Epistemic Graphs for Representing and Reasoning with Positive and Negative Influences of Arguments

Anthony Hunter[1] , **Sylwia Polberg**[2*] and **Matthias Thimm**[3]
[1]University College London, London, United Kingdom
[2]Cardiff University, Cardiff, United Kingdom
[3]University of Koblenz-Landau, Koblenz, Germany
anthony.hunter@ucl.ac.uk, polbergs@cardiff.ac.uk, thimm@uni-koblenz.de

Abstract

In real-world situations, argumentation is pervaded by uncertainty. In monological argumentation, we might be uncertain about how much we believe an argument and how much this belief should influence other arguments. These issues are compounded when considering dialogical argumentation, where each participant might be uncertain about what other agents believe. In addition, there are further notions important for successful argumentation, such as the ability to take contextual information into account, to handle different perspectives that various agents can have about a given issue, or to model agents that are not perfectly rational reasoners or about whom we do not possess complete information.

This paper introduces a novel formalism called epistemic graphs in order to tackle these challenges. They serve as a generalization of the epistemic probabilistic argumentation. In these graphs, an argument can be believed or disbelieved up to a given degree, thus providing a more fine–grained alternative to the standard Dung's approaches when it comes to determining the status of a given argument. The way other arguments influence a given argument is expressed by the epistemic constraints, which can restrict our beliefs with a varying degree of specificity. This allows epistemic graphs to model both attack and support, as well as relations that go beyond those. The freedom in specifying the constraints permits this framework to be more context–sensitive and allow for better modelling of imperfect agents.

1 Statement of Eligibility

This work has not been presented at a major AI conference with archival proceedings before.

Prior to being officially published in Artificial Intelligence [Hunter *et al.*, 2020], this work was made available in 2018 on arXiv [Hunter *et al.*, 2018b]. This line of research was continued in [Hunter *et al.*, 2018a; Hunter *et al.*, 2019; Potyka *et al.*, 2019; Hunter and Polberg, 2019]. These papers present content that is distinct from [Hunter *et al.*, 2020], as they focus on belief updates and computational challenges associated with finding distributions.

This work has been presented during the Online Seminar on Computational Models of Argument [Hunter, 2020], which does not provide any proceedings.

*Contact Author

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