Methodologies for sensitivity analysis of model output when input parameters are defined on non-rectangular domains

Stefano Tarantola

Joint Research Centre - European Commission, Econometrics and Applied Statistics, Ispra, Italy
(stefano.tarantola@jrc.ec.europa.eu)

I introduce the problem of estimating sensitivity indices when the input parameters are defined over non-rectangular domains, i.e. when they are dependent. Dependency could be due to constraints between inputs. For example, the sum of two uniformly distributed inputs in the unit interval cannot be greater than 1, leading to a triangular domain. This situation can often occur in practical problems. I present three approaches that can be used to challenge the problem of estimating sensitivity indices for dependent input. One applies the definition as such, and is called brute-force, the second is based on sampling from conditional distributions, and the third is based on the Rosenblatt transformation to convert the non-rectangular domain into a rectangular one. I discuss the properties of those methods and the complexity of the respective estimation process. I investigate the efficiency of the different methods by using different sampling strategies. This will be done by studying the convergence properties of the different sampling strategies at increasing sample size. I will show the techniques in operation on a number of analytical test cases.