Pathway EM-Algorithm and Its Application to the Estimation of Vaccine

Yang Yang

Abstract

We consider time-to-event data where individuals can experience two or more types of events that are not distinguishable from one another without further confirmation, perhaps by laboratory test. If the type of a portion of the events is identified, this forms a validation set. However, even if a random sample of events are tested, confirmations can be missing nonmonotonically, creating uncertainty about whether an individual is still at risk for the event of interest. In addition, important covariates may be subject to missingness as well. To estimate covariate effects in this survival setting, we developed a pathway Expectation-Maximization (EM) algorithm that takes into account all pathways of discrete event types and covariate patterns in an individual compatible with that individual's test outcomes. This method is compared with a previous simpler method in simulation studies. I will talk about two applications of this algorithm. One is to reevaluate the efficacy of a trivalent live-attenuated influenza vaccine during the 2003-2004 influenza season in Temple-Belton, Texas; and the other is to estimate the efficacy pf a recombinant, live-attenuated, tetravalent dengue vaccine in two large clinical trials.