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Title: Estimation of Hidden Regular Variation Structures in Multivariate Extremes

Abstract: This talk introduces novel methodology for estimation of hidden regular variation, a phenomenon which often arises in the threshold exceedance approach to multivariate extreme value modeling based on the framework of regular variation on cones. Under this framework, a limiting measure arises which describes the dependence in the joint tail of the distribution. When hidden regular variation is present, this limiting measure is degenerate on some joint tail regions, and a modeling approach based on the limiting measure may break down. For example, such an approach is unable to distinguish asymptotic independence from exact independence in two dimensions. This work develops a representation of random vectors possessing hidden regular variation as the sum of independent regular varying components. We develop a likelihood-based estimation procedure from this representation via a version of the Monte Carlo expectation-maximization algorithm which has been modified for tail estimation. The methodology is applied to air pollution data from Leeds, UK. We demonstrate the improvement in tail risk estimates offered by the sum representation over approaches which ignore hidden regular variation in the data.

Future research directions in the realm of extreme-value modeling in climate and environmental problems will also be discussed.