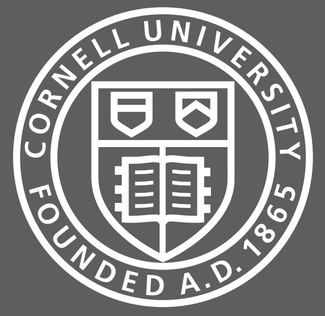
Prelim 2 Practice Session

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True or False?

Can the instance-optimal distortion voting rule ever choose an alternative that no voter ranks first?

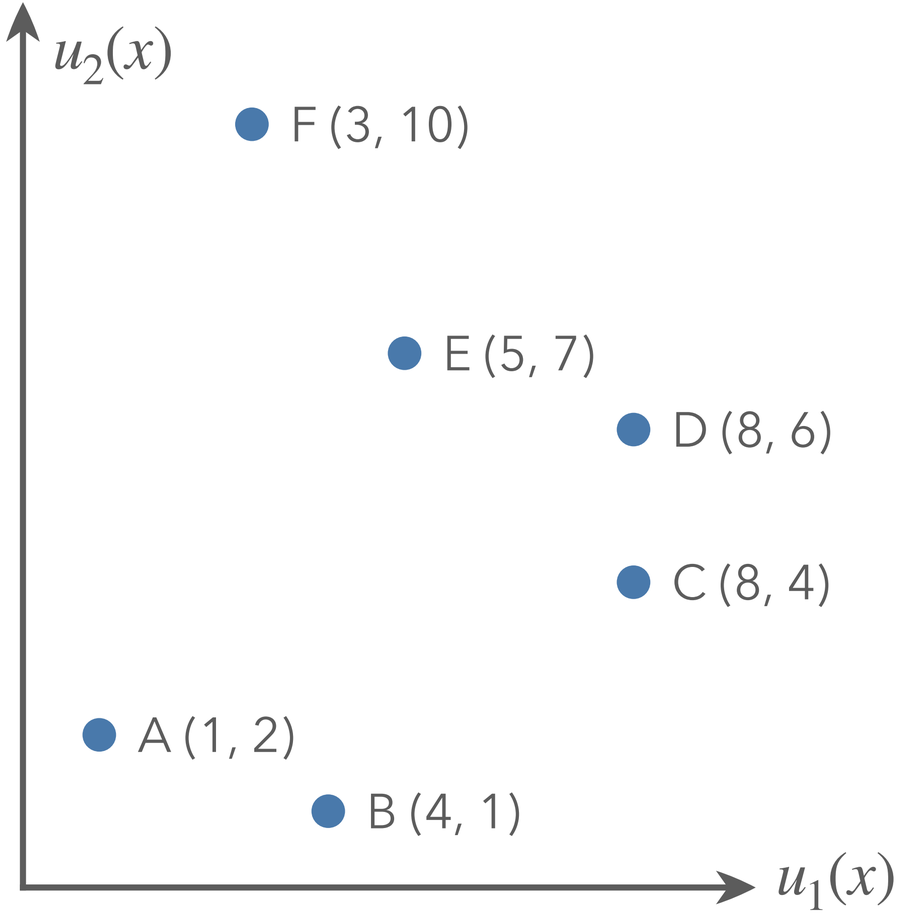
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Distortion

What's the lowest distortion that plurality has for some profile with $m = 100$ alternatives?

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Pareto Optimality



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Which alternatives x are Pareto optimal?

PAV Gone Wrong

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
3x	✔	✔	✔	✔	✔	✔	.	.
1x	✔	.	.	.	.	.	✔	✔
1x	.	.	.	✔	.	.	.	.
1x	.	✔	.	.	.	.	✔	✔
1x	.	.	.	.	✔	.	.	.
1x	.	.	✔	.	.	.	✔	✔
1x	.	.	.	.	.	✔	.	.

multi-winner election

$$n = 9, m = 8, k = 6,$$

$$W = \{a, b, c, d, e, f\}$$

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For which set of voters is EJR violated?

PAV Gone Wrong

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
3x	✔	✔	✔	✔	✔	✔	.	.
1x	✔	.	.	.	.	.	✔	✔
1x	.	.	.	✔	.	.	.	.
1x	.	✔	.	.	.	.	✔	✔
1x	.	.	.	.	✔	.	.	.
1x	.	.	✔	.	.	.	✔	✔
1x	.	.	.	.	.	✔	.	.

multi-winner election

$$n = 9, m = 8, k = 6,$$

$$W = \{a, b, c, d, e, f\}$$

Find a way to improve the PAV score. How come this is possible?

MES Manipulation

Consider the following participatory budgeting setting, for the voting rule MES and cardinality utilities:

$$B = \$45, n = 5, c_a = \$24, c_b = \$14, c_c = \$9.$$

$$A_1 = \{a, b\}$$

$$A_2 = A_3 = A_4 = \{a\}$$

$$A_5 = \{b, c\}.$$

Method of Equal Shares (MES):
Each voter is given initial budget $\beta_i = B/n$.
For $\rho \in \mathbb{R}$, alternative x is ρ-affordable if $\sum_{i \in N : x \in A_i} \min\{\beta_i, \rho\} \geq c_x$.
Let $W = \emptyset$. While there exists ρ-affordable alternative for some ρ:

- Let $x \in M$ be ρ-affordable for minimum ρ.
- Set $\beta_i = \beta_i - \min\{\beta_i, \rho\}$ for $i \in N : x \in A_i$.
- Add x to W.

How can voter 1 manipulate to cause strictly more of their approved projects to be chosen?

Questions?

Do you have any question you want me to answer or concept you want me to re-explain?

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