Collective Information

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One-Slide Version of the Talk

“aggregation is everywhere”
(not just in computational social choice)

should focus on general principles, not just specific domains
(transfer of knowledge will benefit all application domains)

difficult, but not too difficult
(people are doing this already, to some extent)
Aggregation is Everywhere

Lots of challenging applications involve some form of aggregation:

- voting
- reputation systems
- collective argumentation
- consensus clustering
- ontology merging
- ...
Common Pattern

All of these application scenarios share the same general pattern:

- pieces of information
- encoded in domain-specific language
- provided by several agents

\[ F : \mathcal{L}^n \rightarrow \mathcal{L} \]

“collective information”

Also: input constraints — output constraints — input distribution
Looking for General Principles

How do domain parameters (language, constraints, distribution, . . . ) affect our ability to design “good” aggregation rules?

• “good” in normative terms: try to be fair
• “good” in epistemic terms: try to be accurate
• “good” in algorithmic terms: try to be efficient
Examples for Successful Knowledge Transfer

Understanding general principles should enable transfer of knowledge between application domains. Somewhat happening already:

- Normative: we got impossibility results for collective argumentation by exploiting similarities to preference aggregation.
- Epistemic: Caragiannis et al. (2016) designed peer grading methods inspired by work on truth-tracking abilities of common voting rules.


Another Example: Graph Aggregation

Our work on graph aggregation demonstrates the benefits of studying aggregation in the abstract, yielding insights for many applications:

- voting under bounded rationality (graphs as preference relations)
- collective argumentation (graphs as abstract argum. frameworks)
- belief merging (graphs as plausibility orderings)
- consensus clustering (graphs as equivalence relations)
- ...

But: so far only normative perspective

Take-Home Message

Need to aggregate individual pieces of information into a single piece of \emph{collective information} is everywhere.

Progress requires not just more domain-specific work but crucially also \emph{domain-independent work} on general principles of aggregation.

\emph{Computational social choice} provides the right toolbox for doing so.