

## Research Seminar Series 2017/18 Hierarchical / Multilevel Models

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**Thursday, March 1st 2018, 10:30**

CIP-Raum, Humboldtallee 32

*Dynamic frailty models based on compound birth–death processes*

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Abstract:

Frailty models are used in survival analysis to model unobserved heterogeneity. They accommodate such heterogeneity by the inclusion of a random term, the frailty, which is assumed to multiply the hazard of a subject (individual frailty) or the hazards of all subjects in a cluster (shared frailty). Typically, the frailty term is assumed to be constant over time. This is a restrictive assumption and extensions to allow for time-varying or dynamic frailties are of interest. In this paper, we extend the auto-correlated frailty models of Henderson and Shimakura and of Fiocco, Putter and van Houwelingen, developed for longitudinal count data and discrete survival data, to continuous survival data. We present a rigorous construction of the frailty processes in continuous time based on compound birth–death processes. When the frailty processes are used as mixtures in models for survival data, we derive the marginal hazards and survival functions and the marginal bivariate survival functions and cross-ratio function. We derive distributional properties of the processes, conditional on observed data, and show how to obtain the maximum likelihood estimators of the parameters of the model using a (stochastic) expectation-maximization algorithm.

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