Heuristic Voting as Ordinal Dominance Strategies

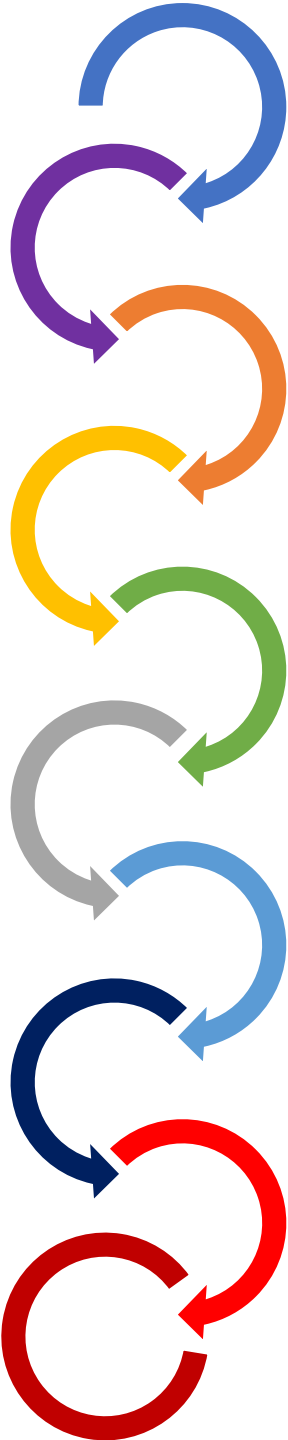Omer Lev, Reshef Meir,
Svetlana Obraztsova, Maria Polukarov

Voting

A set of voters – V

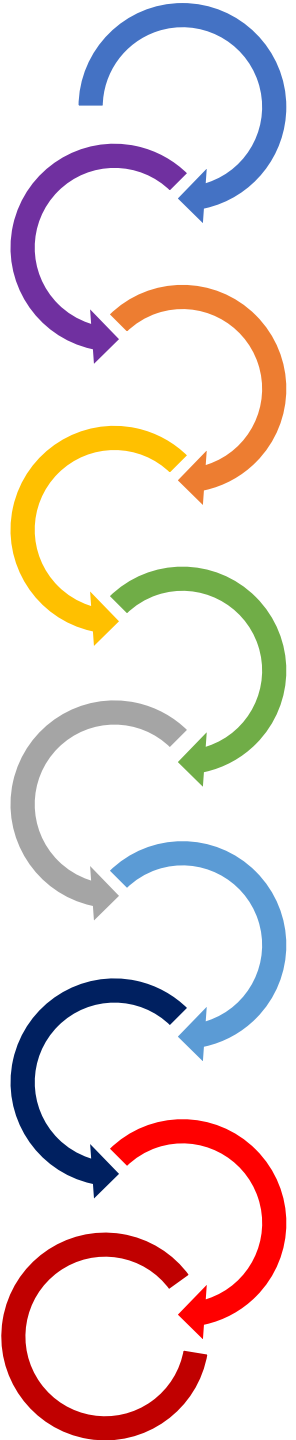A set of options (candidates) – C

A voting function f to take in voters preferences, and output an outcome

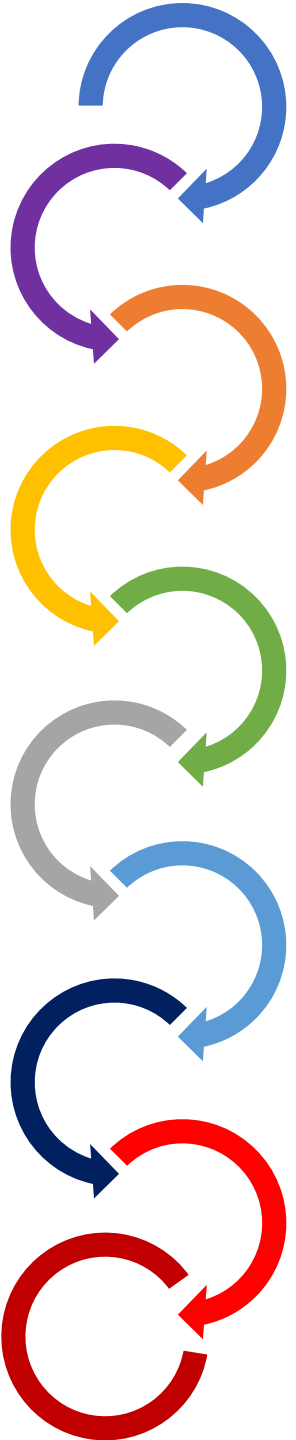# **Voting manipulation**
Gibbard–Satterthwaite

