Distributed lag non-linear models with penalized splines

Antonio Gasparrini
London School of Hygiene & Tropical Medicine, London, United Kingdom

July 8, 2015, 16:00 Uhr s.t.
Department of Statistics, Ludwigstr. 33, Room 144, Munich

In biomedical research, a health effect is frequently associated with protracted exposures of varying intensity, with the risk being dependent on the specific exposure pattern sustained in the past. This phenomenon is common to different types of risk factors, such as environmental stressors, drugs or carcinogenic substances, amongst others. Distributed lag non-linear models (DLNMs) are a modelling framework for describing these kind of exposure-lag-response dependencies, where a bi-dimensional function is applied to model the risk along both spaces of exposure intensity and lag. Here I illustrate an extension of the DLNM framework through penalized splines within generalized additive models (GAM). This extension offers built-in model selection procedures and the possibility of accommodating assumptions on the shape of the lag structure through specific penalties, and generalizes previously proposed penalized DLM for linear dependencies. Results from a simulation study comparing different modelling approaches and real-data applications in time series and survival analysis are presented.