, most basically?

Argument weight is an aspect of sufficiency that minimally involves sorting argument strands into ranked quantitative categories. Weights are applicable in at least the evaluation of conductive and of analogical arguments. Inductive and deductive arguments can be regarded as unweighted or equal-weighted, which works out to the same thing because weighing is inherently comparative in nature. Whether there should be a distinction between argument *strength* (*force*) and argument *weight* is not clear and requires further investigation.

5.2 What are some major components of argument weight?

Argument weight involves *importance* (applied values) and *factors* (applied features). Values might be broadly understood as being either *social values* or *individual preferences*, although this distinction may not be adequate or exhaustive. Arguments can address the application of social values, the application of individual preferences, or the content of social values. But generally arguments do not as often directly address the content of individual preferences, which are subjective and not intersubjective.

The descriptive and normative interaction of value weightings and feature weightings is a promising topic for future study. Values may be weighted among themselves; features may be weighted among themselves, either independently of any corresponding value weights or by subdividing each value's weight among its supporting features. Still other broad types of interactions are imaginable. A single factor may support more than one value, which adds to the complexity of weighting. The weighting of features is best understood as the degree to which each given feature supports its associated value or values. For some but not all features, the *degree of feature presence* is proportional to the feature's degree of support for the corresponding value.

Due to the limitations my own knowledge of AI, it is not clear to me whether or not it is acknowledged in AI that a single feature could appropriately belong to two *opposing* factors. According to Harald Wohlrapp's concept of *reframing* (2008: 238), a given circumstance can sometimes be taken as a pro and sometimes as a con factor in a chain of reasoning. One interpretation of his theory is that a Wohlrappian reframing is basically a revaluing based on a single feature that supports more than one value, as understood in Chorley's treatment of complex dimensions. Insofar as my interpretation of Wohlrapp is correct, it would seem problematic to develop software to accommodate such a reframing because a factor is a feature description placed 'as is' into a conditional statement.

If one and the same feature can be 'seen' in two different ways and thus appear as a pro and as a con consideration, then the two opposed factors would each have to describe the given feature using somewhat different descriptive terms. And if this is the case, then a factor would have to be understood as more than just a feature that is plugged in as the antecedent in a conditional statement form with an outcome, i.e. the 'side' favored, as the consequent. The abstraction level of feature descriptions is likely also an issue here. Walton (2010) extensively analyzes the issue of abstraction levels for descriptions, and he also in that paper addresses work in that area by several other AI & Law theorists. Likely a related issue here is the extent to which the feature/factor distinction as used in AI & Law can be carried over to the murkier geography of general reasoning and argumentation.

The manner in which values and features interact in argument weight can be studied empirically through case studies, most obviously in law but potentially more widely in general argument and argumentation. In such wider framework, a 'case' would be broadly defined as something like 'the focus of a chain of reasoning'. Such empirical studies are currently small in number and perhaps nonexistent outside specialty areas such as legal domains. Computer programs using extended argumentation frameworks in AI and Law provide a promising direction for better understanding these issues in the typically high level of complexity found in real-world arguments. The nature of the relevance of such empirical studies to normative issues in theory of argument is far from clear. Nevertheless, adequate descriptive knowledge is surely essential to effectively working in normative issues.

5.3 Is argument weight numerical or non-numerical?

Numerical weighting is common in computer applications in the areas of process control and knowledge engineering. Numerical weights can be used in creating machine models of actual human reasoning, as we have seen with AI-based theories of the case in civil law contexts in Great Britain and the US. The theory constructor's initial selection of specific numerical

weights is guided by background knowledge of the law; but the initial weightings can be progressively adjusted so as to maximize the retrodictive and predictive success of the theory constructed. Empirically-based numerical weights are generally domain-based and typically initially established and adjudicated by experts in specialty areas of knowledge.

Harald Wohlrapp (2008: 333) has seemingly argued that any putative argument weight, numerical or otherwise, should be understood as originating from subjective individual preferences. Some of those preferences may belong to an institutionalized authority such as a judge, according to Wohlrapp (2008: 334) We thus have in Wohlrapp an opposition between, on the one hand, the numerical/objective and on the other hand the non-numerical/subjective. We shall leave the subjective-objective distinction to a later subsection in order to focus on the numerical-related issues.

