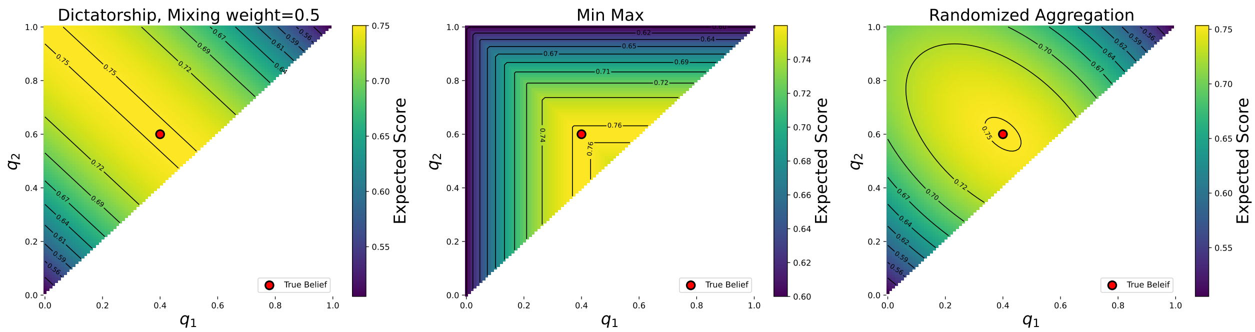

(a) (b) (c)

Figure 3: (Left-to-right) In the first figure we simulate the scoring rule where ρ is a dictatorship with a fixed mixing weight of 0.5, in the middle figure we simulate the scoring rule with min-max ρ (pessimistic decision maker) and in the last figure we simulate the scoring rule where the aggregation is a randomized dictatorship and the forecaster obtains a distribution $\theta = \mathcal{U}[0, 1]$ over ρ. The lower half of the figure is not plotted since that corresponds to region $q_1 > q_2$, i.e. lower probability being greater than upper probability

E SIMULATIONS

To test the sanity of our proposed scoring rule, we simulate a scenario where an imprecise forecaster predicts a binary outcome (e.g., chance of rain tomorrow). We assume the forecaster has an imprecise forecast $[0.4, 0.6]$ and uses an imprecise scoring rule s_ρ where ρ is a dictatorship or some other aggregation like min-max. We compare this to our randomized imprecise scoring rule s_θ. Given the binary outcome, the forecaster reports an interval $\mathcal{Q} := [q_1, q_2]$ where q_1 denotes the lower probability and q_2 the upper probability respectively. Figure 3 highlights that the randomized scoring rule s_θ is strictly proper for imprecise forecasts as it has the highest expected score for the forecaster only when the forecaster reports his true belief. While in other cases of using a deterministic imprecise scoring rule s_ρ, if DM provides a ρ such that it is a dictatorship, such as in the case of Figure 3(a), the scoring rule is proper; however, the forecaster can lie by reporting the dictator. This can be inferred from the contour that the point $[0.5, 0.5]$, which corresponds to the precise forecast 0.5, also has the highest expected score. With ρ being a min-max rule, the scoring rule s_ρ is proper but not strictly as other imprecise forecasts allow the forecaster to obtain the same expected score. For our implementation we consider $\mathcal{A} = [0, 1]$ and $u(a, o) := (o - a)^2$ to satisfy Lemma 4.10.