Incorporating threshold theory into the cultural consensus theory for ordinal categorical data: A simulation study

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Introduction

Cultural consensus theory (CCT)

- A cognitively-driven information-pooling approach to assess informants' consensus (Batchelder et al., 2018).
- The "culturally correct" answers are unknown a priori.
- Originally aims at analyzing data consisting of binary responses (Batchelder & Romney, 1988; Romney et al., 1986).

Threshold theory

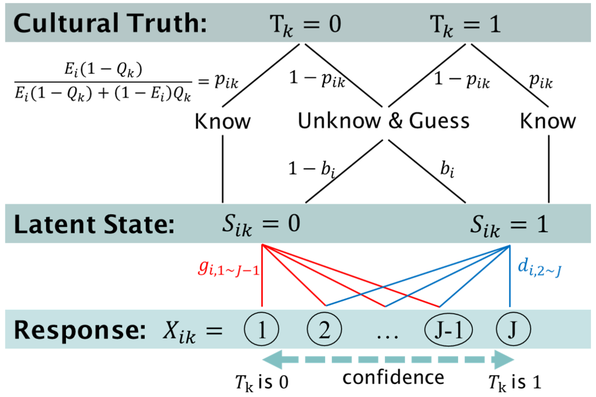
- Distinguish between sensory-based thresholds and decision-based response biases (Krantz, 1969; Luce, 1963).

Objectives

1. Construct a new model embedded threshold theory into the CCT framework to deal with ordinal categorical responses with different confident levels.
2. Estimate items' and informants' parameters by using the hierarchical Bayesian inference.
3. Check the single (consensus) truth assumption.

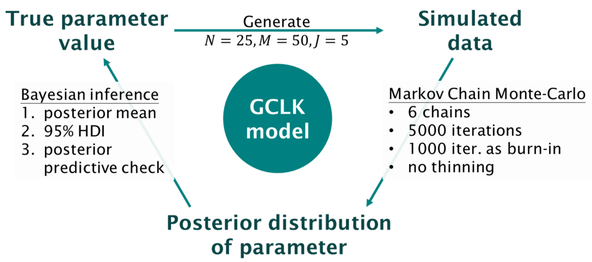
General Condorcet Luce Krantz (GCLK) Model

Consider X_{ik} j is denoted that the ith informant answers the jth confident response on the kth item.

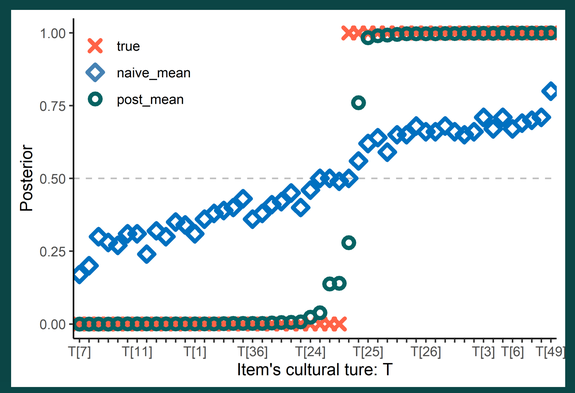


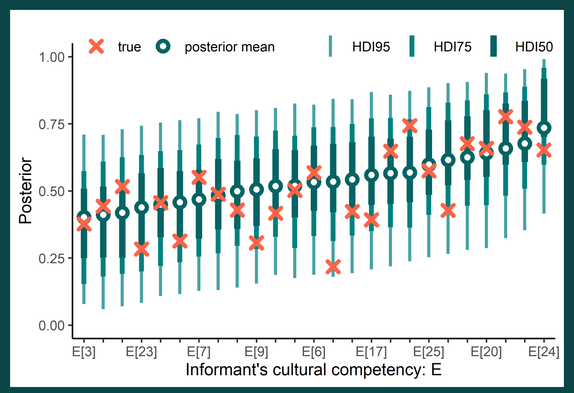
where p_{ik}, the probability of knowing answer, is a function of item's difficulty Q_k and informant's competence E_i. b_i is a sensory bias and $_i$ $_i$ are response criteria respectively at different latent states S_{ik}.

Simulation Procedure



Test theory without an answer key

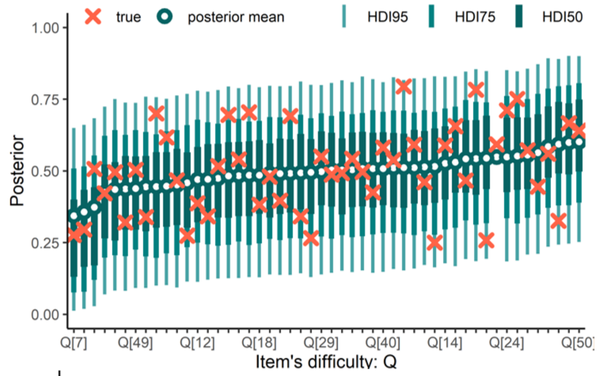


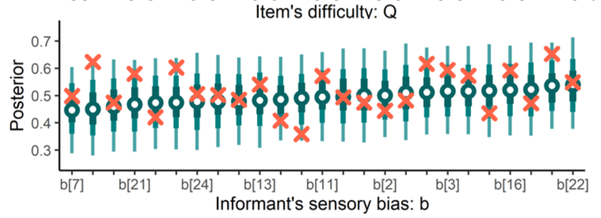


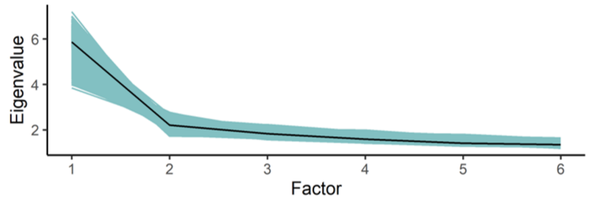
Our model can estimate the correct answers much more accurately by weighting on the informants' responses.

MORE INFORMATION

Results







Discussion

- The GCLK model is developed for applying informant-by-item ordinal response data where items' consensus truth is unknown a priori.
- The simulation study showed that the hierarchical Bayesian approach can get a strong recovery for the true parameters in our model and provide an method for checking single consensus answers in this data.
- The consensus answers estimated by GCLK model are more close to true value than simply calculate average over everyone responses for each item.
- Apply our proposed model to real data (e.g. Likert-type questionnaire format) for the future study.

References

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