I have proposed elsewhere (Fischer 2010) that humans use *non-numerical quantities* in argument weighting. The term 'non-numerical quantity' is proposed as the genus term for the kind of quantity categories for argument strength that appear, for instance, in Stephen Naylor Thomas' textbook (1997), which was originally published in 1973. Thomas uses five categories for argument strength: *strong, moderately strong, weak, moderately weak, and nil.* This type of category is sometimes described as '*qualitative*' in the literature on argument weight because these verbal categories are non-numerical, but it seems to me that these categories are no more qualitative than are categorical logic's terms 'some', 'all', or 'none'. Also in my (2010), I argue that non-numerical quantities are key to understanding Wellman's original model of conductive argument weight. If the terminology of 'non-numerical quantity' is accepted, then the heretofore consequential distinction between numerical weight and non-numerical quantitative verbal weight is reduced to a matter of comparative precision and ease of accrual.

Numerical weights are at home in theories; non-numerical quantitative weights are at home in everyday human discourse. The dispute over argument weight, numerical vs. non-numerical, is also somewhat part and parcel of the grand long-term philosophic dialogue over intelligent systems, consciousness and agency and robotic entities, and so on. As we have seen, some AI theories can and do apply non-numerical weight categories, our example here being the IBP weight assignments of 'KO', 'normal', and 'weak'. There is likely no way to argue conclusively for having universally any one specific number of such distinct non-numerical categories rather than another specific number. IBP has three categories; Thomas has five of them. Intuitively, the number seven for such categories seems to be a kind of outer limit, with two categories (weak, strong) being the minimum. The higher limits are likely connected to human cognitive limitations, so expansion by computerization has a certain initial plausibility. It is likely also true that difficulties with the accrual of arguments expand with more non-numerical categories. Argument accrual is addressed in 5.6 ahead.

5.4 What is the relationship between weight, theory, argumentation, and cases?

In order to address this very broad and important question, I would like to bring forward Harald Wohlrapp's concept of the *theoretical basis* of argument. According to Wohlrapp, the term "theoretical basis" includes theories in science, the humanities, common knowledge, and some central aspects of theory of argument. Wohlrapp writes:

> The expression "theoretical basis" stands for everything which is (more or less) solid in an argumentation. So e.g. scientific theories [are included], but also theories in the humanities and common knowledge. [The theoretical basis] contains also the solid elements of those parts of arguments which are only admitted and/or claimed (the "thetical" parts). Those solid elements are e.g. the concepts and the "Topoi". The intention with the concept of the "theoretical basis" is to make a general distinction within the material of an argument: to distinguish those parts which can be used for support from those parts which need to be supported. (2011; Personal communication)

As I understand him, the 'thetical' parts for Wohlrapp are what we must argue *to*; the theoretical basis is, in my own phrasing, what we must argue *from* or *with*. There is a Kantian aspect in Wohlrapp in the sense that he attempts to lay out the fundament of argument in a way analogous to Kant's attempting to lay out the fundament of understanding from which we proceed. I think Wohlrapp makes an important move here in pointing to the large and intimate role of theory in argument and argumentation.

It seems to me that Wohlrapp's theoretical basis centers on *factual* issues and that *values* for him are viewed as inherently subjective and personal. Argument weighting for Wohlrapp (2008: 319) is explicitly identified as *subjective* and hence non-rational. Common knowledge for Wohlrapp does not seem to include common values, often called social values. These points are subject to the same proviso mentioned above that most of Wohlrapp's *Der Begriff des Arguments* has not been translated into English.

In order to more adequately address the issue of values and also argument weighting, I propose that we add to Wohlrapp's concept of *theoretical basis* a second fundamental concept to be called perhaps the *case basis*. We have seen in Bench-Capon's work how value-based, cased-based reasoning explicitly focuses on social values due to their justificatory role with respect to positive law. Positive law in some countries, most notably Britain and the USA, is explicitly case-based. According to Carel E. Smith (2009), all law is intrinsically case-based to a degree not commonly recognized. Smith's argument seems strong to me. The rationale for adding the case basis to general theory of argument would have to include a defence of the thesis that the concepts of 'case' in 'case-based' in theory of argument could and should be broadened from the legal context to the general context. This expansion is here merely suggested and provisional; it needs a lot more attention elsewhere.

