

Heuristic Algorithms for Computing Mutual Agreement between Belief states in Argumentation-based public Survey

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It is common in Argumentation Theory and more generally in Philosophy to model an argumentation process as a directed network.

The vertices of such a so-called argument network are the statement and a directed labeled edge from vertex A to vertex B indicates whether statement A supports or attacks statement B.

To understand what is the opinion of a population on issues and considerations in a large debate employing the aforementioned argumentation process, one can devise an online survey.

In order to analyse the structure of the data collected by such a survey, one can model it as a complete vertex- and edge-weighted network in the following way.

A vertex of this, so-called opinion network, is a possible answer to the survey. For instance if the possible answers to a question in a survey have been: “yes, no, no opinion”, an opinion can be represented as a set of positive or negated statements. For instance $\{1, !2, 5, 6\}$ would designate the opinion agreeing with statements 1,5,6, disagreeing with statement 2 and having no opinion about the rest statements. The weight of a vertex in the opinion network corresponds to the number of individuals holding the corresponding opinion. An edge in an opinion network is weighted by so-called mutual agreement of the corresponding opinions. Constructing an opinion network which models the reality as close as possible is instrument to understanding the opinion landscape, its polarization and the possible blends between the polarities by employing further network analysis instruments such as graph clustering and visualization. Computing mutual agreement between two opinions is the main topic of this project.

It is generally agreed that standard vector distance measures, such as Hamming distance, or edit distance are no suitable of measuring mutual agreement. That is because such standard distance measures ignore argumentative relations between the statements, on which the users have expressed their opinions. The goals of the project are as follows:

- to investigate the literature in Bayesian epistemology with the goal to

survey the existing measures of mutual coherence

- to formally state the computational complexity of the problem of computing these measures, which is at least exponential in the number of statements

- to develop heuristic algorithms for computing such measures; the challenge here is to utilise skilfully both the information provided by the argument network, but also by the subset inclusion relationships of the opinions

- to evaluate the performance of the developed heuristics in practice