MAS: Activity 11 – Voting as Social Choice Algorithm - Analysis of Single Transferable Vote

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In this activity, you are requested to perform an analysis of a social choice algorithm: *Single Transferable Vote (STV)*[1] system.

The objective of the analysis is to **analyse** the extent to which the **STV protocol can be alleviated** by allowing **incomplete candidate rankings** (e.g. specify only top 3 preferences, even though there are 10 candidates).

The analysis follows these steps:

1. Use the `generate_random_mixture` function to generate 1000 *voting profiles* that form **an experiment**. Generate an experiment for each combination of: number of voters, Φ and number of candidates. **Note:** A **voting profile** is a set of votes (one for each voter) expressed as a ranking over the set of candidates.

2. For each *voting profile* in an experiment:
   - compute the STV winner(s): i.e. the elected candidate(s) using the full ranking order
   - compute the STV-k winner(s): i.e. the elected candidate(s) using only the top-k ranking specifications for each voter
   - compute the overlap between STV and STV-k

3. Average overlap results from previous step and create charts that show the percentage of experiments where there is an exact match between STV and and STV-k outcomes. Analyse dependency based on value of k, number of voters, number of candidates and different values of Φ.

Note: the STV-k is only slightly different from full STV. If in a ballot (i.e. the preference ordering of a voter) all the top-k candidates have been already eliminated in previous STV rounds, then the ballot is called *exhausted* and is ignored in all future rounds.

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[1] https://en.wikipedia.org/wiki/Single_transferable_vote