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Noise-adjusted higher-order sensitivity indices of final repository models

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Sensitivity analysis is a very useful tool for quantifying uncertainties of final repository models by finding important parameters on the basis of, e.g., variance-based sensitivity indices. The two key indices are the first-order index (SI1) and the total-order index (SIT). SI1 refers to the individual impact (or main effect) of a parameter on the model while SIT represents the total effect of the parameter on the output, taking into account its main effect as well as interactions of any order with other parameters. The second-order sensitivity indices (SI2) describe the model sensitivity to the coupled influences of two parameters. The sensitivity indices can efficiently be estimated from a metamodel built by a RS-HDMR (Random-Sampling High Dimensional Model Representation) approach from the original model. However, this approach requires appropriate selection of two coefficients of maximal polynomial orders for the approximation of a representative metamodel. Inappropriate choice of these coefficients, especially in analysis with many parameters, may induce numerical noise upon the higher order indices with low significance. Initial results indicate that the noise upon SI2 and SIT with low significance can be considerably reduced by debiasing these indices. This allows finding appropriate coefficients for the metamodel from the sum over all SI2 instead of analysing the indices for each parameter combination. Some results obtained for final repository models will be shown in the presentation.

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