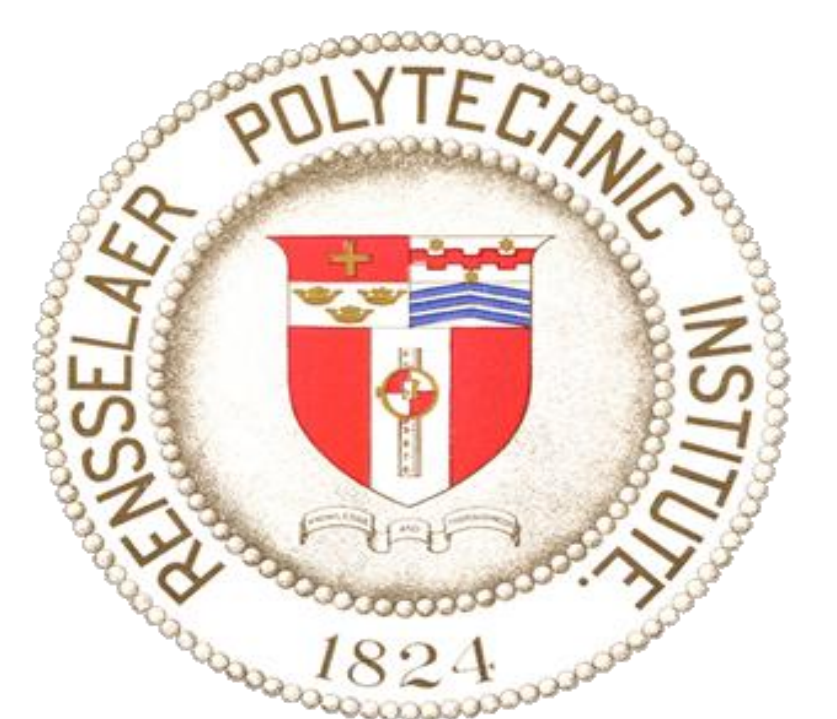
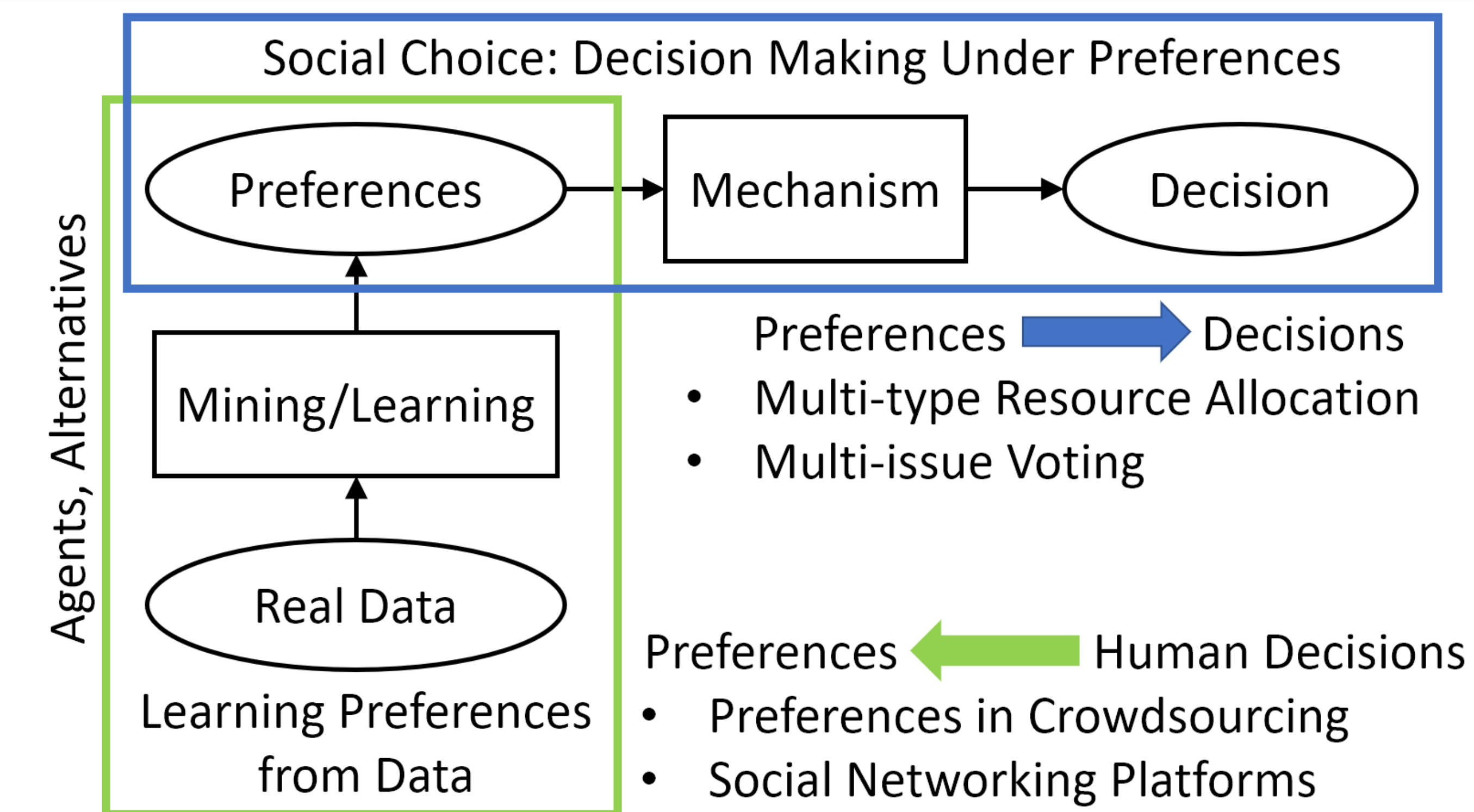


