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A BAYESIAN SEMI-PARAMETRIC SURVIVAL MODEL WITH LONGITUDINAL MARKERS

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We consider inference for data from a clinical trial of treatments for metastatic prostate cancer. Patients joined the trial with diverse prior treatment histories. The resulting heterogeneous patient population gives rise to challenging statistical inference problems when trying to predict time to progression on different treatment arms. Inference is further complicated by the need to include longitudinal marker as a covariate. We develop a semi-parametric model for joint inference on longitudinal data and an event time, with the possibility that some patients are cured. The event time distribution is based on a non-parametric Plya tree prior. For the longitudinal data we assume a mixed effects model. Incorporating a regression on covariates in a non-parametric event time model in general, and for a Plya tree model in particular, is a challenging problem. We exploit the fact that the covariate itself is a random variable. We achieve an implementation of the desired regression by factoring the joint model into a marginal model for the event time and a regression of the longitudinal outcomes on the event time, i.e., we implicitly model the desired regression by modeling the reverse conditional distribution.