A few more practice questions for the midterm

Vincent Conitzer

Another property of (some) voting rules

- A voting rule is said to satisfy consistency if the following (always) holds for it:
- Suppose V_1 is a set of votes for which alternative w wins, and V_2 is another set of votes (over the same alternatives) for which the same alternative w wins. Then if we consider all the votes V_1 and V_2 together, w necessarily still wins.
- Argue that any positional scoring rule (plurality, veto, Borda, …) satisfies consistency.
- Take some other voting rule(s) and prove that it does not satisfy consistency, by giving an example of two sets of votes V_1 and V_2 that each separately result in the same alternative w winning, but that taken together result in another alternative winning.

Combinatorial prediction markets: Worst-case ranking

- Suppose we (as the auctioneer) have accepted bets where we have to pay:
- $3 if horse A finishes ahead of horse B
- $1 if horse B finishes ahead of horse C
- $2 if horse C finishes ahead of horse A
- What is the worst-case outcome for us (where we have to pay out the most)?
- Consider this problem in general (arbitrary # of horses, arbitrary bets). Which problem that you have seen before does this resemble?
- Is the problem NP-hard?
- Give an integer linear program for this problem in the general case.

Patients with multiple willing donors

- Alice is in dire need of a kidney transplant but is difficult to match. To improve her odds, Bob and Carol *both* offer to donate on her behalf.
- Suppose that we require that we use *at most one* of Bob and Carol's four kidneys (and only if Alice receives one). How does this change the exchange problem?
- What if we allow that we simultaneously use a kidney from *both* Bob *and* Carol (only if Alice gets one) – i.e., we get "two kidneys for the price of one" in this setup?
- (When asking "how does this change the problem," think about this from as many angles as possible. What is the right way to formulate the problem? How would outcomes be likely to change? How would the computational complexity and integer programs change? Do you see any practical / ethical problems? Etc.)