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Talk announcement

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Reduced Basis Method for Heat Transfer in Electric Machine Simulation

In this talk we propose the Reduced Basis Method (RB) for the transient heat transfer equation. The Reduced Basis Method is especially useful for multi-query operations such as temperature control, parameter studies, and optimization problems. After a brief introduction to the main components and steps of the RB method in the elliptic case, we will highlight the differences for the parabolic setting. We will start by setting up the Galerkin high-fidelity model with an implicit time discretization scheme, check that parameter separability is satisfied, and solve the high-fidelity system to take snapshots. To construct the reduced basis elements, we use the Proper Orthogonal Decomposition (POD) algorithm, which performs a (randomized) singular value decomposition. The output matrix of the POD is used to project all matrices and vectors from the high-fidelity system into a low dimensional space. This leads us to the reduced problem, which can be solved very fast. As numerical tests, we will derive the reduced basis solution for two different experiments conducted with a squirrel cage induction machine located at TU Graz and compare the results with temperature measurements. The first experiment will be a cooling process. In the second experiment, the stator windings are energized by DC current, resulting in Joule heating but no rotation of the machine.