Bayesian Personalized Treatment Selection for Advanced Breast Cancer

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Abstract

In this talk, I will describe a Bayesian method for personalized treatment selection in settings where data are available from a randomized clinical trial with multiple outcomes. The motivating application is a trial that compared the combination letrozole plus bevacizimab (L+B) to letrozole alone (L) as first-line therapy for hormone receptor positive advanced breast cancer. The trial's data showed that L+B was associated with longer progression-free survival (PFS) time, but also a higher rate of severe toxicities. To address the problem of selecting a future patient's treatment based on the trial's data and the patient's covariates, collaborating physicians who treat advanced breast cancer patients constructed a joint utility function of PFS time, total toxicity burden (TTB), and patient prognostic covariates. The construction was guided by their clinical experiences. To estimate joint effects of treatment and covariates on PFS time and TTB, a multivariate Bayesian nonparametric regression model was fit to the data. Using the fitted model, a future patient's treatment may be selected by maximizing the posterior predictive mean utility, computed using the patient's covariates. Posterior inferences showed that the optimal treatment for a given patient depends on their age.

References

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