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EDITORIAL

Preface: Special Issue on Model Reduction

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This special issue of *Journal of Scientific Computing* contains invited and peer-reviewed manuscripts after one of the workshops of the special semester on Numerical Methods for Partial Differential Equations (PDEs) at the *Henri Poincaré Institute* in Paris in fall 2016.

Numerical Analysis applied to the approximate resolution of Partial Differential Equations (PDEs) has become a key discipline in Applied Mathematics. One of the reasons for this success is that the wide availability of high-performance computational resources and the increase in the predictive capabilities of the models have significantly expanded the range of possibilities offered by numerical modeling. Novel discretization methods, the solution of ill-posed and nonlinear problems, model reduction and adaptivity have been the leading topics of the special semester.

This issue covers the topics of the second special semester workshop on *recent development in numerical methods for model reduction* (November 2016). More info: http://www.ihp.fr/en/CEB/T3-2016/workshop2.

This special issue contains seven selected contributions: *M. Gunzburger* et al. introduce an improved discrete least-squares/reduced-basis method for parameterized stochastic elliptic PDEs; *L. Venturi* et al. study a weighted Proper Orthogonal Decomposition (POD) approach for the same parametric elliptic PDEs with random inputs; *F. Bachmann* et al. propose an efficient POD-based mixed-integer optimal control of the heat equation with a posteriori error bounds; *F. Pichi* et al. present a reduced basis approaches for multi-parametric bifurcation problems held by non-linear *Von Kármán* equations in structural mechanics; *B. Maboudi Afkham* et al. move to structure-preserving model reduction dealing with dissipative Hamiltonian systems representing an electric circuit; *J. V. Aguado* et al. deal with a low rank tensor representation of non-linear models using cross approximations by allowing compact storage and efficient manipulation of multi-dimensional data; then, *K. Kergrene* et al. present a goal-oriented version of the Proper Generalized Decomposition (PGD) method.

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The topics contained in this special issue in model reduction are quite wide and they well represent the efforts of the model reduction community to face more and more complex problems and reach the capability to deal with real world problems, but at the same time they provide a strong methodological innovative contribution in scientific computing and in the numerical analysis of PDEs.

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Tony Lelièvre, Simona Perotto, Gianluigi Rozza,
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