

On the Power of Knowledge

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Abstract

In this talk I am interested in analysing the distribution of information in a multi-agent system, and in particular in identifying the agents with the most important information. In order to do that, I will combine formal logic and game theory. Epistemic logic is a popular approach in computer science and artificial intelligence for modelling and reasoning about the distribution of information in a multi-agent system. The approach I present in this talk takes as input a model of epistemic logic, and quantifies how the information is distributed among the different agents, or how important each agent is, with respect to some fact (the objective). It is typically the case that the objective is distributed knowledge in the system, but that no individual agent alone knows it. It might be that several different groups of agents can get to know the objective together by combining their individual knowledge. I will argue that voting games and power indices such as the Banzhaf index, developed in game theory and voting theory, are useful for analysing such scenarios. These information-based power indices can be expressed in standard epistemic logic which allows, e.g., standard automated verification tools to be used to quantitatively analyse the distribution of information in a given Kripke structure. The talk is based on joint work with Wiebe van der Hoek and Michael Wooldridge.