Computational Science and Engineering
A Radical Epistemic Rupture

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Computational science and engineering result for the convergence of the following three powerful investigation and knowledge engines. These are new sets of conceptual and practical instruments for stating, formalizing and solving problems, which dramatically amplified our means for understanding and acting in the world:

- Computational models, simulation, and high performance computing;

- Sensing, instrumentation, imaging, swarms of communicating sensors;

- Processing, visualization and storage of massive data, from sensors and simulations, together with search, mining, and machine learning techniques to integrate signals into meaningful data, then into new knowledge.

The convergence of these three investigation engines, their exceptional capabilities of integration, of composition from elementary components into complex models and systems, of networking and dissemination at scales undreamed of until now have revolutionized all fields of knowledge and engineering. These approaches are deeply changing the epistemic foundations as well as the conceptual and practical apparatus of scientists and engineers. They allow to observe, experiment widely in-silico, acquire, visualize and process massive data, to represent and abstract these observations into meaningful relations and models, to prototype virtually, design artifacts and make decisions. The talk presents this three ingredients of computational science and engineering and illustrates their impacts and new perspectives.