Scoring Uncertainty in Synthetic Voting Procedures *

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Abstract. There are many contexts in which aggregating diverse individual opinions into a collective decision is essential. Social choice theory examines how individual preferences can be aggregated to make group decisions. Ranking aggregation, in particular, focuses on synthesizing individual rankings of preferences given by some voters over a set of alternatives into a single, comprehensive ranking that represents the collective opinion of the group. However, it is crucial to recognize the inherent uncertainty in individual preferences and voting behaviors to ensure the robustness and reliability of the aggregation procedure and to be able to parameterize how the aggregation methods behave in certain situations depending on the uncertainty of the preferences. In this sense, the Mallows model is widely used for creating synthetic ranking profiles [2], aiming to provide a consistent framework for comparing different ranking aggregation algorithms. It is commonly assumed that these algorithms exhibit stable behavior as the number of voters or options increases, based on the characteristics of the generated profiles. Nevertheless, recent research is pointing out that this kind of profiles can be misleading in the comparison of ranking aggregation algorithms [1]. Our research underscores the importance of defining scores that capture the uncertainty inherent in voting, so they make possible to make profiles comparable in some terms. These scores help to clarify how aggregation procedures for determining a consensus ranking perform under various conditions. We find that specific configurations of the Mallows model parameters can significantly influence the structural properties of the generated profiles. Therefore, it is crucial to consider these uncertainties when analyzing ranking aggregation algorithms.

Keywords: social choice, uncertainty, voting systems, scores

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