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

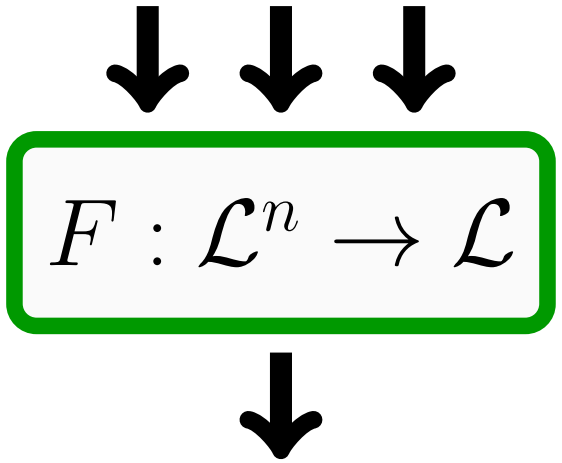
Lots of challenging applications involve some form of aggregation:

- 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



"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
- Algorithmic: de Haan (2018) obtained efficient methods for *participatory budgeting* via encoding in *judgment aggregation*

W. Chen and U. Endriss. Preservation of Semantic Properties in Collective Argumentation. *Artificial Intelligence*, 2019.

I. Caragiannis, G. Krimpas, and A. Voudouris. How Effective Can Simple Ordinal Peer Grading Be? EC-2016.

R. de Haan. Hunting for Tractable Languages for Judgment Aggregation. KR-2018.

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

U. Endriss and U. Grandi. Graph Aggregation. *Artificial Intelligence*, 2017.

Take-Home Message

Need to aggregate individual pieces of information into a single piece of *collective information* is everywhere.

Progress requires not just more domain-specific work but crucially also *domain-independent work* on general principles of aggregation.

Computational social choice provides the right toolbox for doing so.