Unified Latent Class Modeling of Scores and Rankings Applied to Grant Panel Review

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Motivation and Data

The motivation is grant panel review:

- 10 panelists assessed 28 proposals using numerical scores and top-6 rankings.
- Scores and rankings must be aggregated in order to understand differences in quality between proposals and make funding decisions.
- We suspect that panelists may assess proposals using distinct *preference ideologies* based on their backgrounds, affiliations, or experiences.

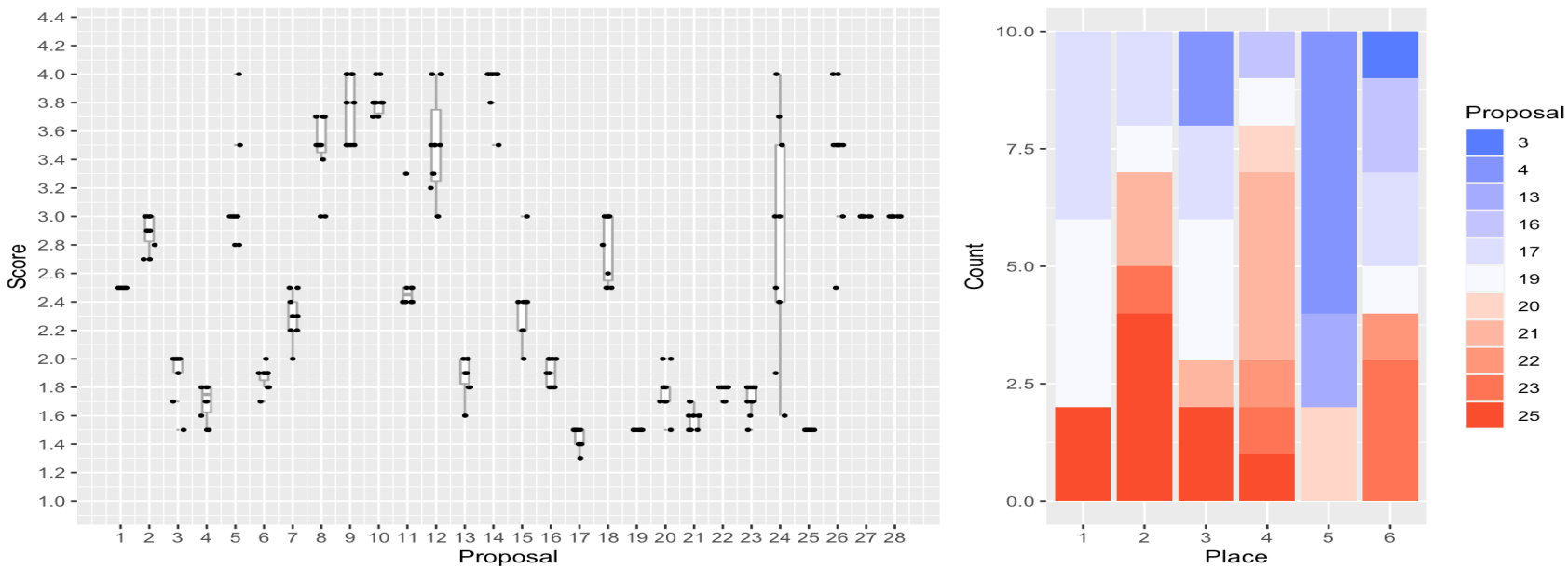

Figure: *Left:* Scores by proposal. *Right:* Proposals by rank place.

Goals and Method

Goals:

- Identify **how many ideology classes** exist and estimate the probabilities that reviewers belong to the given classes.
- For each class, identify a **consensus ranking** of the proposals and **estimate the uncertainty** of those rankings to make informed funding decisions.
- Identify **agreement** and **disagreement** in consensus rankings across classes.

We assume a Bayesian hierarchical model:

1. Assume a **latent class mixture** of reviewers.
2. Conditional on latent class, reviewer **scores and rankings are independent Mallows-Binomial** (model proposed by Pearce and Erosheva, 2021).

The model is fit using an adaptive Metropolis Hastings-within-Gibbs procedure.

Results

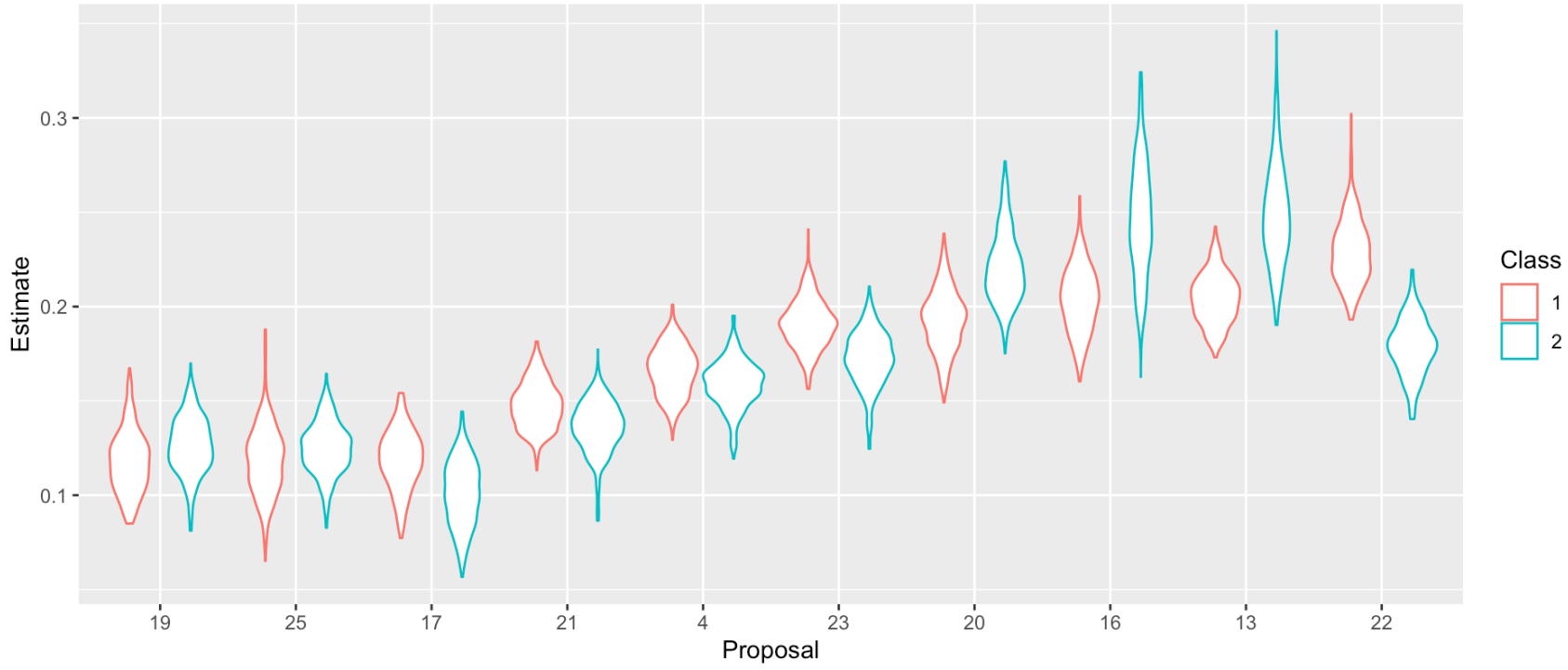

Figure: Posterior “relative quality" distributions of selected top proposals, by ideology class.

- Perception of quality by each class often aligns, but not always.
- Consensus is stronger within class 2 than class 1.