

SHORT TERM SCIENTIFIC MISSION (STSM) – SCIENTIFIC REPORT

The STSM applicant submits this report for approval to the STSM coordinator

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Committee selection is a central problem in the field of social choice. Examples include choosing a parliament or a committee, identifying a set of time slots, and selecting a set of research projects. Agents vote to choose candidates, and the aim is to select a committee that represents the different opinions that are present among voters. While much of the literature focuses on binary outcomes of the election, there are some scenarios where we need to select a mixture of several desirable outcomes: for instance, a city council may decide how the city tax must be spent on different public projects based on their residents' wills.

This project is concerned with the problem of selecting a mixture of committees instead of choosing a binary solution. That is, we are interested in choosing a probability distribution over candidates, in which voters' opinions should be adequately reflected by the distribution. To capture the idea of an efficient or fair outcome, a number of solution concepts have been developed, including the utilitarian rule, and the egalitarian rule. Often, achieving both efficiency and fairness is difficult; most of proposed rules thus satisfies at most one of the desired properties. However, many of real-life requirements do not fall clearly into two categories. In such scenarios, it is essential is to choose a rule that is attractive in both dimensions.

During my visit, we focused on how well each rule achieves the two extremes of interest: efficiency and fairness. In particular, we tried to provide guarantees of how each rule approximates the utilitarian welfare and individual fair share. Specifically, the efficiency guarantee of a specific rule is considered as the worst case ratio between the optimal social welfare and the worst social welfare under the given rule; analogously, the fairness guarantee is defined as the ratio between the optimal egalitarian welfare and the worst egalitarian welfare under the given rule. As preliminary results, we showed that an outcome maximizing the Nash product achieves efficiency guarantee at least $1/2\sqrt{m}$ where m is the number of candidates. For future work, we are interested in extending our results to other rules, such as random serial dictatorship.