

Weighted Electoral Control

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WCCAV (weighted control by adding voters)

Given:

- $E = (C, V)$ – a weighted election
- $W = (w_1, \dots, w_n)$ – weighted voters that we can add
- P – preferred candidate
- k – how many voters we can add

Question: Is it possible to ensure p 's victory in E by adding at most k voters from W ?

WCCDV (weighted control by deleting voters)

Given:

- $E = (C, V)$ – a weighted election
- P – preferred candidate
- k – how many voters we can delete

Question: Is it possible to ensure p 's victory in E by deleting at most k voters?

Weighted Voter Control vs. Manipulation (fixed numbers of candidates)

	WCCAV	WCCDV	WCM
Plurality	P	P	P [CSL07]
t-approval ($t \geq 2$)	P	P	NP-complete [HH07]
Borda	NP-complete	NP-complete	NP-complete [HH07]
$\alpha = (\alpha_1, \dots, \alpha_m)$ $ \{\alpha_1, \dots, \alpha_m\} \geq 3$	NP-complete	NP-complete	NP-complete [HH07]
Llull (3 candidates)	NP-complete	NP-complete	P [FHS08]
(weak)Condorcet-consistent rules	NP-hard	NP-hard	Depends on the voting rule

Weighted Voter Control (unbounded number of candidates)

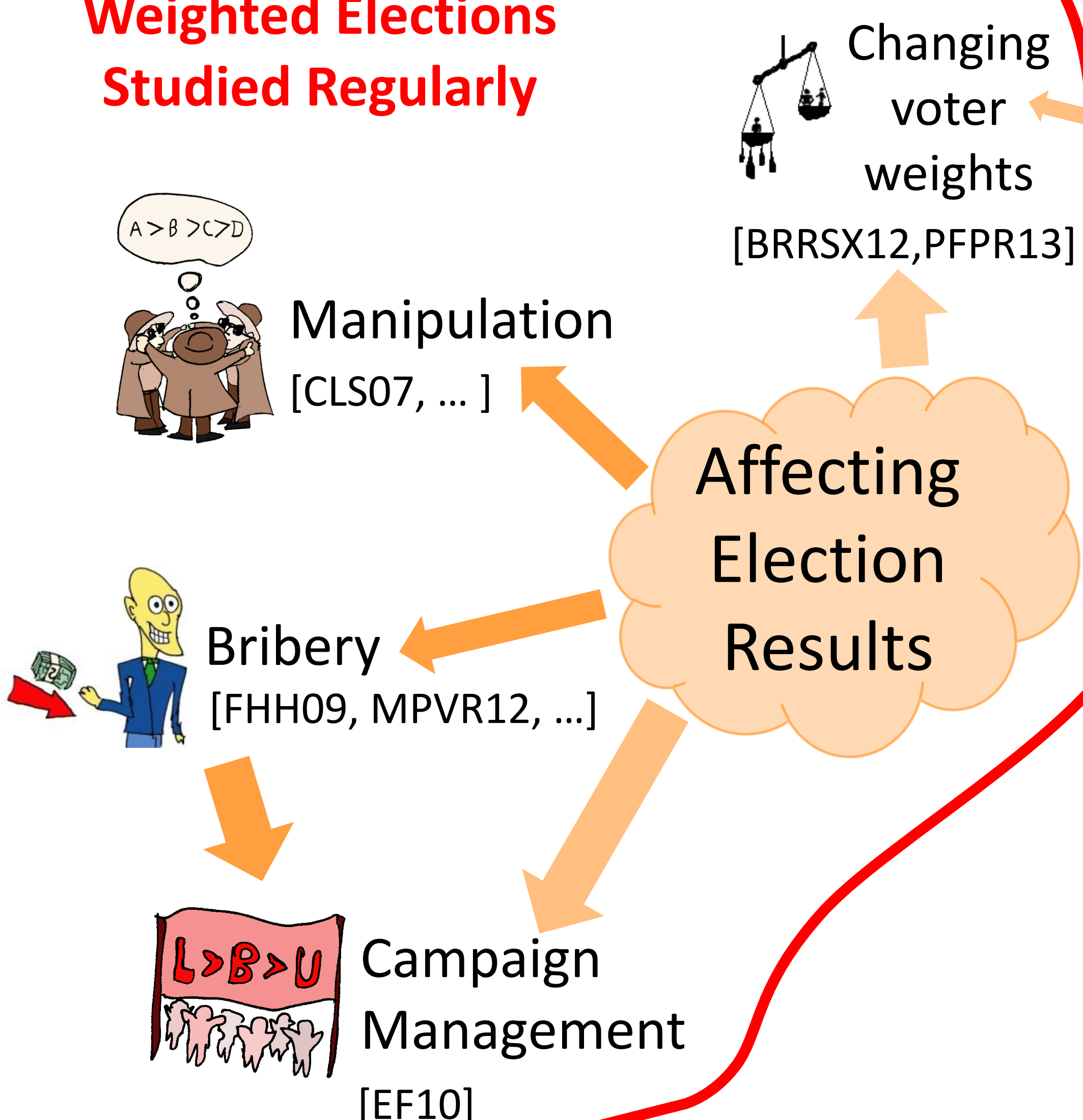
	WCCAV	WCCDV
t-approval		
t = 2	P	NP-complete
t = 3	NP-complete	NP-comp. [Lin12]
t ≥ 4	NP-comp. [Lin12]	NP-comp. [Lin12]
t-veto		
t = 2	NP-complete	P
t = 3	NP-comp. [Lin12]	NP-complete
t ≥ 4	NP-comp. [Lin12]	NP-comp. [Lin12]

	WCCAV	WCCDV
t-approval	$O(\log m)$ t	$O(\log t)$ t
t-veto	$O(\log t)$ t	$O(\log m)$ t

Approximation Algorithms

- Using Weighted Multicover
- Direct greedy strategies

Weighted Elections Studied Regularly



Adding/Deleting Voters

WCCAV/WCCDV mostly done for t-approval and t-veto [Lin12]

Our results

Full classification of the complexity of WCCAV and WCCDV for:

1. All scoring protocols
2. All (weak)Condorcet-consistent voting rules

Theorem For every (weak)Condorcet-consistent voting rule, WCCAV and WCCDV are NP-complete (even with 3 candidates)

Theorem For every scoring protocol $(\alpha_1, \dots, \alpha_m)$, WCCAV and WCCDV are NP-complete if $|\{\alpha_1, \dots, \alpha_m\}| \geq 3$, and are in P otherwise.

Adding/Deleting Candidates

Weighted control not interesting

- NP-completeness results translate directly
- P-results translate easily (Llull, Maximin)

Weighted Elections Barely Studied Before