2018/4 Final

STAT 5020: Topics in Multivariate Analysis

Final Examination

The Department of Medicine and Threapeatics, Community and Family Medicine, and Pharmacy at the Chinese University of Hong Kong conducted a compliance study to investigate patient nonadherence to medication. A total number of 837 ethnic Chinese patients diagnosed as suffering from hypertension were randomly selected from hospitals and clinics in Hong Kong to serve as subjects for the study. The following observed variables are associated with patients' nonadherence to medication, their knowledge of medication, and their health conditions, respectively. Frequencies of (Yes '1'/No '0') are in parentheses.

Dichotomous variables.

η_1 ①
- y_1: Did you have any surplus in the previous prescribed drugs? (175/662)
- y_2: Did you stop/reduce/increase the dosage? (69/768)
- y_3: Did you forget to take medications? (391/446)

η_2 ②
- y_4: Do you feel you have hypertension? (363/474)
- y_5: Do you know the reasons for taking drugs? (650/187)
- y_6: Do you know the reasons for taking drugs for a long term? (605/232)

η_3 ③
- y_7: In the past two weeks, did you have emotional problems such as upset, hot temper, etc? (387/450)
- y_8: In the past two weeks, did your health cause any difficulties in daily activities? (181/656)
- y_9: In the past two weeks, did your health cause any difficulties in social activities? (177/660)

(a) Establish an SEM to analyze this dataset. Explain the model and the purpose of your study.

(b) Specify the conjugate prior distributions for the unknown parameters in the proposed model, and show the conjugacy of the specified priors.

(c) Derive the posterior distributions of the unknown parameters, and describe the posterior inference via MCMC sampling in the context of the proposed model.

(d) Explain why a model comparison is useful for model building, and illustrate how to implement the path sampling procedure in computing Bayes factor for the model comparison of the proposed model.

(e) Discuss advantages and disadvantages of the Bayesian method in the analysis of SEMs.