Contribution ID: **84** Type: **not specified**

Sensitivity Analysis in the Presence of Hierarchical Variables

Tuesday, 12 September 2023 10:00 (20 minutes)

In the context of sensitivity analysis, the main objective is to assess the influence of various input variables on a given output of interest, and if possible to rank the influential inputs according to their relative importance. In many industrial applications, it can occur that the input variables present a certain type of hierarchical dependence structure. For instance, depending on some architectural choices (e.g., combustion or electric motor technology), which can be seen as parents variables, some of the children variables (e.g., engine battery weight) may or may not have an effect on the output of interest. When dealing with given-data sensitivity analysis, this may result in missing tabular data, as the inactive children variables may not make physical sense, or may not be measurable (e.g., number of pistons for an electric motor). In this work, we focus on a hierarchical and functional type of relation between the inputs for the purpose of performing sensitivity analysis. The aim of this work is to propose an adaptation of existing sensitivity indices to accurately quantify the influence of all inputs on the output while taking into consideration their hierarchical dependencies. An adaptation of Sobol'sensitivity indices is studied and two given-data estimators are suggested. The theoretical analysis and numerical tests on different toy-cases, as well as on a real-world industrial data set, show promising results in terms of interpretability, but also highlight some limitations regarding the indices estimation with limited amounts of data and in the presence of statistical dependence between inputs.

Keywords

Sensitivity analysis, hierarchical variables, Sobol' indices

Classification

Mainly methodology

Primary authors: PELAMATTI, Julien (EDF R&D); Dr CHABRIDON, Vincent (EDF R&D)

Presenter: PELAMATTI, Julien (EDF R&D)

Session Classification: CONTRIBUTED Interpretable models

Track Classification: Interpretable models