

A STUDY ON TAILS OF BIVARIATE DISTRIBUTIONS

Diego Canales & Steven Collazos

Abstract

There are disciplines that model some stochastic processes as heavy-tailed. Whether a distribution is heavy-tailed or not depends on the behavior of the tails of the distribution under consideration. Although tail behavior of statistical distributions in one dimension has been studied by several authors, distributions in higher dimensions have not been studied as much. In this paper, we explore the concept of heavy-tailedness in two dimensions by constructing bivariate distributions via copulas and linear transformations, projecting the data generated from such distributions to different axes, and observing the extreme spacings of the data projected onto these axes through the use of a test statistic. We observe that projections onto the principal components, which provide perhaps the most intuitive approach to studying the problem, do not always capture the tail behavior of the bivariate distributions we constructed, and we provide estimates for the probability for type I error and power of the test statistic we used for several bivariate distributions. Finally, we discuss our results and future possible approaches for studying this problem.