Abstract

By introducing the notion of logical pluralism, it can be concluded that up to now theories of semantic information have - at least implicitly - relied on logical monism, the view that there is one true logic. Adopting an unbiased attitude in the philosophy of information, we ought to ask whether logical pluralism could entail informational pluralism. The basic insights from logical pluralism and their implications for a theory of semantic information should therefore be explored.

First, it is shown that (i) the general definition of semantic information as meaningful well-formed data does not favour any logical system, (ii) there are nevertheless good reasons to prefer a given logic above some others, and (iii) preferring a given logic does not contradict logical pluralism.

A genuine informational pluralism is then outlined by arguing that for every true logic the logical pluralist accepts, a corresponding notion of semantic information arises. Relying on connections between these logics, it can be concluded that different logics yield complementary formalisations of information and informational content. The resulting framework can be considered as a more versatile approach to information than its monist counterparts.

1 Context and motivation

Despite several authors’ attention for the multi-faceted character of the concept of information (see Floridi (2003) and Bremer & Cohnitz (2004)), actual attempts to formalise the concept of information all too often tend towards an implicit logical monism (the view that there is a true logic). The core aim of this paper is to provide an alternative for the assumption that there is a single logic of (semantic) information. The plan, however, is not to deny the possibility of a logic of information being better than others, but to provide a conceptual framework in accordance with both the polyvalence of information and the unbiased approach in the philosophy of information.

Our starting point is two-fold. On the one hand different theories of semantic information are available, all relying to a certain extent on formal logic. On the other there is the pluralist claim from Beall & Restall (2000) that there is more than one true logic. Basically, the logical pluralist claims that there are several ways to give a precise account of the pre-theoretical notion of logical consequence (and hence of logical truth), and above all that none of these is a priori better than the others. The logical pluralist, however, does not claim that every true logic is suited for all contexts of application. Taking logical
pluralism seriously, we ought to ask ourselves what kind of theory of semantic information the logical pluralist should adopt.

An elementary consequence of this point of view is that when a formal account of semantic information is elaborated, the truth of a logic cannot be taken for granted. Some further - external - evidence for its applicability is needed. Taking the implications of logical pluralism further, one might make the stronger claim that the pre-theoretical notion of semantic information does not in itself favour a unique logic, but is inherently plural. In other words, a pluralist position about logic may be equally reflected in a formal theory of semantic information. Both the elementary (henceforth weak) and the strong implication of logical pluralism for formalising the concept of information need further investigation.

2 From logical to informational pluralism

Relying on the standard definition of logical consequence as truth preservation over all cases, the logical pluralist concludes that - as ‘cases’ can be specified in different ways - different consequence relations arise. This yields at least three different logics: Classical Logic for Tarskian Models (consistent and complete), Intuitionistic Logic for Constructions (consistent but possibly incomplete), and Relevant Logic for Situations (possibly incomplete and inconsistent), Beall & Restall (2000).

Starting from the general definition of semantic information as meaningful and well-formed data (Floridi (2003)), there is no obvious clue as to which logic should be used. All three mentioned logics give an account of meaning, consequence, and hence of truth. This is basically everything a general theory of semantic information needs. So far nothing within the intended domain of application puts a specific logic foward: apparently semantic information allows for a pluralist approach. Additional evidence for this claim is to be found in the results from Restall (2002) and Paoli (2003), showing that an account of logical pluralism should not imply the relativity of meaning nor a change in language (as is implied in Quine’s classical argument against deviance). Consequently a pluralist account of semantic information can - to a certain extent - retain the existence of a ‘fixed semantics’.

Admittedly, theories of semantic information do rely on distinct logical systems, but they do so by changing their criteria for information equivalence in the first place, not by altering their deductive strength (however the latter might be a consequence of the former). This means that within a single approach there is still room for pluralism about truth and consequence. Consider for instance the theory of weakly semantic information which relies on (classical) logical probabilities. Once it is accepted that there is more than one true logic, logical probabilities can be defined for intuitionistic and relevant logic. The corresponding calculi for informational content are then easily obtained.

As said, the implications of logical pluralism have both a strong and weak interpretation. An obvious way to tackle the problem of pluralism in the weak sense, is by claiming

\[ \text{1Of course, the probability calculus which arises from non-classical logic will not satisfy all of Kolmogorov's axioms } (p(\alpha) + p(\neg\alpha) = 1 \text{ fails}), \text{ but rejecting it on that basis would be begging the question.} \]
that upon further investigation the concept of semantic information does favour a certain logic, viz. an information preserving one. A standard argument aims to show that relevant logic models the preservation of information, and thus is the one logic a theory of information needs\(^2\). Such a way of delimiting the scope of semantic information does not contradict the idea of logical pluralism, nor excludes it a stronger appeal to pluralism in the context of information. One might still claim that the pre-theoretical notion of information allows for a classical or constructive interpretation besides the relevant one. To make sense of this claim a genuine informational pluralism must be outlined.

This is done by showing that a theory of semantic information based upon classical, intuitionistic or relevant logic captures the pre-theoretical notion of information. In other words, if we can make sense of information in models, constructions and situations, then there is a basis for informational pluralism. Knowing in addition that models can be seen as completed situations, it follows that if we can talk about information in a situation (as was argued before), we can also talk about information in a model. As analogue arguments are available for connecting constructions to models and situations - Beall & Restall (2001), we can start from any of these and then easily recover the others.

The only remaining question is then why relevant logic cannot be used for all kinds of cases (it is arguably the most general approach). The answer is a straightforward consequence of the way in which informational content depends upon the underlying logic. While some classical tautologies can be informative in a situation or a construction, they can be uninformative in a model. Contradictions can by the same argument be informative in a situation, and still be considered too informative in both models and constructions\(^3\). And if we want a theory of information which is able to discern between informative, uninformative and too informative sentences, pluralism is the way to go.

### 3 Aim and outline

The aim of this paper is essentially to take the idea of logical pluralism seriously and use it as an underlying philosophy of logic when formalising semantic information. It is thought that logical pluralism and the informational pluralism it entails contributes to a more general pluralist attitude which is fundamental to the philosophy of information. To show the specific benefits of our approach, it is argued that (i) logical pluralism and semantic information are mutually compatible, and that (ii) a pluralist approach provides a versatile and more discriminating account of semantic information.

### References


\(^2\)Interpretations of relevant entailment in terms of information flow (Mares (1997)) supports this.

\(^3\)Contradiction are - to the pluralist - not too informative, but only too informative for consistent cases.


