Speakers: Jordan Richards (University of Edinburgh)

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Title: A deep learning approach to modelling joint environmental extremes

Abstract:
The geometric representation for multivariate extremes, where data is split into radial and angular components and the radial component is modelled conditionally on the angle, provides an exciting new approach to modelling environmental data. Through a consideration of scaled sample clouds and limit sets, it provides a flexible, semi-parametric model for extremes that connects multiple classical extremal dependence measures; these include the coefficients of tail dependence and asymptotic independence, and parameters of the conditional extremes framework. Although the geometric approach is becoming an increasingly popular modelling tool for environmental data, its inference is limited to a low dimensional setting ($d \leq 3$).
We propose here the first deep representation for geometric extremes. By leveraging the predictive power and computational scalability of neural networks, we construct asymptotically-justified yet flexible semi-parametric models for extremal dependence of high-dimensional data. We showcase the efficacy of our deep approach by modelling the complex extremal dependence between metocean variables sampled from the North Sea.