Covariate-varying threshold selection method in non-stationary generalized pareto model

ABSTRACT

Non-stationary data usually exist in real life and influenced by covariates. The non-stationary extremes are usually modelled by setting a constant high threshold, u, where the threshold exceedances are modelled by Generalized Pareto distribution (GP). Covariates model is incorporated to the GP parameters to account for non-stationarity. However, the threshold, u, may be high enough for GP approximation on certain covariates but not on others, which in this case may violate the asymptotic basis of the GP model. In this paper, a covariate-varying threshold selection method based on regression tree is suggested and applied on simulated non-stationary data sets. The regression tree will be used to partition data sets into stationary groups with similar covariate condition. Thus, a constant high threshold can be fixed within each group. The tree-based threshold exceedances can then be modelled by stationary GP which is a simpler model compared to the non-stationary GP. Simulation study is done to demonstrate and assess the performance of this method compared to the conventional method. The results show that the proposed method is a reasonable complement to the conventional method.