Social Choice & Voting

Branislav Bošanský, Dominik Seitz, José Hilario , Michal Šustr

Czech Technical University in Prague

branislav.bosansky@agents.fel.cvut.cz
dominik.seitz@aic.fel.cvut.cz
hilarjos@fel.cvut.cz
michal.sustr@aic.fel.cvut.cz

December 10, 2019

Previously ... on multi-agent systems.

And now ...

Simple Voting Example

Assume there are 7 agents with the following preferences:

- 3 agents: $a > b > c$
- 2 agents: $b > c > a$
- 2 agents: $c > a > b$

Which of the candidates is selected if we use different voting protocols?

- Plurality
- Borda's rule
- Pairwise elimination with ordering: a) (a, b, c), b) (b, c, a), c) (c, a, b)

Simple Voting Example

Assume there are 7 agents with the following preferences:

- 3 agents: $a > b > c$
- 2 agents: $b > c > a$
- 2 agents: $c > a > b$

Assume that we want to include a fourth candidate d into the profiles. Is there a modification of the current preference profiles such that c can be the winner under Borda voting rule?

Condorcet Loser

Condorcet Loser

Condorcet loser is a candidate that loses in pairwise comparison with every other candidate.

Condorcet Loser

Condorcet loser is a candidate that loses in pairwise comparison with every other candidate.

Assume we are using the plurality voting rule. Can the winner under plurality be the Condorcet loser?

Condorcet Loser

Condorcet loser is a candidate that loses in pairwise comparison
with every other candidate.

Assume we are using the plurality voting rule. Can the winner
under plurality be the Condorcet loser?

How the situation changes if we use Approval voting protocol?

Condorcet Loser

Condorcet loser is a candidate that loses in pairwise comparison with every other candidate.

Assume we are using the plurality voting rule. Can the winner under plurality be the Condorcet loser?

How the situation changes if we use Approval voting protocol?

How the situation changes if we use Borda voting protocol?

Agents do not have to vote truthfully and can behave strategically.

Games and Social Choice

Agents do not have to vote truthfully and can behave strategically. One of the classical problems in computational social choice: If one agent knows the full preferences of other agents, how hard it is to calculate an insincere vote that can improve agent's preferences?

Agents do not have to vote truthfully and can behave strategically. One of the classical problems in computational social choice: If one agent knows the full preferences of other agents, how hard it is to calculate an insincere vote that can improve agent's preferences?

	unweighted votes, constructive manipulation		weighted votes, constructive				weighted votes, destructive		
# alternatives			2	3	4	≥5	2	3	≥4
# manipulators	1	≥ 2							
plurality	P	P	P	P	P	P	P	P	P
plurality with runoff	P	P	P	NP-c	NP-c	NP-c	P	NP-c	NP-c
veto	P	P	P	NP-c	NP-c	NP-c	P	P	P
cup	P	P	P	P	P	P	P	P	P
Copeland	P	P	P	P	NP-c	NP-c	P	P	P
Borda	P	NP-c	P	NP-c	NP-c	NP-c	P	P	P
Nanson	NP-c	NP-c	P	P	NP-c	NP-c	P	P	NP-c
Baldwin	NP-c	NP-c	P	NP-c	NP-c	NP-c	P	NP-c	NP-c
Black	P	NP-c	P	NP-c	NP-c	NP-c	P	P	P
STV	NP-c	NP-c	P	NP-c	NP-c	NP-c	P	NP-c	NP-c
maximin	P	NP-c	P	P	NP-c	NP-c	P	P	P
Bucklin	P	P	P	NP-c	NP-c	NP-c	P	P	P
fallback	P	P	P	P	P	P	P	P	P
ranked pairs	NP-c	NP-c	P	P	P	NP-c	P	P	?
Schulze	P	P	P	P	P	P	P	P	P

Design an algorithm for manipulating Borda rule.

Games and Social Choice

Design an algorithm for manipulating Borda rule.

Design an algorithm for manipulating STV.