Other than in a dictatorship, when agents **know how others are voting**, they may be better off voting differently than they believe.
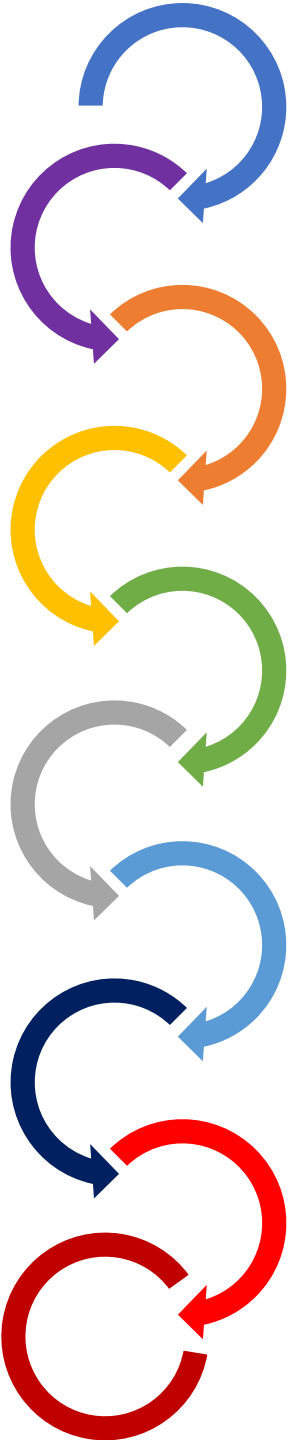
Voting manipulation
Uncertainty?

What do you do when you do not know what all others are voting for?

Voting manipulation
Uncertainty?

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Not probability!

Heuristics
Not probability!

A function that takes a certain state and outputs what should the voter vote for:
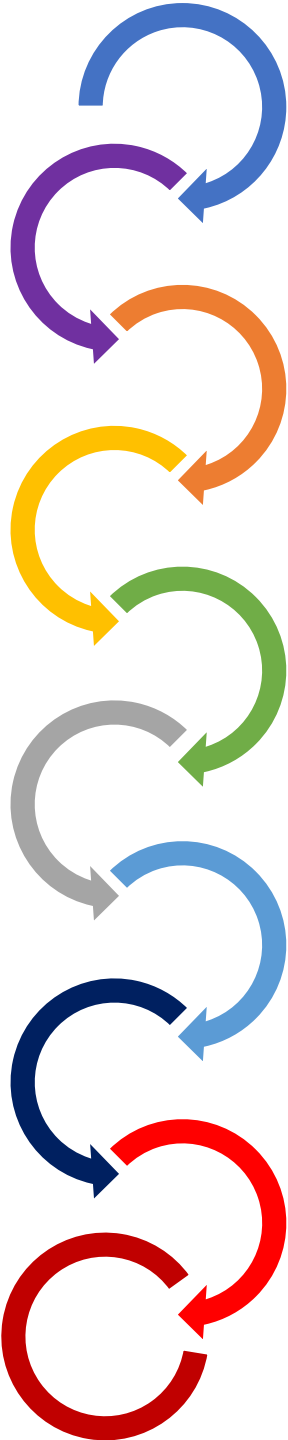
An arbitrary candidate that isn't the least favorite.

