A Unifying Program for Defeasible Reasoning Forms: Adaptive Logics

Diderik Batens
Centre for Logic and Philosophy of Science
Ghent University, Ghent, Belgium
Diderik.Batens@UGent.be

Abstract

Most actual reasoning is defeasible and all knowledge, whether empirical or mathematical, ultimately rests on defeasible reasoning. The latter is clearly distinct from deductive reasoning, in technical respects as well as in philosophical respects. Defeasible reasoning forms display often an external dynamics (non-monotonicity) and always an internal dynamics. The internal dynamics results from the absence of a positive test—the consequence set of defeasible reasoning is not in general recursively enumerable.

Crucial is the so-called standard format of adaptive logics. The pursued tenet is that every sensible defeasible reasoning form is characterised by an adaptive logic in standard format. The logics have a selection semantics and a dynamic proof theory, which explicates the reasoning process. A strong point of the approach is that the metatheory is studied for the whole domain at once rather than for each logic separately.

At the predicative level, defeasible reasoning forms have very weak decidability properties. This required the development of dynamic proofs, of which the usual (static) proofs are a special case.

The standard format is a concept under construction. While the phrase was used at least since 2001, even recently a paper modifying, viz. simplifying, the notion was published. The related research introduces an unexpected result: while every logic **L** (phrased in terms of a syntactic inference relation) is sound and complete with respect to a multiplicity of semantic systems, it also determines a unique semantics that is 'natural' in that it delineates the situations (say, sets of true and false formulas) that are possible according to **L**.

Adaptive logics offer precise an formal characterisations of methods. While their origin lies with methods for handling inconsistency, there are many results on other methods (inductive generalisation, abduction and explanation, erotetic logic, deontic logic, etc.). Most of these require *ampliative* adaptive logics (logics that extend classical logic).

Unexpectedly, it was shown that adaptive logics are also interesting for defining complex mathematical theories. While the weakness of decidability properties also affects classical theories, adaptive logics engender theories that are up to Π^1_1 complex and of which the non-triviality is provable by finitary means.

The lecture will offer a survey of the program and elucidate technical as well as philosophical results. Innovative aspects will be emphasised. Attention will be paid to the comparison with other approaches to defeasible reasoning forms.