I believe the absence of the case basis in Wohlrapp's theory may be connected with his rather sharp distinctions between fact and value and objectivity and subjectivity. As explicitly shown in case-based legal systems, cases decide values and continually modify values in a dynamic interchange described as *reflective adjustment* by Kevin Ashley (2002). I suggest that a process highly similar to value-based, case-based reasoning determines evolving values in general reasoning. A case basis in this sense consists of a discourse community's paradigm cases (in a broadened, non-specialist meaning of 'case') and the values formed by, and forming, those case outcomes. An example of a culture in which paradigm cases are much more salient than in modern industrial democracies would be the Classical and Hellenistic Greek cultures. Mythology and parables such as those of Aesop function to express how certain situations should or should not be resolved and are effectively value statements. Some of the 'stereotypical situations' of today's presumptive logic can also be viewed as having moral import.

Both our common knowledge of fact and our common knowledge of values seem to me to involve *family resemblances* rather than universal agreements. Groups and

cultures generally do not have cognitively explicit and comprehensive statements of their social values, except in quite limited and incomplete ways. Often, values must be inferred from observed practices and positive law, which in constitutionally-governed groups expresses values in documents such as the U.S. Bill of Rights. But even documents such as the Bill of Rights, are not taken to be comprehensive indicators of values. The case-basis, however, is a fairly comprehensive expression of values, even if it is cognitively unwieldy in obvious ways. It is perhaps a potential impact of Bench-Capon's theories to facilitate managing what I am calling the case basis.

Arguments that turn on purely subjective preferences of course commonly occur and are often unresolvable. For an example of addressing distinct personal preferences in a context of mutual decision-making, see Bench-Capon's and Atkinson's (2009) analysis of choosing on the train vs. the plane for joint or separate travel to a conference. Values involved in argumentation are best described as *intersubjective*, with a family resemblance relationship among those in a social values subscribed to by individuals. Calling this group the 'audience' puts them into a passive position, as compared to using a term such as 'respondent'. A jury is a 'subjective' element in trial proceeding, but their reasoning in the jury room is not subjective, ideally at least.

5.5 How are individual argument weights rationally determined?

Harald Wohlrapp (2008: 335) has argued against Govier that the concept of argument weight is subjectively determined and therefore basically non-rational. A major import of the case basis approach proposed here is that individual argument weights are commonly derived from the theoretical basis for factual areas and from the case basis for many normative areas.

The case basis varies by individual, group, affiliation, and so forth. But a culture, and to some extent, the entire world, shares an increasing number of paradigm cases and associated evolving values. Wohlrapp might argue that cases are what we argue *about*, not what we argue *with*. But the same is often true of theories as well. There is a family resemblance among widely accepted theories, not a universality; and the same is true, only less so, with widely accepted paradigm cases. A problem with paradigm cases is that they are often in the mental background of argument, rather than being brought explicitly into the rational discussion. Neither the theoretical basis nor the case basis is properly described as subjective in nature.

A domain-derived weighting could be based on the theoretical basis or on the case basis or both. It must be admitted parenthetically here that my usage of 'theoretical basis' may have diverge too far from Wohlrapp's usage for him to be comfortable with it. If weighing is understood as domain or field dependent, it might still be granted that aspects of argumentation not involving weighting are not field or domain dependent. This points could offer a partial solution to the very long-term dispute as to the field-dependence, or not, of the theory of argument evaluation.

5.6 Do reasons accrue in conductive arguments?

A chief advantage of numerical argument weights is that the numbers facilitate the accrual of arguments. But since humans rarely use numerical weights in their argumentation, an additional issue is how to address non-numerical weights in the accrual process. Ap-

plying the numbers '3, 2, 1, 0' to Stephen Naylor Thomas' quantitative non-numerical categories provides a rough and ready method of accrual, but it is hard to see how one could argue for or against using "3, 2, 1, 0' vs. '10, 5, 2, 0'; and the choice of number sets can provide different evaluations for some arguments.