Truth bias
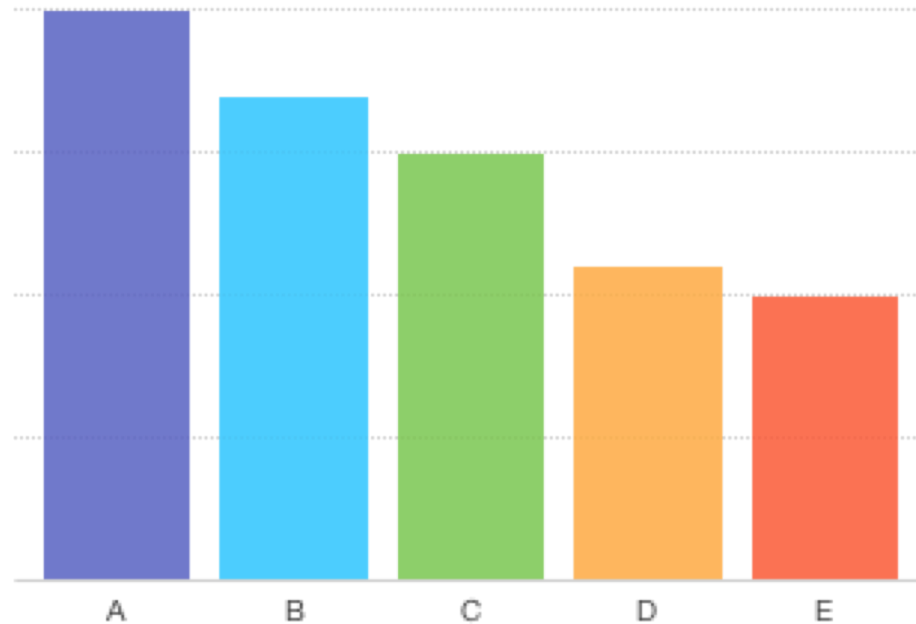
Lazy bias

T-pragmatist

Leader rule

Previously...
Local dominance

A binary model – probable/improbable states, calculated by a metric from a base data point (e.g., poll). Among the probably states, choose a dominant strategy.
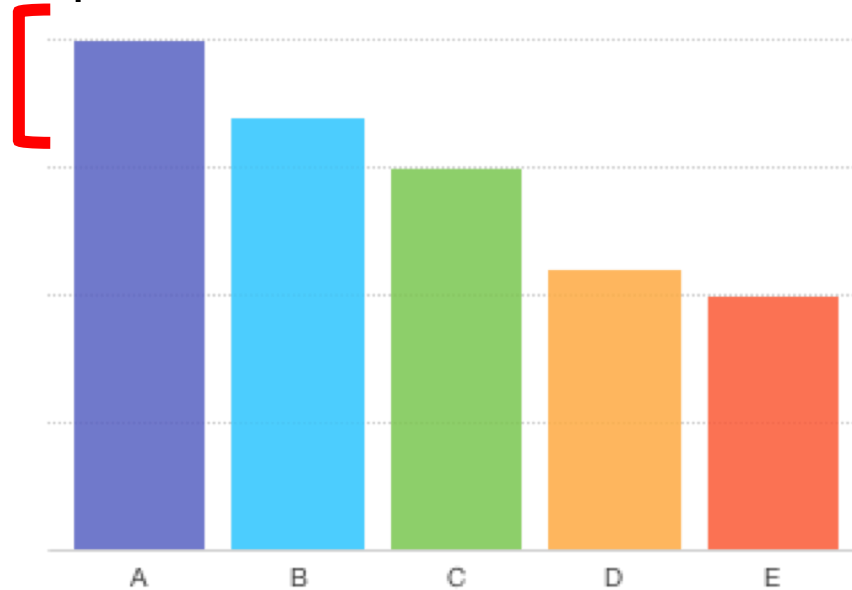
Meir, L., Rosenschein
A Local-Dominance Theory of Voting Equilibria, *EC 2014*

