

Speaker: Stephen Jun Villejo (Imperial Collge London)

Date: 31/10/2025 at 13:15 in 4 West 1.7 (Wolfson Lecture Theatre)

Title: Validating uncertainty propagation approaches for two stage Bayesian spatial models using simulation-based calibration

Abstract:

My talk tackles the problem of uncertainty propagation in two-stage Bayesian models, with a focus on spatial applications. A two-stage modelling framework has the advantage of being more computationally efficient than a fully Bayesian approach when the first-stage model is already complex in itself, and avoids the potential problem of unwanted feedback effects. Two ways of doing two-stage modelling are the crude plug-in method and the posterior sampling method. The former ignores the uncertainty in the first-stage model, while the latter can be computationally expensive. In this talk, I will show results from a model validation exercise of the two aforementioned approaches. I will also discuss a new approach to do uncertainty propagation, which we call the Q uncertainty method, implemented using the Integrated Nested Laplace Approximation (INLA). The different approaches are validated using the simulation-based calibration method, which tests the self-consistency property of Bayesian models. Results show that the crude plug-in method underestimates the true posterior uncertainty in the second-stage model parameters, while the resampling approach and the proposed method are correct. I will illustrate the approaches in a real-life data application which aims to link relative humidity and dengue cases in the Philippines for August 2018.