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Hybrid Pareto models for asymmetric fat-tailed data

Density estimators that can adapt for asymmetric heavy tails are required in many applications such as finance and insurance. We put forward a non-parametric density estimator that brings together the strengths of non-parametric density estimation and of Extreme Value Theory. A hybrid Pareto distribution that can be used in a mixture model is proposed to extend the generalized Pareto (GP) to the whole real axis. Experiments on simulated data show the following. On one hand, the mixture of hybrid Paretos converges faster in terms of log-likelihood and provides good estimates of the tail of the distributions when compared with other density estimators including the GP distribution. On the other hand, the mixture of hybrid Paretos offers an alternate way to estimate the tail index which is comparable to the one estimated with the standard GP methodology. The mixture of hybrids is also evaluated on the Danish fire insurance data set.