# Efficient and Thrifty Voting By Any Means Necessary

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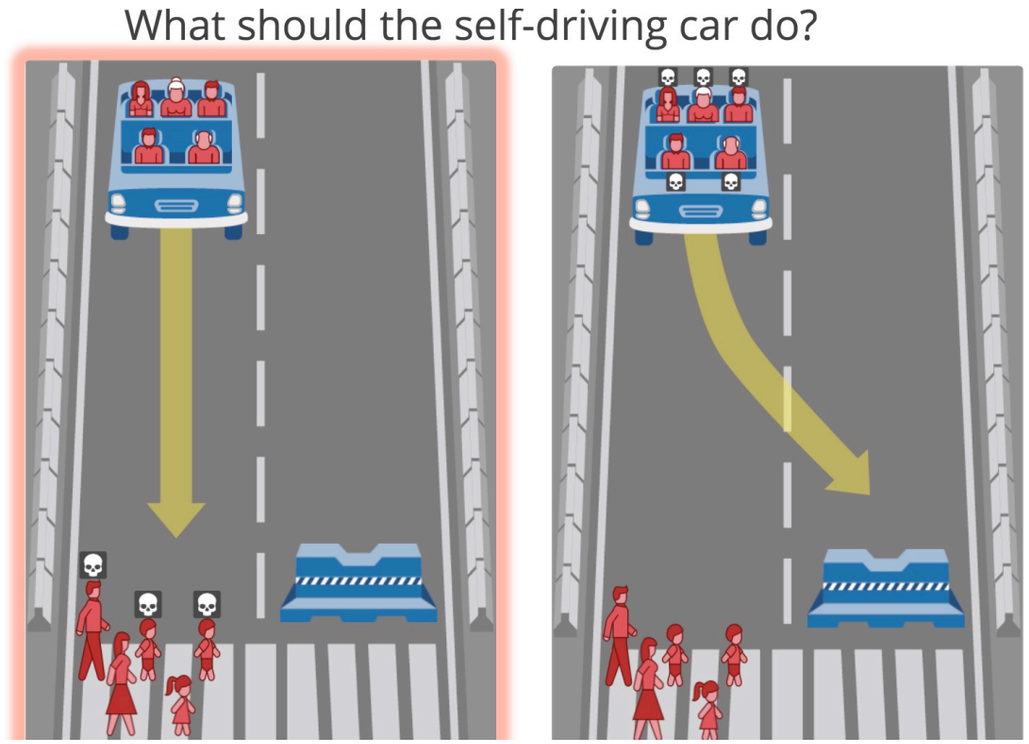
# Voting

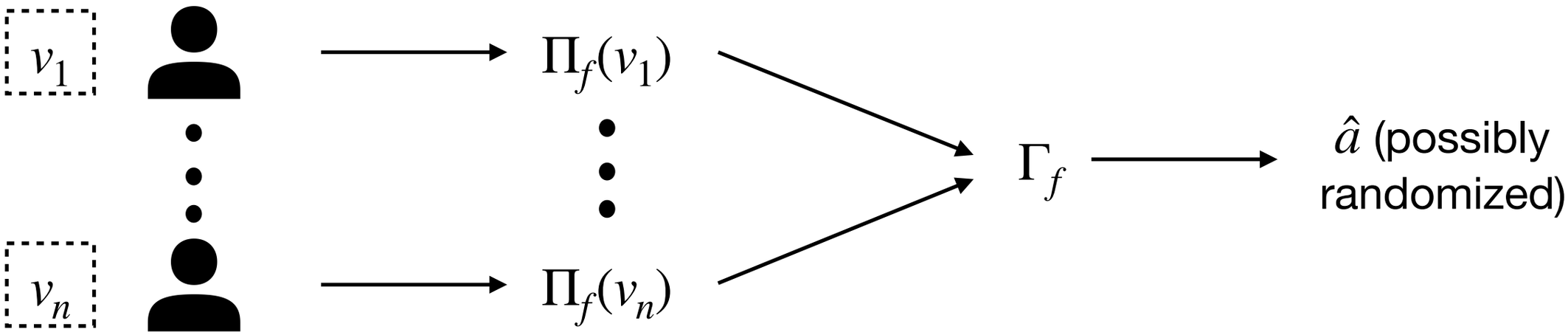

NYC Participatory Budgeting




Moral Machine
Awad et. al., 2018

# Model

*Implicit Utilitarian Voting*
[Procaccia, Rosenschein, 2006]




- *Communication Complexity* $C(f)$: #bits elicited by $f$ from each voter.

- Distortion $dist(f)$: $\max_v \frac{\max_a E[sw(a,v)]}{E_{\hat{a}\sim f(v)}[sw(\hat{a},v)]}$

For a given budget of k bits per voter, what's the minimum achievable distortion?

# Results

*Upper Bounds*:

- Ranking achieves distortion $\sqrt{m}$ with communication $\Theta(m \log m)$ [Boutilier et. al., 2015]

- Threshold approval achieves distortion $\log m$ with communication $\Theta(m)$ [Benadè et. al., 2017]

We show

- There is a voting rule with deterministic elicitation, and aggregation and achieves distortion d with communication $\tilde{O}(m/d)$.

- Randomized aggregation can achieve distortion o(m) with communication o(log m).

# Results (contd.)

*Lower Bounds*:

- Any voting rule with distortion d must have communication
  - $\Omega(m/d^2)$ if using deterministic elicitation
  - $\Omega(m/d^3)$ if using randomized elicitation

# Future Work

- Can randomized aggregation help to improve the distortion of voting rules?
- Can we use adaptive, and possibly non-uniform elicitation across voters?