

Seminari di Matematica

Nell'ambito delle attività di ricerca coordinate dal Prof. Luciano Lopez,

il Prof. Paolo Zunino

Dipartimento di Matematica e del MOX del Politecnico di Milano

terrà presso il Dipartimento di Matematica
dell'Università degli Studi di Bari Aldo Moro,
la seguente conferenza:

“On linear model order reduction for problems
with microstructure using mesh informed neural networks”

il 17 Luglio 2023 alle ore 15:00 in aula III

Abstract: Several applications in computational physics require the numerical approximation of problems with microstructure, characterized by the presence of multiple spatial scales in the definition of their data. The need to capture very fine details to properly account for those data involving the smaller scales usually makes the solution of these problems computationally expensive, and even not affordable in case of repeated queries for multiple values of input parameters, when these latter represent features of, e.g., operator coefficients and/or forcing/source terms at different scales. For the general case of second-order elliptic PDEs approximated by the finite element method, a well accepted prototype for important families of engineering applications in, e.g., mass/heat transfer and solid mechanics, we show that classical projection-based reduced order models (ROMs) exploiting linear sub-manifolds of the solution space might entail several drawbacks. Hence, we propose alternative ROMs that leverage on linear subspaces generated through classical proper orthogonal decomposition (POD) with mesh-informed neural networks (NNs) to approximate the ROM degrees of freedom non-intrusively, and properly accounting for the spatial dependence of the input parameter fields. A subsequent correction obtained through a NN-based closure model further enhances the approximation, taking into account the effect of the microscale. We apply this approach to the approximation of a real-life problem in the context of transport phenomena, modeling the effect on microcirculation on the tissue microenvironment.

La S.V. è cordialmente invitata a partecipare.

Bari, 14.07.2023

F.to Prof.ssa Anna Maria Candela