A small(?) change

Multiple **information sets**, denoting which is more probable than another
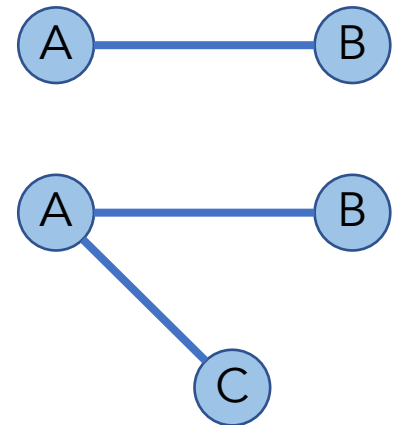
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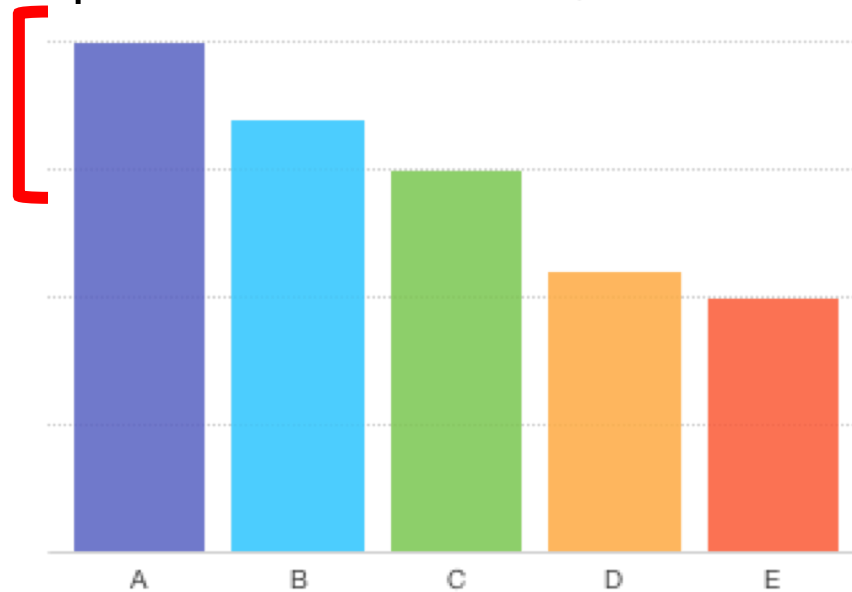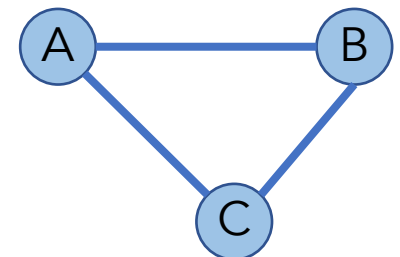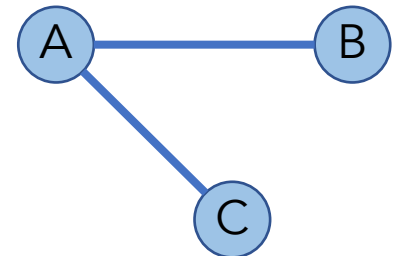
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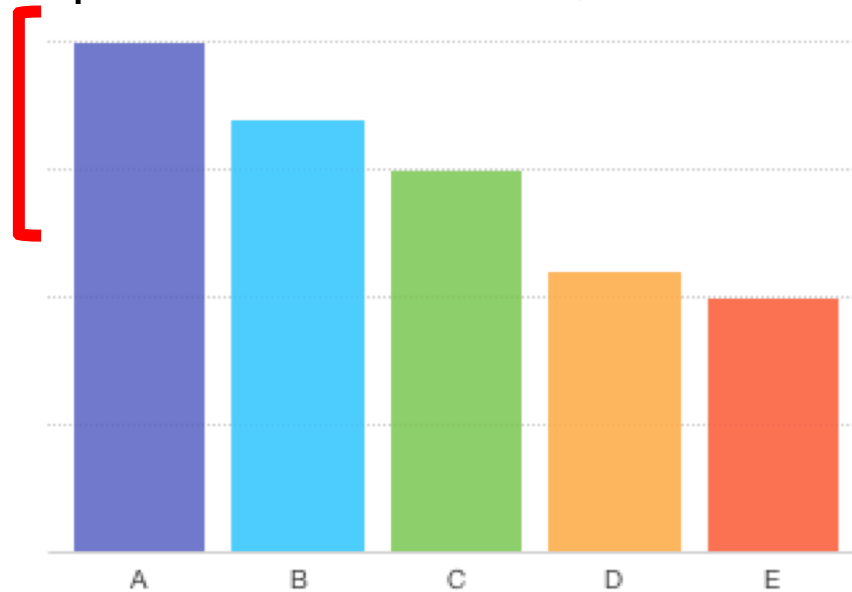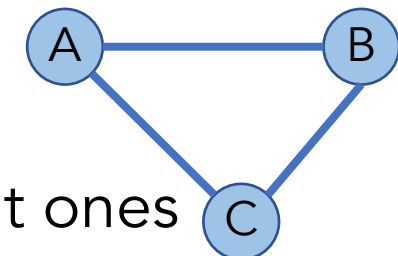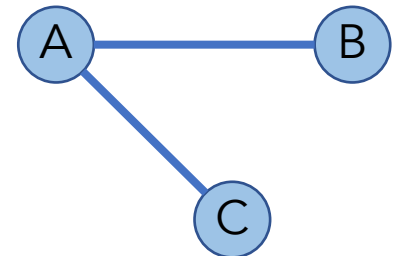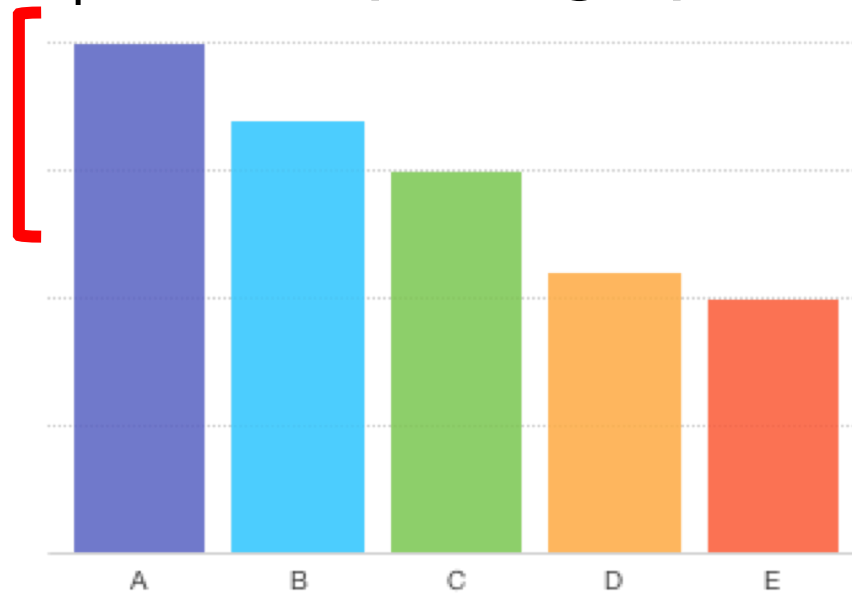
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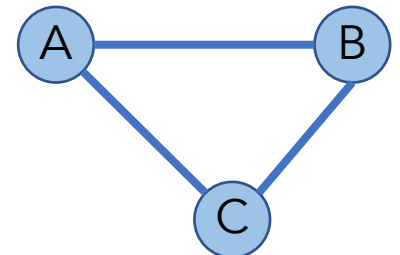Multiple **information sets**, denoting which is more probable than another. Each has an equivalent **pivot graph**.

