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ADVANCED MODEL ORDER REDUCTION TECHNIQUES FOR COMPUTATIONAL FLUID DYNAMICS

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MINISYMPOSIUM

The aim of Model Order Reduction (ROM) is to efficiently simulate phenomena using a reduced computational framework, while retaining the high accuracy of standard discretization techniques. By extracting key knowledge from precomputed solutions (snapshots), ROM enables low-dimensional representations, reducing computational costs for parametric simulations in many-query scenarios.

This minisymposium focuses on presenting the latest advancements and insights in ROM strategies, with a specific emphasis on fluid dynamics. The objective is to identify the state of the art, address existing challenges, and explore future perspectives in the field.

The topics covered will include methodological developments in numerical analysis and model order reduction, with a strong focus on mathematical modeling and efficient approximations. Additionally, various applications such as inverse problems, optimal flow control, shape optimization, bifurcating phenomena, and uncertainty quantification will be discussed. The presentations will also touch upon advances in dealing with complex physical systems in multi-physics contexts, fluid-structure interaction, and more general coupled phenomena.

Tackling such complex applications led to a growing interest of the ROM community into novel methodologies based on non-intrusive (also called data-driven) approaches. Given the rise of machine learning enhanced reduced models, we also aim at connecting with researchers bringing new perspectives on efficient methodologies for computational fluid dynamics simulations.

The goal of this minisymposium is to foster idea exchange and encourage fruitful discussions across a wide range of academic, industrial, medical, and environmental applications. By bridging the gap between high-performance computing, advanced reduced order modeling and real-time computing, we aim at bringing together researchers actively involved in the development of novel reduced strategies in computational fluid dynamics to stimulate interactions and potential collaborations.