Call for application for research scholarships

for post-graduate international candidates

RESEARCH PROJECT N. 61

Title

Compact modeling of complex and multiphysics dynamical systems

Scientific responsible (name, surname, role)

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Short description of the research activity (max 250 words)

This research activity aims at developing novel algorithms for the automated generation of compact (reduced-order) models of complex dynamical (possibly multiphysics) systems. The demand for such compact (simple yet accurate) models is dramatically increasing in several cross-disciplinary application areas, due to the requirement of performing fast numerical simulations during design flows in practically all fields of engineering.

Both data-driven (starting from measurements) and projection/truncation-based (starting from first-principle or field formulations) approaches will be considered for model extraction. Also, various multidisciplinary application areas will be covered, including electronics and telecommunications, energy, thermal, mechanical, acoustic and coupled multiphysics problems. Specific modeling tasks will be developed in collaboration with prominent companies that are active in the respective application fields.

Specific emphasis will be on systems whose response depends on external parameters (geometrical, material, ambient, bias conditions,…), whose explicit dependence must be included in some approximate closed-form in the models. This parameterization in turns enables design and optimization flows based entirely on the compact models, leading to robust and reliable designs. The main challenge in this parameterized modeling setting is the possibly high-dimensional nature of the parameter space, which will require specialized techniques for data and model compression, including high-order tensor description, storage, handling, complemented by low-rank and hierarchical approximations, thus drawing ideas from and providing contributions to the broad field of “big data”.

Specific requirements (experiences, skills)

Preferably: a solid background in electrical/electronic engineering; well-developed skill in both analytical and numerical math; proficiency in Matlab/Octave or other high-level scientific software.

Website of the research group (if any)

www.emc.polito.it

Keywords (min 3, max 6)

Compact dynamical modeling, Model Order Reduction, Approximation, Circuit equivalents, Parameterized systems.

Research Area (max 1)

Electronics, Control and Telecommunication Engineering