Title: Stochastical inference in the model of extreme events

Author: Jan Dienstbier

Department/Institute: Department of probability and mathematical statistics

Supervisor of the doctoral thesis: Doc. RNDr. Jan Picek, CSc.

Abstract: The thesis deals with extremal aspects of linear models. We provide a brief explanation of extreme value theory. The attention is then turned to linear models $\mathbf{Y}_{n\times 1} = \mathbf{X}_{n\times p}\boldsymbol{\beta}_{p\times 1} + \mathbf{E}_{n\times 1}$ with the errors $E_i \sim F, i = 1, \ldots, n$ fulfilling the domain of attraction condition. We examine the properties of the regression quantiles of Koenker and Basset (1978) under this setting we develop theory dealing with extremal characteristics of linear models. Our methods are based on an approximation of the regression quantile process for $\alpha \in [0, 1]$ expanding older results of Gutenbrunner et al. (1993). Our result holds in $[\alpha_n^*, 1 - \alpha_n^*]$ with a better rate of $\alpha_n^* \to 0$ than the other approximations described previously in the literature. Consecutively we provide an approximation of the tails of regression quantile. The approximations of the tails enable to develop theory of the smooth functionals, which are used to establish a new class of estimates of extreme value index. We prove $T(F_n^{-1}(1 - k_n t/n))$ is consistent and asymptotically normal estimate of extreme for any T member of the class. Various possible estimates of the empirical tail quantile functions are considered, discussed and illustrated on a simulation study.