John Pollock (2001) has famously argued at length that the strength of a group of arguments should be understood as the strength of the single *weakest* component argument. In effect, this means that no accrual of arguments is rationally required. I am not convinced by his argument, although there are aspects of it I cannot claim to understand. It seems to me that the accrual of arguments has to be understood as an everyday fact and accepted as a legitimate norm, albeit as yet being only vaguely delineated.

If numerical weights are not provided for non-numerical quantitative categories, it is hard to see how accrual can work for some arguments. A common method of evaluating conductive arguments is to strike off one strong argument on each side, etc., and then to assess the accrual outcome by seeing what arguments remain. Perhaps conductive arguments which cannot be addressed in this way are not rationally decidable as stated. For example, it may simply be the case that there is no rational evaluation of a conductive argument with, say, one strong reason pro and nine weak reasons con. Pragmatically, such arguments are resolved, if at all, by searching for additional relevant reasons or undermining reasons already provided, pro or con. Perhaps what is really needed here is more empirical studies in order to draw out and describe 'best practices', with the criteria for 'best' being developed in terms of some widely shared human basic values such as reducing avoidable suffering among sentient beings.

5.7 Is machine learning relevant to normative theory of argument?

To some extent at least, humans learn in the same way that intelligent machines learn, i.e. by experiencing examples and building general patterns from successive examples. Alternatively, both machines and humans can learn not from examples but by taking in rules directly. The process of machine learning by examples is obviously inductive. It is not simple induction but rather a complex process, not yet well understood, of constructing a complex pattern that somehow expresses much of the key commonalty in already-experienced patterns. Pattern recognition is studied widely in AI. With cases understood as a focus of reasoning, the patterns involved are not physical but rather patterns of reasoning and argument.

The use of argument patterns in case-based reason and argument would seem to involve a kind of *support by logical analogy*. The corresponding method in theory construction is a kind of *confirmation by logical analogy*. As indicated in my (2010) quotation of Pinto:

> In his (2001, p. 123), Robert C. Pinto describes the method of logical analogy as "pre-eminently important." Pinto further notes: "Though it [argument from logical analogy] is fairly widely recognized as a method for justifying negative evaluation of arguments and inference, in my view it can also provide grounds for positive evaluations as well." Govier addresses refutation by logical analogy in her textbook's chapter on analogical reasoning. I am not aware of her addressing support by logical analogy elsewhere. (2010: 7)

Both analogical and conductive arguments are case-based in the broader definition of "case" as being the subject of a unitary rational focus. While human learning is inductive,

its application is substantially through conductive and analogical argumentation. There is a sense in which all reality, in terms at least of our cognitive interaction with it, consists of cases, unless one is a Platonist of some sort.

There is an important sense in which the proposed case basis could be folded into the theoretical basis. In a joint paper with Giovanni Sartor (2000: 5), Bench Capon identifies the criteria of normative theory selection as: *explanatory power*, *consistency*, *simplicity*, and the *avoidance of 'arbitrary' elements*. If one charitably includes empirical adequacy as a given and also folds Bench-Capon's non-arbitrariness into simplicity, the criteria of good theory selection seem similar or identical to those used in selecting good scientific theories. So it would be accurate in some sense to state that the proposed case basis deserves a 'theoretical' status. Whether this means that the case basis should be characterized as some kind of subset of the theoretical basis is hard to say, but I would argue that the case basis is at least worthy of special singling out as a subset of the theoretical basis, if not as a separate basis on its own. The issue at this point is mostly terminological only, once the concept of a case basis is granted.

One other possible advantage of the case basis is that is connects argumentation to audience. Bench-Capon (2001) has reviewed George Christie's interesting book, *The Notion of an Ideal Audience in Legal Argument*, which seems to me to be a valuable tie-in between CBR and issues in theory of argument in its rhetoric-centric approaches.

6. CONCLUSION

Investigating the concept of argument weight has lead us into a number of conceptual 'gray' areas involving description and prescription, theories and cases, the subjective and the objective, and others. The result has had an admittedly 'piecemeal' feel to it, but perhaps that is just where we are right now on the subject of argument weight. Working within such gray-areas can be awkward and even frustrating, but hopefully it can also be fruitful both in the development of new theory and in adjustments to existing theory.

