Trustworthiness and Expertise: Social Choice and Logic-based Perspectives

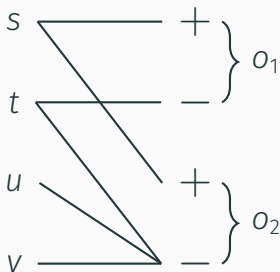Joseph Singleton
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- The thesis studies problems relating to unreliable information and expertise
- Emphasis on applying formal methods
    - social choice theory
    - modal logic
    - belief revision
    - formal learning theory

- The first half of the thesis uses the methodology of computational social choice theory
- We develop an axiomatic framework for truth discovery and bipartite tournament ranking
- Axioms formalise "desirable" properties for a method
- Axiomatic analysis complements empirical work for comparing and developing new methods

Truth Discovery

- Truth Discovery has recently arisen as a branch of the literature on crowdsourcing
- Central question: given conflicting information, who should we trust and what should we believe?
- We set out new axioms for truth discovery, and analyse an existing method from the literature

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- "Ground truth" data can help with truth discovery:
  - We already know something about the trustworthiness of sources
  - But this is not straightforward if objects vary in *difficulty*
- We generalise aspects of this problem: how should players in a bipartite tournament be ranked?

[**TODO:** Example tournament]

Logic-based Perspectives

- The second half of the thesis uses logic-based methods:
  - Modal logic framework to reason about expertise
  - Multi-source belief change problem with non-experts
  - Investigation into truth-tracking with non-experts

- new logical framework with E and S modalities
- connections with epistemic logic
- investigation into different properties of expertise

- belief change problem in the style of AGM and KP belief merging
- uses the expertise framework to reason about expertise and trust (we trust a source if we believe they are an expert)
- key feature: trust can be revised as well as beliefs about the world
- approach is axiomatic: rationality postulates

- AGM revision focusses on rationality, not on truth-tracking
- we adapt previous belief change problem with notions of truth-tracking
- see what can be learned in principle with non-experts: there are fundamental limits
- look at whether rationality is compatible with truth-tracking (yes)