Working Group on Statistical Learning Seminar

Title: Non-stationarities in extreme hourly precipitation over the Piave Basin, Northern Italy

Speaker: Dáire Healy (UCD School of Mathematics and Statistics)

Date: Thu 9th October 2025 at 3:00PM

Location: E0.32 (beside Pi restaurant)

Abstract: We study the spatio-temporal features of extremal sub-daily precipitation data over the Piave river basin in northeast Italy using a rich database of observed hourly rainfall. Empirical evidence suggests that both the marginal and dependence structures for extreme precipitation in the area exhibit seasonal patterns, and spatial dependence appears to weaken as events become more extreme. We investigate factors affecting the marginal distributions, the spatial dependence and the interplay between them. Capturing these features is essential to provide a realistic description of extreme precipitation processes in order to better estimate their associated risks. With this aim, we identify various climatic covariates at different spatio-temporal scales and explore their usefulness. We go beyond existing literature by investigating and comparing the performance of recently proposed covariate-dependent models for both the marginal and dependence structures of extremes. Furthermore, a flexible max-id model, which encompasses both asymptotic dependence and independence, is used to learn about the spatio-temporal variability of rainfall processes at extreme levels. We find that modelling non-stationarity only at the marginal level does not fully capture the variability of precipitation extremes, and that it is important to also capture the seasonal variation of extremal dependence.