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Commentary on "ISSUES IN CONDUCTIVE ARGUMENT WEIGHT" by Thomas Fischer

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1. INTRODUCTION

Fisher' paper is about the concept of argument weight that has received comparatively little attention in theory of argument, and is a rich paper that makes one think about a lot of things. Although detailed and sometimes technical, what he wants to say is not difficult to follow in general terms, and its gist can be summarized rather briefly: Even though Pinto (2010) is in the right direction on argument weight, his theory of argument weight seems still "very preliminary", and can be improved by what theorists in the area of AI and law have achieved such as Trevor Bench-Capon's theory of value-based, case-based reasoning (VCBR). It is with the help of the work of Bench-Capon and others that we can venture "some tentative claims about argument weight".

Clearly, the scope of the paper is not restricted to the introduction of the work of Bench-Capon and others to informal logicians who are interested in the issues about argument weight; it is also concerned with investigating the concept of argument weight itself. For instance, Fischer states that "the present paper will have achieved much of its purpose if it helps engender between AI theorists and the broader argument theory community *a wider discussion of issues in the topic area of argument weight*" (Italics mine). In the section 5 of the paper, Fisher addresses some key issues about argument weight that I think are very valuable in stimulating discussion, e.g., is argument weight numerical or non-numerical? Is it legitimate to investigate conductive argument by means of the achievements in analogical reasoning? In my comments I shall first challenge Fischer's assumption that argument weight is an aspect of argument sufficiency, and then expand some points of Fischer's view on values involved in argument weight. Finally I shall provide a very tentative account of how argument weight functions under the framework of argument relevance and sufficiency.

2. ARGUMENT WEIGHT IS NOT AN ASPECT OF ARGUMENT SUFFICIENCY

As Fischer holds, "it is a working assumption of the present paper that argument weight is a major aspect of argument sufficiency". In Section 5 he provides us with a definition of the concept: "Argument weight is an aspect of sufficiency that minimally involves sorting argument strands into ranked quantitative categories".

Zenker, F. (ed.). *Argumentation: Cognition & Community: Proceedings of the 9th International Conference of the Ontario Society for the Study of Argumentation* (OSSA), May 18-21, 2011. Windsor, ON (CD ROM), pp. 1-7.

Even though some prominent theorists have argued that the ARS approach, taking acceptability, relevance and sufficiency as main criteria for argument evaluation, has its problems, it is still one of most influential approach to argument evaluation in the field of informal logic. I appreciate this approach and will take it as a framework of the following discussion. My questions about Fischer's definition are—why should argument weight be treated as an aspect of sufficiency? Does it mean that the condition of sufficiency is satisfied if the pros outweigh the cons in a conductive argument? Are there alternative ways to conceive of argument weight, e.g., defining it in terms of argument relevance?

When talking about principles of conductive reasoning, Wellman (1971: 67-68) draws a distinction between *rules of relevance* and *rules of force*:

> In any argument of the third pattern, it is not enough to know whether the premises are or are not relevant to the conclusion; one must also know how much logical force the reasons for the conclusion have in comparison to the reasons against the conclusion. To determine the validity or invalidity of any reasoning from both pros and cons, rules of relevance must be supplemented by rules of force.

Rules of force are aimed at explaining how to determine whether the pros outweigh the cons, or whether the pros have greater weight than the cons, so it is reasonable to view rules of force as being in relation to argument weight. In other words, Wellman seems not to treat argument weight as an aspect of argument relevance. However, he does not claim explicitly that argument weight is an aspect of argument sufficiency either.

Pinto does not use the concepts of relevance or sufficiency to address argument weight. When expounding the steps to be taken in answering questions about the relative strength of sets of considerations, he (2010: 13) argues:

> If neither set outweighs the other, or if the cons outweigh the pros, then the argument fails to support its conclusion, i.e. fails to support taking a positive attitude toward the conclusion. Otherwise the argument succeeds—that is to say, supports our taking a positive attitude toward the conclusion.

When Pinto says that if the set of pros outweighs the set of cons the argument succeeds, he seems to mean that the pros provide sufficient reason for the conclusion. If my reading is right, Pinto holds here that a conductive argument satisfies the condition of sufficiency if the pros outweigh the cons, that is, the pros carry greater weight than the cons. At this point, I think that Pinto might agree with Fischer that argument weight is an aspect of argument sufficiency.

