

Monday 22 July 2024

13:30-15:00 Invited Session 2 (Main Room)

Recent advances in survival analysis with complex data structures (Chair: Giorgos Bakoyannis)

Joint Modelling of (Un)bounded Longitudinal Markers, Competing Risks, and Recurrent Events in Cystic Fibrosis Data

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Joint models for longitudinal and survival data have become a popular framework for studying the association between repeatedly measured biomarkers and clinical events. Nevertheless, addressing complex data structures remains a challenge. In particular, even though many applications consist of recurrent and competing event times, those are commonly not analysed using a single model. Moreover, existing frameworks rely mainly on a Gaussian distribution for continuous markers, which may be unsuitable for bounded biomarkers, resulting in biased estimates of associations. To address these limitations, we propose a Bayesian shared-parameter joint model that simultaneously accommodates multiple (possibly bounded) longitudinal markers, a recurrent event process, and competing risks. We use the beta distribution to model responses bounded within any interval without sacrificing the interpretability of the association. The model offers various forms of association, discontinuous risk intervals, and both gap and calendar timescales. We analyse the US Cystic Fibrosis Foundation Patient Registry to study the associations between changes in lung function and body mass index, and the risk of recurrent pulmonary exacerbations, while accounting for the competing risks of death and lung transplantation. Our comprehensive approach provides new insights into cystic fibrosis progression.