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NUMERICAL METHODS AND THEORETICAL ADVANCES IN UNCERTAINTY QUANTIFICATION TRACK NUMBER 800

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ABSTRACT

The study and modeling of complex systems in the presence of uncertainty has become a central issue in most engineering applications. Such systems are typically governed by differential equations depending on parameters which are generally assumed to be random variables. This allows to take into account either the lack of knowledge on their precise values, or their intrinsic aleatoric nature [1]. Propagating these uncertainties on output quantities of interest is a challenging task in realistic contexts, where the computational cost of the resolution of the underlying equations may be very demanding, even for a single realization of the vector of random parameters. Tackling such problems requires advanced tools and methodologies at the interface of stochastic analysis, statistical modeling and scientific computing [2].

The aim of this minisymposium will be to gather international experts in the development and theoretical analysis of innovative numerical methods for uncertainty quantification in engineering problems. We wish to specifically address the following bottlenecks: data-driven construction of stochastic models, high-dimensionality of the parameter space, uncertainty propagation and sensitivity analysis in complex coupled systems, design of accurate reduced-ordered models, rare events and Monte-Carlo methods in reliability, applications for industrial test cases. A particular attention will be drawn to contributions dealing with the theoretical understanding and justification of numerical methods, as well as quantitative error estimation through validation and verification procedures.

REFERENCES

[1] T. J. Sullivan, *Introduction to uncertainty quantification*. Springer, 2015.

[2] R. Ghanem, D. Higdon and H. Owhadi, *Handbook of uncertainty quantification*. Springer, 2017.

[3] E. de Rocquigny, N. Devictor and S. Tarantola, *Uncertainty in industrial practice*. Wiley, 2008.