

Bayesian Hierarchical Analysis of Choice Data

Kazuo Shigemasu Takahiro Hoshino Satoko Kojima

Department of Cognitive and Behavioral Science

The University of Tokyo

{kshige, hoshino, satokoji}@bayes.c.u-tokyo.ac.jp

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Abstract

We proposed the model and analysis of the choice pattern in terms of the hierarchical Bayesian modeling (Shigemasu, Ohmori and Hoshino, 2003). Bayesian hierarchical modeling combined with the MCMC method was proven (as always) to be very effective for the analysis of complex data. This model introduces two latent variables, i.e. latent utility and latent class indicator, which made the hierarchical structure very neat so that the random numbers can be drawn from the standard full conditional distributions. The posterior distributions for all latent variables and parameters are given in a coherent and unified way to fit the data. This unified approach can incorporate prior knowledge and any related data, as long as their relationships with latent variables or parameters are specified. Also, it is very flexible in that the analysis can handle many kinds of data gathering.

In this report, we extend our model to analyze binary choice data, rating data, ranking data, pick any data and the like. The key technique to analyze these data is to accept draws of the latent variables only when they are consistent with the observed data. For example, in case of the pair-comparison data, when the latent utilities for the relevant two alternatives are consistent with the data, they are accepted, while the other random utilities for the rest of the alternatives remain intact. Thus this approach does not need any extra assumption to deal with "inconsistent" data.

We demonstrate the effectiveness of the proposed method by simulated data and then we apply it to the real data.

References

Kazuo Shigemasu, Takuya Ohmori and Takahiro Hoshino. (2003) Market Segmentation Method From the Bayesian Viewpoint. *Between Data Science and Applied Data Analysis*, pp. 595-602. Springer.