Unlike Wellman, Pinto and Fischer, Govier deals with argument weight in another way. In her list of guideline for conductive argument evaluation, Govier (2010: 365 f.) writes:

> 2. Determine whether the premises offered to support the conclusion are positively relevant to it, and assess the strength of the reasons.
>
> …
>
> 6. If you judge the premises do outweigh the counterconsiderations, you have judged that the R and G condition are satisfied…

Item 2 is about argument relevance. She seems to think that the strength of the reasons, that both Pinto and Fischer take as a function of argument weight, can be determined in

terms of argument relevance, but she does not tell us how to do it. [1] In item 6 Govier claims that if the pros do outweigh the cons both relevance condition and good grounds (or sufficiency) condition are satisfied. That is to say, she appears to maintain that both argument sufficiency and argument relevance are involved in argument weight. However, she does not explain how both conditions function in the process of judging that the pros carry greater weight than the cons.

Based upon Govier's approach to argument weight, I think that argument weight is better defined in terms of argument relevance. Let us look at an example first:

> Even though 15% of the faculty of East China Normal University (ECNU) complains that working at a new campus will inevitably result in an increase in their transportation time and costs, the authority of ECNU still prefers to construct a new campus because 85% of the faculty does not think that they will spend more time and money on transportation if working at that proposed new campus.

This argument involves both a pro and a con. Following the line of thought of VCBR theory, according to the principle of majority, it is reasonable to assign greater weight to the pro; therefore it is also reasonable to judge that the pro outweighs the con.

If argument weight is indeed an aspect of argument sufficiency, can we say justifiably that in the above argument the pro provides sufficient reason for the conclusion? My answer is "No", because in this case the arguer neglects some considerations such as the necessity of constructing a new campus, the size of the proposed new campus, the costs of construction of the proposed new campus, the financial conditions of the university. As far as the problem at issue is concerned, these considerations are usually highly relevant, or bear greater weight, or are more significant, than those mentioned. In my view, only the arguer takes into account the positively relevant considerations or considerations with greater weight as many as possible and judges the pros do have greater weights than the cons can he judge reasonably that the pros give sufficient reason for the conclusion. Since the condition of sufficiency might not be satisfied in a conductive argument even though the pros have greater weight than the cons, it is still inconclusive that argument weight is an aspect of argument sufficiency.

But how can we interpret argument weight from a viewpoint of argument relevant? I find it is very illuminating that Govier relates argument weight to argument relevance through the concept of significance. She (2010: 355-356) points out:

> If an arguer explicitly acknowledges counterconsiderations but nevertheless still claims that her conclusion is supported by positively relevant premises, she is judging that her positively relevant premises outweigh the counterconsiderations. Obviously, the term *outweigh* here is metaphorical; it expresses the idea that the positively relevant factors are more significant, or count for more, than the negatively relevant factors. (Italics original)

In my view, Govier's idea could be interpreted as follows: a pro *outweighs* a con in a conductive argument, or a pro bears *greater weight* than a con if and only if the pro is *more*

[1] According to Govier (1999: 170), "We commit ourselves to the judgement that, on balance, the pros *outweighs* the cons, and do so to a sufficient degree that there are good grounds for the conclusion." (Italics original) Here she seems to hold that the outweighing of the pros over the cons is equal to that the pros provide sufficient reason to the conclusion.

relevant to the conclusion than the con; and the pro is *more relevant* to the conclusion than the con if and only if the pro is *more significant* for supporting the conclusion than the con.

Clearly this interpretation presupposes an idea of the degrees of argument relevance. In Johnson and Blair (2006: xiv), they holds that the concept of relevance can be understood in two ways:

> If the concept of relevance designates the *weight* of the support, then it comes in degrees…On the other hand, if the concept of relevance designates the idea of having *bearing* on the truth of the claim at issue, then relevance is an "on/off" concept, for a premise either is relevant in this sense or it isn't…We would now say that a premise in an argument (always in combination with the other premises) either has probative relevance to (i.e., bearing on) the conclusion or it does not. If it does have probative relevance, then the weight of that relevance will belong somewhere in the range between very weak relevance at one extreme and decisive relevance at the other. (Italics original)

