Belief Revision for Non-Monotonic Knowledge Bases

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The formalisation of reasoning with uncertainty is of central importance in computational and philosophical logic. Two of the dominant approaches in this regard are the areas of non-monotonic reasoning and belief revision. The former is concerned with the formal modelling of information that is intrinsically defeasible, while the latter deals with the formal characterisation of changes to be made to a knowledge base in the presence of new, and possibly conflicting information, with attention being paid to preserving logical consistency and minimising the loss of information. Although there is a well-known formal connection between a specific branch of non-monotonic logics and belief revision, what is lacking is a comprehensive proposal for combining non-monotonic reasoning and belief revision in a single framework.

Our aim here is to fill that gap. We identify two forms of revision that can be applied to non-monotonic reasoning systems. The first type is similar to classical belief revision, and is aimed at the preservation of the logical consistency of the system in the face of new evidence, possibly eliminating previous information. With the second type of revision we investigate the possibility of replacing classical statements with their (weaker) defeasible counterparts in order to preserve the logical coherence of the system (with the definition of coherence being that a select set of formulas are guaranteed not to be necessarily false). Starting from the postulates characterising classical belief revision, we present an analysis of the desiderata and the constraints that our two kinds of revision should satisfy, and how they should interact.

An interesting application of this topic is in Philosophy of Science, where non-monotonic reasoning can be used to characterise the interaction between a scientific theory and empirical evidence, and belief revision can be used to formalise the notion of a rational modification to existing scientific theories.
On The De-Semantification and Re-Semantification of Deep & Expert Disagreements: Inquiries on Formalization Design and Adequacy Criteria

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This work aims at investigating the philosophical project that suggests that formal languages may be conceived as epistemic tools for debiasing spontaneous reasoning patterns, through the virtuous integration of both de-semantification (Krämer, 2003) and re-semantification (Dutilh Novaes, 2014) processes. My work focuses on examining the results of such a project applied to the problem of conceiving deep disagreements, and - in particular - expert disagreements.

In the recent history of informal logic, deep disagreements have been traditionally interpreted as describing a type of intractable “clash of underlying principles”, amenable only to persuasion (Fogelin, 1985). Luggs (1986) critically revised Fogelin’s conceptualization of deep disagreement, to be amenable to rational resolution, in a dynamic approach to rationality: “reason may not be sufficient to decide a particular issue here and now but it may still contribute significantly to its resolution later on”. Further integrating the dynamic picture, Adams (2005) rejected the very possibility of specifying a priori the conditions to assert when a disagreement is deep. Such rejection indicated that the only way to know when a disagreement would be deep would be to entirely avoid the path of persuasion proposed by Fogelin, and instead, embrace debate, in the limit of exhausting normal discourse. Through debate, discovery may be the case, and both ground-level argumentation and meta-argumentation may be identified in particular disagreements in the quest for knowing their “depth”.

The integrated de-semantification and re-semantification treatment of such unclear disagreements (in Adam’s descriptive sense) may provide an alternative cognitive debiasing technology for epistemically improving our understanding of such conundrums, within a dynamic, non-monotonic reasoning perspective. In this analysis, the description of ground-level and meta-level argumentation of disagreements in their specific domains through formalization and adequate application criteria, may suggest a new classification for expert disagreement as well, through meta-argumentation mapping, for debate and discovery.