Randomized model order reduction

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During the last decades (numerical) simulations based on partial differential equations have considerably gained importance in engineering applications, life sciences, environmental issues, and finance. However, especially when multiple simulation requests or a real-time simulation response are desired, standard methods such as finite elements are prohibitive. Model order reduction approaches have been developed to tackle such situations. Here, the key concept is to prepare a problem-adapted low-dimensional subspace of the high-dimensional discretization space in a possibly expensive offline stage to realize a fast simulation response by Galerkin projection on that low-dimensional space in the subsequent online stage.

In this talk we show how randomized methods that have been developed in the context of large-scale data analytics can be exploited both for constructing reduced order models and deriving bounds for the approximation error. We also demonstrate those techniques for the generation of local reduced approximation spaces that can be used within domain decomposition or multiscale methods.

Biography:
Kathrin Smetana is Assistant Professor at the Department of Applied Mathematics at the University of Twente. Prior to that appointment she worked as a postdoctoral associate in the Group of Prof. Dr. Mario Ohlberger in the Department of Applied Mathematics at the University of Münster, Germany and in the Group of Prof. Dr. Anthony T. Patera in the Department of Mechanical Engineering at the Massachusetts Institute of Technology, United States. Smetana holds a PhD in Mathematics from the University of Münster. The main focus of her research is model reduction for partial differential equations and randomized algorithms for numerical simulations.