Taking Johnson and Blair's view as the starting point, I think the relevance of considerations to the conclusion can first be divided into three ranked categories: positive relevance, irrelevance and negative relevance, according to whether those considerations have bearing on, or have no relationship to, or count against, the truth or acceptability of the conclusion. Then, the positive relevance can be further rated in terms of the degrees of significance of the pros for supporting the conclusion. The same is true of the negative relevance: it can also be graded on the basis of the degrees of significance of the cons for undermining the conclusion. Thus we can attach ranked categories of weight to the pros and the cons in terms of the degrees of relevance of those considerations to the conclusion.

3. VALUES INVOLVED IN ARGUMENT WEIGHT

Wellman and Govier have used the term "weight" in their discussion of conductive argument, but neither defined it nor accounted for the components of argument weight. Based upon the achievements made by Pinto and theorists in AI and Law, Fischer holds that "Argument weight involves *importance* (applied values) and *factors* (applied features)" (Italics original). Considering that Fischer himself describes his claims as "conversation starters rather than as purportedly well-grounded views", in this section I shall address some questions about his view of values involved in argument weight.

First, values involved in argument weight, according to Fischer, "might be broadly understood as being either *social values* or *individual preferences*." As he points out, "this distinction may not be adequate." (Italics original) If one asks why Fischer tends to limit values to social values and individual preferences, I guess the reason might be that he addresses argument weight mainly on the basis of the theory of VCBR. In fact, conductive arguments are not only prominent in areas such as law, politics and ethics where people make decisions about what to do, but also used to interpret human behaviour, historical events, or literary texts, and even needed at the very core of scientific theorizing. One reason for my claiming that Fisher's distinction is inadequate is that some values involved in argument weight are neither social values nor individual preferences, but *epistemic values*. Let us look at an example provided by Govier (2010: 354). According to her, to argue that a proposed explanatory hypothesis is better than its alternatives one needs to argue that it is more plausible, simpler, and has greater explanatory power. The argument about this case is a conductive one because there are distinct aspects relevant

to the merits of a scientific hypothesis. It is clear that the weighting of those aspects is determined by a set of epistemic values, such as the plausibility, the simplicity and the explanatory power of a scientific hypothesis, neither social values nor individual preferences. [2]

Another reason for my claim is that argument weight may not involve values, either social values or epistemic values or individual preferences, but relates to *a set of criteria*. There is an example in Wellman (1971: 54): Although John can play only one instrument, and that not very well, he is still musical because he has a remarkable memory for music he has heard and composes upon occasion. In this example a factual conclusion about some individual case—whether or not John is musical—is drawn from information about that case. There are some factors independently relevant to the conclusion, and they do bear different degrees of weight of the support for the conclusion. In my view, the weighting of those factors are not determined by a set of values but a set of criteria for identifying a person to be musical. In this case, it is the priority of those criteria that sort the weight of those factors into different ranked categories.

Second, how can we decide the values and their priority needed for the weighting of factors in a case? According to Fischer's account of the theory of VCBR, different cases may need different sets of values for determining argument weight. The selection of values is typically case-based or domain-based and adjudicated by common sense or experts in special areas of knowledge. In the theory of VCBR, the priority of values seems more important for ranking the weight of factors. When addressing the issue of how to assign weight to factors, Fisher mentions rule preference and value preference of the theory of VCBR, and holds that both preferences are rankings and could be regarded as the precursor of weighting or the first level of weighting. But he does not go into detail about the issues such as: where are rule preference and value preference derived from? Which is fundamental, rule preference or value preference? How do rule preference, value preference and factors interact in determining argument weight?

Third, when talking about his own view about values involved in argument weight, Fischer puts stress on the distinction between the intersubjectivity of social values and the pure subjectivity of individual preferences, and believes that both values and argument weight can be intersubjective even though values are case-based or domain-based. However, he seems overoptimistic about that the entire world shares an increasing number of paradigm cases and associated evolving values. To my mind, Fischer neglects the fact that even if different cultures can share one and the same set of values, the priority of those values may probably be different among those cultures. Accordingly, when dealing with the same case, different cultures may probably sort the same factor into different categories of weight on the basis of different understandings of the priority of the same set of values. Considering the inevitability of the culture-dependence of values and the priority of values, in the final analysis, argument weight still cannot escape from the undergoing dispute with regard to the field-dependence and field-invariance of argumentation evaluation.

