A review on quantile regression for stochastic computer experiments

In many domains, computer simulation models have gained more and more place for performance evaluation, decision making, quality control, ... In pharmacology, the performances of drugs may depend on genetic characters, age, sex and environmental interactions. In agronomy, the yield of a plant depends on the climate. To treat this kind of problem one may divided the input variable into two parts. The fist group could contains the uncontrollable variables mentioned above and includes it into an aleatory contribution. The other group could contains the controllable variables, for example the drug recipe or a plant variety.

In such systems the links between the input and the output may be too complex to be understand fully or to be formulated under a closed form. In this case, the problem is defined as a stochastic black box that could be formalized by an unknown function $f : \mathcal{X} \times \Omega \to \mathbb{R}$ with $\mathcal{X} \subset \mathbb{R}^d$ a compact space representing the controllable variables, and Ω the probability space representing the uncontrollable variables.

In this talk we focus our interest on the estimation of the conditional quantile of f. It is motivated by the fact that quantiles can provide a good interpretation of the distribution tails and it can be used in order to take risk aversion decisions.

Our ambition is to present a review of quantile regression methods under the classical constraints related to the stochastic black box framework. A special attention will be put on the performance of the methods and indications will be provided about which models using according to the characteristics of the problem.