My research highlights in 2013

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Abstract

This short note lists my scientific results in 2013. Two main research topics are addressed: High dimensional statistical learning and Extreme-value analysis.

1 High dimensional statistical learning

Copula provides a relevant tool to build multivariate probability laws, from fixed marginal distributions and required degree of dependence. From Sklar's Theorem, the dependence properties of a continuous multivariate distribution can be entirely summarized, independently of its margins, by a copula. I proposed a new family of multivariate copulas adapted to high-dimensional problems. The family is built from a one-factor model [1, 2]. The estimation is performed using a moments method.

Besides, I developped dimension reduction methods for high dimensional regression problems, see [3] for an application to the estimation of dominant physical parameters for leakage variability in 32nanometer CMOS. I also worked on the optimization of power consumption and user impact based on point process modeling of the request sequence. See [4] for an application to printers.

2 Extreme-value analysis

The decay of the survival function is driven by a real parameter called the extreme-value index. When this parameter is positive, the survival function is said to be heavy-tailed. I focused on the situation where a covariate is recorded simultaneously the variable of interest. In this case, the extreme-value index and the extreme quantile depend on the covariate [5, 6]. It may be the case in hydrology for instance, see [7] for an application to the study of extreme rainfalls. The estimation of extreme risk measures is addressed in [8, 9, 10, 11, 12].

When this parameter is negative, the survival function vanishes above its right end point. The

estimation of this endpoint is addressed in the conditional framework. It is referred to as frontier estimation which is investigated in [13, 14].

If this parameter is zero, then the survival function decreases to zero at an exponential rate. An important part of my work is dedicated to the study of such distributions [15]. For instance, in reliability, the distributions of interest are included in a semi-parametric family whose tails are decreasing exponentially fast. These so-called Weibull-tail distributions include Gaussian, gamma, exponential and Weibull distributions, among others.

The behaviour of the distribution tail can be precised using the so-called second-order parameter. The estimation of this parameter is addressed in [16, 17].

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