[2] Pinto (2010: 14) has noticed that when Zenker (2010) speaks of the weight of considerations he appears to have in mind values other than purely epistemic values.

4. ARGUMENT WEIGHT, RELEVANCE AND SUFFICIENCY CONDITIONS

In this section I want to briefly venture the question of how argument weight functions under the framework of argument relevance and sufficiency, the second and third of informal logic's argument evaluation triad of *ARS* (*Acceptability*, *Relevance* and *Sufficiency*).

Although Pinto does not relate argument weight to argument relevance and sufficiency, his theory of argument weight is still a suitable starting point for the following discussion. According to Pinto (2010: 18),

> The *weight* of a consideration would be a function of (a) the extent or degree to which a criterion has been satisfied and (b) the importance of that criterion. And the overall *force* of any consideration would be a function of the weight of the consideration and the risk involved in relying on that consideration.

Following Fischer, I will not go into detail about the issues concerning the concepts of *risk*, *importance*, *degree of feature presence*, etc. I agree with him that Chorley's system, based in most respects on Bench-Capon's account of VCBR provides some improvement on Pinto's idea of argument weight. For example, according to Chorley, what Pinto calls importance should be better understood as involving values which are ranked and thus weighted in some way. Based upon Pinto's account of argument weight and Chorley's system, Fischer develops his own understanding of argument weight: (a) it is an aspect of argument sufficiency and (b) involves *importance* (applied values) and *factors* (applied features).

In the above sections, I have argued that argument weight should be better viewed as relating to argument relevance and expanded Fischer's the concept of values, into which *epistemic values* and *criteria* are included. In the rest of this section, I will venture a very preliminary account of how argument weight functions under the framework of argument relevance and sufficiency. The basic ideas are as follows:

(1) The weight (W) of a feature (F) of one case is determined by values/criteria (V/C) involved in that case.
(2) Both the selection of V/C and the priority of V/C are decided either in *a priori* ways (conceptual analysis of that case) or in empirical ways (descriptive studies of similar cases).
(3) In general, F_i usually has corresponding V/C_i, or V/C_i always corresponds to F_i.
(4) W_i of F_i is an indicator of the degree of the relevance of F_i to that case. Put it another way, W_i of F_i would be a function of (a) the degree to which V/C_i has been satisfied and (b) the significance of V/C_i.
(5) Suppose that F_1 corresponding to V/C_1 has W_1, F_2 corresponding to V/C_2 has W_2. If V/C_1 takes precedence over or is more significant than V/C_2, F_1 is more relevant to that case than F_2; accordingly, W_1 is greater than W_2.
(6) Suppose that both F_1 and F_2 correspond to V/C_1, F_1 satisfies V/C_1 to degree D_1, and F_2 satisfies V/C_1 to degree D_2. If D_1 is greater than D_2, F_1 is more relevant than F_2; accordingly, W_1 of F_1 is greater than W_2 of F_2.
(7) Suppose that F_1 corresponds to both V/C_1 and V/C_2. If V/C_1 is more significant than V/C_2, F_1 relating to V/C_1 (F_1-$_{V/C1}$ in abbreviation) is more relevant than F_1 relating to V/C_2 (F_1-$_{V/C2}$); accordingly, W_1 of F_1-$_{V/C1}$ is greater than W_2 of F_1-$_{V/C2}$.
(8) The weight of F_i or the degree of the relevance of F_i belongs in the range between negative relevance and positive relevance. The degree of positive or

negative relevance itself varies from very weak relevance at one extreme to decisive relevance at the other.

(9) Suppose that an argument about that case involves both PRO (=features being positively relevant to a claim K) and CON (=features being negatively relevant to K). The sufficiency of PRO for K would be a function of (a) the quantity of individual PRO and (b) the weight of individual PRO and (c) that the collective weight of PRO outweighs the collective weight of CON. That is, the more individual PROs are considered and the greater the weight of individual PRO bears, plus the outweighing of PRO over CON, the greater the degree of sufficiency of PRO for K is.

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