Acceleration of industrial computations using Dictionaries of Reduced-Order Models

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In an industrial group like Safran, the numerical simulation of physical phenomena is used in the majority of design processes. Physical reduced-order modeling aims to replace the costly reference high-fidelity solver, by a reduced-order model for which we want to control the speedup/accuracy trade-off. Contrary to most black-box meta-models, we keep the knowledge of the underlying physical model by projecting the continuous model equations on a reduced-order space. In this talk, we present recent contributions in a class of nonlinear reduced-order called ROM-nets, involving a piecewise linear approximation of the solution manifold, and carefully designed clustering and classification tasks on this manifold. This enables the construction of a dictionary of reduced-order models, with automatic model selection. The framework is applied to an uncertainty quantification study on an industrial high-pressure turbine blade.

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