11th International Conference on Sensitivity Analysis of Model Output, April 23–25 2025, Grenoble, France

A new paradigm for global sensitivity analysis

Gildas Mazo
Université Paris-Saclay, INRAE, MaIAGE, 78350, Jouy-en-Josas, France

Current theory of global sensitivity analysis, based on a nonlinear functional ANOVA decomposition of the random output, is limited in scope—for instance, the analysis is limited to the output's variance and the inputs have to be mutually independent—and leads to sensitivity indices the interpretation of which is not fully clear, especially interaction effects. Alternatively, sensitivity indices built for arbitrary user-defined importance measures have been proposed but a theory to define interactions in a systematic fashion and/or establish a decomposition of the total importance measure is still missing. It is shown that these important problems are solved all at once by adopting a new paradigm. By partitioning the inputs into those causing the change in the output and those which do not, arbitrary user-defined variability measures are identified with the outcomes of a factorial experiment at two levels, leading to all factorial effects without assuming any functional decomposition. To link various well-known sensitivity indices of the literature (Sobol indices and Shapley effects), weighted factorial effects are studied and utilized.

[Gildas Mazo; Université Paris-Saclay, INRAE, MaIAGE, 78350, Jouy-en-Josas, France]
[`gildas.mazo@inrae.fr` – `http://genome.jouy.inra.fr/~gmazo/`]