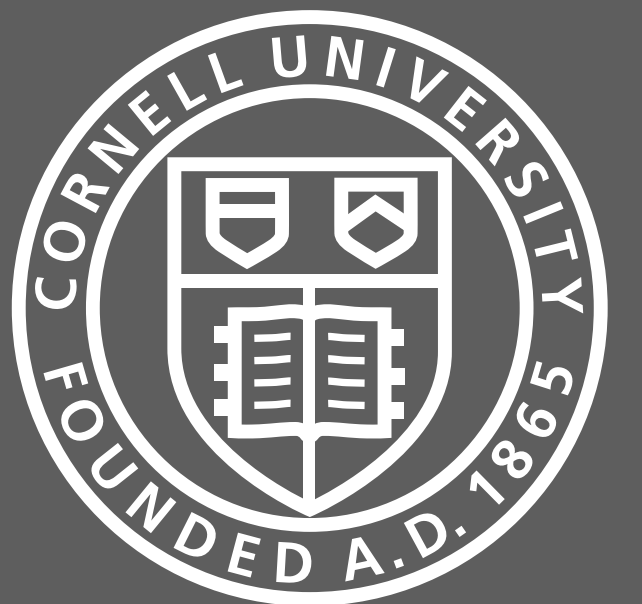


Prelim 1 Practice Session

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Lecture 9, ORIE 4360/5360, Fall '26



Prelim 1 on Monday

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Please gather outside of the room while we prepare.

75 minutes.

You can bring one *hand-written*, double sided cheat sheet. Besides, just bring writing utensils.

Check out the study guide on Canvas.

Compute STV Winner

$n = 17, A = \{a, b, c, d\}$

4x $a \succ b \succ c \succ d$

4x $c \succ d \succ b \succ a$

6x $b \succ d \succ a \succ c$

1x $d \succ c \succ a \succ b$

1x $a \succ c \succ d \succ b$

1x $d \succ c \succ b \succ a$



Which alternative is selected by
Single Transferable Vote (STV)?

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True or False?

Let there be five alternatives ordered $a < b < c < d < e$, and let all preferences be single-peaked with respect to this order. n is odd. Let

$$f(\sigma) = \begin{cases} \text{maximum peak} & \text{if all peaks} \leq d \\ d & \text{otherwise.} \end{cases}$$



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Is f strategyproof (on the domain of single-peaked preferences)?

Liquid Democracy

Your task: Choose a set of voters, their competences, and delegations between them.

Can you choose them such that the correct winner is both more likely than if all voters vote independently **and** more likely than if everyone delegates to the voter with highest competence?



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Bradley-Terry

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Recall the Bradley-Terry model: Alternative x has $\beta_x \in \mathbb{R}$; an agent prefers x over y with probability $\sigma(\beta_x - \beta_y)$, where $\sigma(z) = 1/(1 + e^{-z})$.

Can the Bradley-Terry model change if we increase all β_x by the same amount $c > 0$?
... if we scale all β_x by the same $d > 0$?



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Rule Condorcet Consistent?

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For alternatives x, y , let

$\text{margin}(x, y) = (\#\text{voters preferring } x \succ y) - (\#\text{voters preferring } y \succ x).$

Consider the social choice function $f: \mathcal{L}^n \rightarrow A$,

$f(\sigma) = \operatorname{argmax}_{x \in A} \min_{y \in A, y \neq x} \text{margin}(x, y).$

You may assume that n is odd.



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Is f Condorcet consistent?

Questions?

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



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