Optimal Multi-Attribute Decision Making in Social Choice Problems



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Decision Making Under Preferences

Exchanging with Friends



School Meal Program



Allocation: Bundles of items of different *types*

Voting: Decision on each of multiple *issues*

Goal: Decision satisfying agents' preferences

Challenges

Computation is hard in many settings

Preference representation and Elicitation

Mechanism Design Under Natural Restrictions

Agents' preferences often have natural structure.

- For agents: Easier to express preferences.
- For designer: Tractability.

Recover positive results in the multi-attribute setting.

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	Problem	Preference Structure	Contribution
➡	Multi-type Housing Markets [AAAI '17, MPREF '18]	Lexicographic CMI-trees	First core selecting mechanisms
➡	Multi-issue Voting [AAMAS '17]	CP-nets PCP-nets	New class of voting rules Loss Minimization Framework
⬅	Question Answering [ICCCN '17]	Heuristic-Lexicographic	Learning crowd behavior

Highlight: Multi-Type Housing Markets

Initial Endowments



Acceptable bundles



Goal: Strict Core-Stable-Allocation

- Core: No group has incentive to deviate by exchanging their initial endowments.
- Implies *individual rationality* and *Pareto optimality*.
- [Konishi et al. '01]: Strict core can be empty, even for two types and separable preferences
- [Sonmez and Unver '11]: Positive results ... [on housing markets] ... no longer hold in an economy in which one agent can consume multiple houses or multiple types of houses

Top-Trading-Cycles (TTC) Mechanism is Strict Core Selecting for Multi-Type Housing Markets [Moulin '95]

- ✓ Agents may own and accept multiple items of each type
- ✓ Under Lexicographic preferences and Conditionally-Most-Important (CMI) tree preferences which generalize several important compact preference languages.
- ✓ Whenever agents accept only bundles with same number of items of each type as initial endowment
 - Generalizes Fujita et al. '15, Sikdar et al. '17
- ✓ Whenever the output is an acceptable full allocation
- ✓ Resists manipulation*

Main Message

Compact or structured preference representations help

- Lower cognitive burden
- Elicit preferences
- Express complex preferences
- Lower communication cost
- Lower computational complexity
- Design better mechanisms

Future Work

Allocating Multiple Types of Goods

- When each type is allocated by a different agency.
- What are restrictions on mechanisms used by each agency so that overall allocation has desirable properties?

Question Answering

- Why are some answers more popular than others?
- What attributes make some answers more credible?
- Is there some underlying structure that explains it?