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Data-driven metamodelling in Global Sensitivity Analysis

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Computer simulations of natural and physical systems are subject to various sources of uncertainty necessitating the facilitation of uncertainty quantification and sensitivity analysis methods in the development of mathematical models. As complexity of mathematical models grows, non-intrusive methods draw the attention for identification and characterisation of uncertainties in model outputs. In this setting, Global Sensitivity Analysis (GSA) enables a holistic approach to apportioning output uncertainty to uncertain model inputs. The advantage of GSA over previous local sensitivity analysis methods is the computation of sensitivity indices for wider classes of mathematical models considering nonlinear statistical and structural dependencies among inputs and outputs [1]. However, GSA requires the estimation of conditional variances based on Monte Carlo simulations, which might be computationally prohibitive for physical models of high complexity. Addressing this issue, metamodel-based GSA methods have been developed to utilise data-driven models as surrogate response surfaces that accelerate GSA [2]. The authors aim to incorporate recent advances in machine learning for system identification and model reduction with implications for the computational efficiency of GSA.

References:

1. Iooss, B. and Lemaître, P. (2014) 'A review on global sensitivity analysis methods', *Uncertainty management in Simulation-Optimization of Complex Systems: Algorithms and Applications*, 30, p. 23. doi: 10.1007/978-1-4899-7547-8_5.

2. Gratiet, L. Le, Marelli, S. and Sudret, B. (2016) 'Metamodel-Based Sensitivity Analysis: Polynomial Chaos Expansions and Gaussian Processes', in Ghanem, R., Higdon, D., and Owhadi, H. (eds) *Handbook of Uncertainty Quantification.* Cham: Springer International Publishing, pp. 1–37. doi: 10.1007/978-3-319-11259-6_38-1.

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