Computational Social Choice

- summary of the voting protocols
    - scoring rules (plurality, Borda)
    - single transferable vote (STV)
    - pairwise elimination
    - plurality with runoff
- Condorcet winner
- Exercise
    - assume following preferences:
        - 3 agents: a > b > c
        - 2 agents: b > c > a
        - 2 agents: c > a > b
    - Which of the candidates is selected if we use plurality voting?
        - Borda?
        - Pairwise elimination with ordering
            - (a,b,c)?
            - (b,c,a)?
            - (c,a,b)?
    - Assume that we want to include a fourth candidate, “d”, into the preferences profiles. Can we do it in such a way “c” will be the winner under Borda voting rule?
- Definition of Condorcet loser
    - This candidate loses in pairwise comparison with every other candidate.
    - Let’s assume we are using plurality voting rule. Can the winner under plurality be the Condorcet loser?
        - If so, find an example of such a situation. If not, prove it.
    - What happens under Borda voting rule?
- Manipulation
    - strategic behavior in the voting setting
    - Classical problem -- If one agent knows the full preferences of other agents, how hard it is to calculate an insincere vote that can improve agent’s preferences.
    - Computational complexity is beneficial in this case.
    - P for simple voting rules and one manipulator (e.g., Borda)
    - NP for more complex rules (e.g., STV)
- Statistical Social Choice
    - we can use the social choice methods for aggregating opinions of other agents/people in order to find the “ground truth”
    - maximal-likelihood estimation principle -- we are seeking for a model (truth), for which it is the highest probability that the evidence (gathered votes) is as observed.
    - the simple voting rules (e.g., scoring rules) are correct estimators -- by aggregating the votes in this way we are guaranteed to find a correct model