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HPC SIMULATIONS AND AI FOR THE WIDE INDUSTRIAL REALM

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ABSTRACT

Supercomputers have made available to researchers an unprecedented amount of computing power. But "power without grip" is useless: the availability of thousands of processors to compute must be accompanied with a steep evolution in software development based on High-Performance Computing (HPC) techniques, to open a completely new way of facing the most complex simulation problems of Computational Physics and Engineering. Especially in technology niches such as in industrial, energy, environmental or biomechanical applications, treatment of complicated or coupled phenomena of fluid and solid motions, which require a huge amount of computing resources, pose extreme challenges. Another benefit of the availability enormous HPC resources is the ability to generate big data through simulations. In recent years, using neural networks, attempts have been made to speed up calculations using surrogate models and reduced models, to reconstruct flow fields from incomplete information, and to explore design spaces using reinforcement learning.

Thus, the objective of this Mini-Symposium is to communicate and discuss issues and perspectives of HPC simulation and/or AI techniques, targeting industrial applications, which cover fields, such as bio, automotive, aerospace, pharmacology, energy, environmental, etc. The expected topics should include algorithms, simulation strategies, and programming techniques for the kind of complex simulations of fluid/solid phenomena (usually including coupled multiphysics) requiring massively HPC environments to solve. Parallel issues, such as the robustness and performance analysis, and introduction of pre- and post-processing techniques, e.g., CAD integration, mesh generation, or visualization are also welcome.