Robust Sparse Voting

Youssef Allouah, Rachid Guerraoui, Lê-Nguyen Hoang, Oscar Villemaud

Motivation

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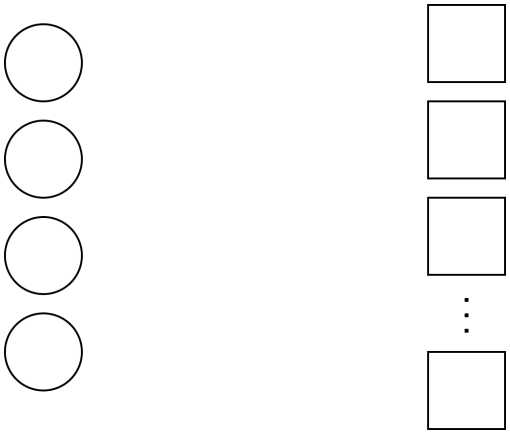
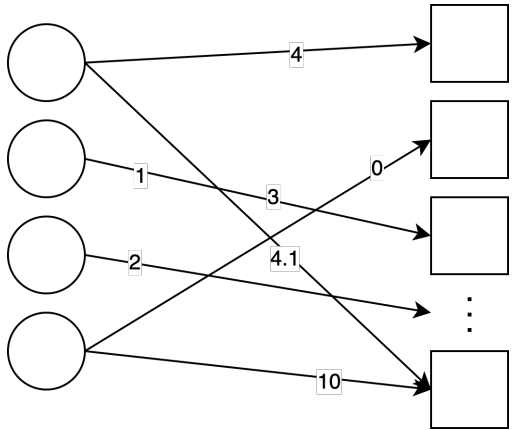
- **ubiquitous**: movies, president, consensus, ML, ...
- **important**: decision-making, fairness, performance, ...
- **hard**: [Arr50] "optimal" voting is impossible ...

Problem



Problem



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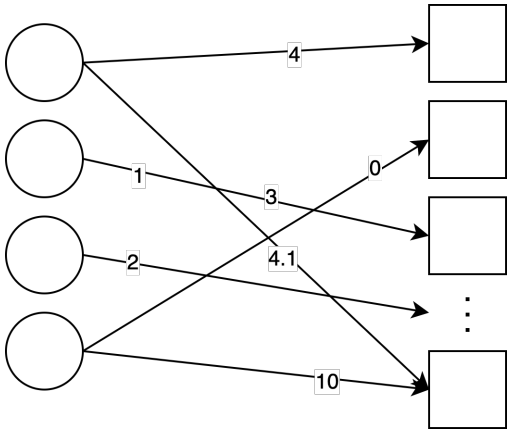

- **Question:** How to aggregate?

Challenge 1: Sparsity

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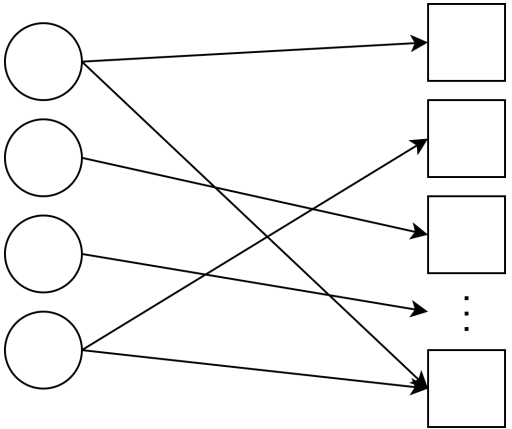

Challenge 2: Preference scaling

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- Scaling: similar preferences can be expressed very differently

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R1	Strong accept!	Strong accept!!	Strong accept!!!
R2	Weak accept	Weak accept	(Very) Weak accept

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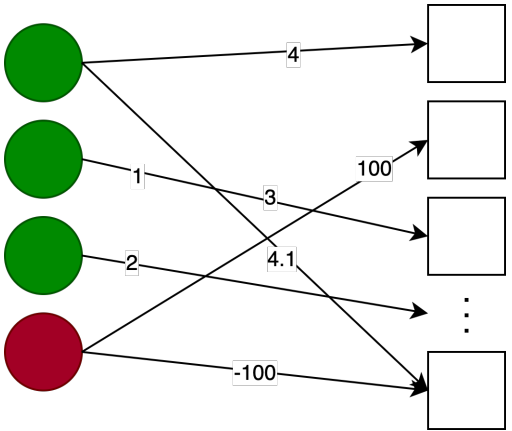

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α-Byzantine Resilience (informal)

No voter can influence the global vote by more than $\alpha \geq 0$.

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Sparse Unanimity (informal)

Assuming a majority is honest and agrees on some preferences, the global vote should return the honest majority's preferences.

Main results

Impossibility (informal)

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Impossibility (informal)

No normalization function allows the median to be Sparsely Unanimous.

- Critical consequence: collaborative agreement between honests on the scaling is **necessary**
- Our solution: each voter learns from other's scores and agrees on a collective scale
- Our solutions verifies both properties ☺

More information

- More on arxiv:

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- Deployed on `Tournesol.app`, an open-source content recommendation project

The End