Judgement Aggregation

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What is the relationship between individual and group beliefs?

A Miscarriage of Justice

	The Glove Fits	If The Glove Fits Then Acquit	Acquit
Judge 1	Yes	No	No
Judge 2	No	Yes	No
Judge 3	Yes	Yes	Yes

A Miscarriage of Justice

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Majority	Yes	Yes	No

What Just Happened?

- Some Logically Related Propositions

A Miscarriage of Justice

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What Just Happened?

- Some Logically Related Propositions
- Logically Consistent Agents

A Miscarriage of Justice

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Judge 1	**Yes**	**No**	**No**
Judge 2	No	Yes	No
Judge 3	**Yes**	**Yes**	**Yes**
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What Just Happened?

- Some Logically Related Propositions
- Logically Consistent Agents
- Majoritarian Election

Anybody Notice Change of Slide Title?

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Judge 1	Yes	No	No
Judge 2	No	Yes	No
Judge 3	Yes	Yes	Yes
Majority	**Yes**	**Yes**	**No**

What Just Happened?

- Some Logically Related Propositions
- Logically Consistent Agents
- Majoritarian Election
- Disaster

How Bad Is It? I

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- Undermining scientific consensus [Solomon, 2011]?
- Subverting democracy [List, 2006]?

How Bad Is It? II

When is **(interesting)** group belief formation possible?

Some Tools

- *Voters* V: (at least 2) people who have opinions about propositions.
- *Agenda* A: propositions about which people have opinions.

The Agenda

- At least two atomic propositions: Q, R.

The Agenda

- At least two atomic propositions: Q, R.
- Their conjunction: $(Q \& R)$
- The negation of their conjunction: $\neg(Q \& R)$

Some Tools

- *Agenda* A: propositions about which people have opinions,
- *Voters* V: people who have opinions about propositions.
- *Profile* P: opinions of people concerning propositions.

The Profile

- Every voter has a *personal profile* Φ of votes on A.
- P is a list of all Φ.

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- Every voter has a *personal profile* Φ of votes on A.
- P is a list of all Φ.
- Each Φ is complete: for all propositions q in A, either q is in Φ or $\neg q$ is in Φ.
- Each Φ is consistent: no propositions q in A is such that both q and $\neg q$ are in Φ.
- Each Φ is deductively closed: for all propositions q, r in A, if q entails r and q is in Φ then r is in Φ.

How Bad Is It? III

Given an A, V, and P as stated, is there a procedure for **(safely)** forming **group beliefs**?

Group Belief

Want a function that takes P as input and outputs Φ^G:

- Φ^G is complete: for all propositions q in A, either q is in Φ or $\neg q$ is in Φ^G.
- Φ^G is consistent: no propositions q in A is such that both q and $\neg q$ are in Φ^G.
- Φ^G is deductively closed: for all propositions q, r in A, if q entails r and q is in Φ then r is in Φ^G.

How Bad Is It? IV

Given an A, V, is there a **(safe)** function from P to Φ^G?

Safe Functions: Universal Domain

- The function should take as input any P for any A.

Safe Functions: Anonymity

- The function should be invariant under permutations of V.

Safe Functions: Systematicity

- If all voters makes same judgements about Q as R, function makes the same judgements about Q as R.

Safe Functions

- The function should take as input any P for any A. [Universal Domain]
- The function should be invariant under permutations of V. [Anonymity]
- If all voters makes same judgements about Q as R, function makes the same judgements about Q as R. [Systematicity]

How Bad Is It? V

Given an A, V, is there a function satisfying Universal Domain, Anonymity, and Systematicity, from P to Φ^G?

No.

Lemma

If Q is accepted with n votes then R is accepted with n votes.

Proof [List and Pettit, 2002]

	Q	R	$(Q\&R)$	$\neg(Q\&R)$
Voter 1	Yes	Yes	Yes	No
Voter 2	Yes	No	No	Yes
Voter 3	No	Yes	No	Yes
Voter $i > 3$ & i is even	Yes	Yes	Yes	No
Voter $i > 3$ & i is odd	No	No	No	Yes

Welp.

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- Relax Universal Domain? (Scientific conferences.)
- Relax Anonymity? (Legal deliberation.)
- Relax Systematicity? (Constitutional democracy.)

Forming group beliefs is hard, but maybe that's ok.

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