

國立中央大學

統計研究所

學術演講

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講 題：Random-Effect Modelling Approaches for Survival Data using H-likelihood

時 間：107 年 05 月 22 日 (星期二) 上午 11:00 ~ 12:00

地 點：中央大學 綜教館O209室

茶 會：上午 10:30 ~ 11:00 地 點：鴻經館 510 室

ABSTRACT

Survival models with random effects for various time-to-event data including correlated survival data have been widely studied in biomedical researches (e.g. multi-center clinical trial or genetic study of twin and family). Correlation and/or heterogeneity caused by clusters can be modelled by introducing unobserved frailty components (random effects) into the hazard function. For the purpose, semi-parametric frailty models, generalizations of Cox's (1972) PH models, have now been widely used. However, current likelihood-based inferences may encounter difficulties caused by (i) intractable integration required to obtain marginal likelihood (i.e. observed likelihood), (ii) incompleteness of data due to censoring and/or truncation and (iii) nuisance parameter problems due to non-parametric baseline hazard. Such challenging problems can be overcome by using the hierarchical likelihood (or h-likelihood; Lee and Nelder 1996, Lee et al. 2017). Here, the h-likelihood (denoted by h) is defined by

$$\begin{aligned} h &= \log f(y|v;\theta) + \log f(v;\theta) \\ &= \log f(v|y;\theta) + m(y;\theta) \end{aligned}$$

where y is observed data, v is random effect and $m(y;\theta)=\log f(y;\theta)$ is marginal likelihood.

In this talk, we present the h-likelihood methodologies which have been developed for various random-effect survival models (Ha, Jeong and Lee, 2017). We also show that the h-likelihood gives a unified framework for multivariate survival analysis. Furthermore, we introduce how the h-likelihood frameworks are extended to the advanced survival analyses such as (i) interval estimation of individual random effects, (ii) model selection, (iii) penalized variable selection, (iv) competing or semi-competing risks modelling, and (v) joint modelling of different outcomes. The proposed methods are demonstrated with simulation studies and practical examples including a data set from multi-center clinical trials. Further extensions via the h-likelihood are finally discussed.

Key words: Competing-risks models, Frailty models, H-likelihood, Random effects, Joint models

References

Lee, Y and Nelder, J. A. (1996). Hierarchical generalized linear models (with discussion). JRSS B 58: 619–678

Ha, I.D., Jeong, J.-H. and Lee, Y. (2017). Statistical modelling of survival data with random effects: h-likelihood approach. Springer.