NUMTA 2026 Special Session on

High-Performance Computing in Modelling and Simulation

(NUMTA2026–HPCMS)

Special Session Organizers:

- William Spataro – University of Calabria, Italy, email: william.spataro (at) unical.it
- Alessio De Rango – University of Calabria, Italy
- Rocco Rongo – University of Calabria, Italy
- Andrea Giordano – ICAR-CNR, Italy

The creation of models that enable computers to simulate the behaviour and evolution of both artificial and natural systems is fundamental to progress in scientific and engineering fields. Over recent decades, increasing computational capabilities have significantly broadened the reach of these methodologies, supporting their use in research, industry, and the quantitative study of complex phenomena. This growth has encouraged wide adoption of numerical methods for solving differential equation systems (e.g., FEM, FDM, PIC) as well as the investigation of alternative computational paradigms such as Cellular Automata, Genetic Algorithms, Neural Networks, and Swarm Intelligence. These complementary strategies have shown particular promise when traditional simulation techniques face spatial or temporal constraints, opening new avenues for modelling complex processes. The HPCMS Workshop at NUMTA provides a forum for a multidisciplinary community of scholars, researchers, developers, educators, practitioners, and experts from leading universities, institutions, agencies, and companies engaged in Computational Science. Its goal is to facilitate the exchange of insights on emerging trends, key challenges, and state-of-the-art advances in high-performance computing and computational problem-solving, with applications across engineering, physics, chemistry, biology, geology, medicine, ecology, sociology, traffic control, economics, and more.

Topics of interest include, but are not limited to:

- High Performance Computing in computational science: intra-disciplinary and multi-disciplinary research applications
- Complex systems modelling and simulation
- Implementations of Cellular Automata, Genetic Algorithms, Neural Networks, and Swarm Intelligence
- Integrated approaches to optimization and simulation
- MPI, OpenMP, SYCL, and CUDA applications in Computational Science
- Optimization algorithms and modelling techniques related to optimization in Computational Science
- High-performance software designed to address scientific (e.g., biological, physical, social), engineering, medical, and humanities problems
- Performance models and their integration into the design of efficient parallel algorithms for heterogeneous platforms
- Hardware approaches to high-performance computing in modelling and simulation (e.g., FPGAs, neuromorphic computing, etc.)
- HPC applications in Quantum Computing (e.g., optimization and scheduling, simulation, etc.)