

**University of California, Irvine
Statistics Seminar**

***Semiparametric Estimation of the Shape of the Limiting
Multivariate Point Cloud***

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6011 DBH**

We propose a model to flexibly estimate joint tail properties by exploiting the convergence of an appropriately scaled point cloud onto a compact limit set. Characteristics of the shape of the limit set correspond to key tail dependence properties. We directly model the shape of the limit set using Bezier splines, which allow flexible and parsimonious specification of shapes in two dimensions. We then fit the Bezier splines to data in pseudo-polar coordinates using Markov chain Monte Carlo, utilizing a limiting approximation to the conditional likelihood of the radii given angles. By imposing appropriate constraints on the parameters of the Bezier splines, we guarantee that each posterior sample is a valid limit set boundary, allowing direct posterior analysis of any quantity derived from the shape of the curve. Furthermore, we obtain interpretable inference on the asymptotic dependence class by using mixture priors with point masses on the corner of the unit box. Finally, we apply our model to bivariate datasets of extremes of variables related to fire risk and air pollution.