Sensitivity analysis of pollutant concentration maps

Noé Fellmann*[1,2], Céline Helbert[1], Christophette Blanchet[1], Adrien Spagnol[3], and Delphine Sinoquet[4]

[1]Ecole Centrale de Lyon – Ecole Centrale de Lyon, École Centrale de Lyon – France
[2]IFP Energies Nouvelles – IFP Energies Nouvelles, IFP Energies Nouvelles – France
[3]IFP Energies Nouvelles – IFP Energies Nouvelles, Solaize, France – France
[4]IFP Energies Nouvelles – IFP Energies Nouvelles, IFP Energies Nouvelles – France

Résumé

In the context of air quality control, we are interested in measuring the influence of uncertain inputs on maps of pollutant dispersion. Through sensitivity analysis methods, we aim at quantifying the influence of five inputs of a meta-model of the pollutant concentration maps in the urban area of Issy-Les-Moulineaux (5). However, most sensitivity analysis methods deal with scalar or
vectorial outputs. A map-valued output space makes the adaptation of classical sensitivity analysis methods nontrivial. Two approaches are proposed. A first one is pointwise. It consists in computing Sobol indices at each position of the maps to obtain Sobol indices maps. Aggregated Sobol indices are also computed (3). A second one consists in seeing the maps as sets and proposes to carry out sensitivity analysis of set-valued output. Three different types of sensitivity indices are proposed. The first ones use kernel-based sensitivity indices adapted to sets (1). The second ones are inspired from Sobol indices but are adapted
to sets relying on random sets theory (4). The last ones adapt universal indices which are initially defined for general metric output space (2). (1) Noé Fellmann, Christophette Blanchet-Scalliet, Céline Helbert, Adrien Spagnol et Delphine Sinoquet. Kernel-based sensitivity analysis for (excursion) sets. 2023. arXiv : 2305.09268 (math.ST).
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*Intervenant