



Statistics and Actuarial Science Seminar

Title: Local summary statistics and Dirichlet processes for spatial intensity estimation and automatic cluster detection

Speaker: Jorge Mateu (Universitat Jaume I)

Date: Thu 22nd October 2026 at 3:00PM

Location: N0.20 – Science North

Abstract: Common practice in spatial point process modelling dictates that formal analysis begins with intensity estimation, which is carried out by exploiting external covariates, when available. Parametric intensity modelling often uses the Poisson likelihood function, but this underperforms when the data come from a more complex model, with some kind of interaction among points. To address this shortcoming, we propose a method that incorporates local second-order characteristics to account for spatial dependencies in the model fitting procedure. Our method relies on a locally weighted Poisson log-likelihood, which avoids making explicit assumptions about the type and degree of spatial interaction. We further propose a non-parametric test for the detection of interaction between points. In addition, when the intensity outlines the existence of a clustering behaviour, we propose a spatio-temporal Dirichlet process mixture model on Euclidean and linear network windows to automatically detect space-time clusters of the events. We consider a Bayesian hierarchical model and adopt a convolution kernel estimator to account for the network structure in the city. Several applications will be illustrated.