First International Conference on Emerging Technologies in Computational Science for Industry, Sustainability and Innovation – M2P 2023
May 30th - June 1st , 2023, Taormina, Italy

MATHEMATICAL SOFTWARE FOR COMPUTATIONAL AND DATA SCIENCE AT EXTREME SCALES

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ABSTRACT

Industrial competition and societal challenges, the wide diffusion of artificial intelligence, and the huge computational needs of leading-edge scientific research are driving rapid changes and advancements in High-Performance Computing. Computational nodes are becoming increasingly more powerful, featuring a large number of heterogeneous physical cores and accelerators. This high complexity leaves legacy software unable to make efficient use of the increased processing power and developing a new generation of application codes able to run at scale on the new hardware platforms is a critical challenge for scientific computing.

Mathematical software libraries provide a large resource for high-quality, reusable software components upon which applications can be rapidly constructed. They are building blocks for solving main mathematical problems, including radically new algorithms and methods at a low level, that domain scientists can transparently reuse in form of basic components with very little need of specific mathematical and computer science expertise.

This session is intended to bring together applied mathematicians, computer scientists, and computational scientists from different areas, in order to discuss recent challenges in developing open-source high-quality software for Computational and Data Science at a very large scale. Topics include, but are not limited to:

- new algorithms for sustained performance, scalability, resilience, and power efficiency on hybrid architectures;
- leading-edge programming models and tools for mathematical software on heterogeneous platforms;
- challenges and successes in developing scientific and industrial applications for HPC at extreme scales.