Each level is nested in the subsequent ones

Ordinal domination

Action *a* dominates action *b* if there is an information set where *a* dominates *b*.
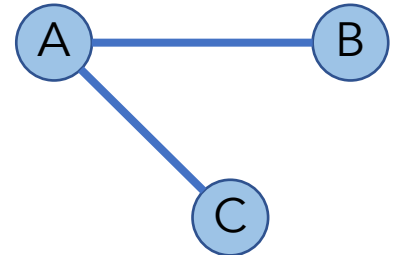
Different graphs for different heuristics

Arbitrarily voting for anyone that isn't least favorite:
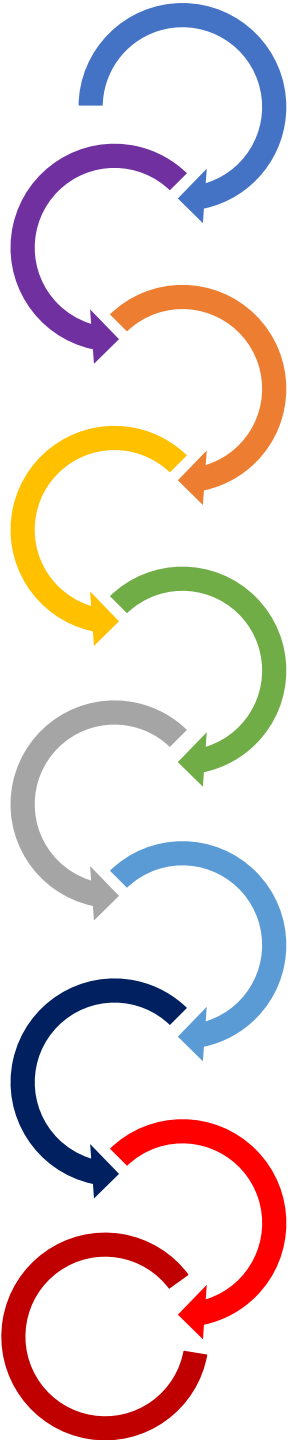
A graph where all candidates are tied with each other.

Different graphs for different heuristics

Local dominance:

A graph where candidates of a certain distance from the winner are tied.

Different graphs for different heuristics

Truth-bias / Lazy-bias:

Level 1: as in local dominace.
Level 2: Truthful vote connected to all nodes in level 1.

Different graphs for different heuristics

Leader rule

Level 1: top two candidates
Level 2: "star" connecting winner to all other candidates.

Iterative voting & local dominance

Regular metric distances induce pivot graphs that are upward closed (if tied with a candidate, also tied with candidates with higher scores).

When using candidate-wise rules, such as ℓ_∞, the pivot graph is a clique at every level

Iterative voting & local dominance

If voters' model is a cliqued one, the will converge using ordinal dominance when using plurality or veto.

Iterative voting & local dominance

If voters' model is a cliqued one, the will converge using ordinal dominance when using plurality or **veto**.

Known from previous result, Meir, **Plurality voting under uncertainty**, *AAAI 2015*

New

Future directions

More matchings between **heuristics and graphs**

Creation of **novel heuristics** using graphs

Convergence results using graph topology

Graph topology meaning?

More **uncertainty representations** using graphs

Thanks for listening!