

INSTITUT DE CALCUL INTENSIF

A High Performance Computing Research Institute
Nantes, Pays de la Loire / France

Democratising High Performance Computing



Centrale
Nantes

Massively
PARALLEL
COMPUTING

ANISOTROPIC
Multiphase
CFD & MESH
ADAPTATIVITY

COMPUTATIONAL
Urban Composites
Bio Processing Physics
Engineering **Rheology**

DATA
BASED
ENGINEERING

Advanced
Model Order
REDUCTION

The Institut de Calcul Intensif (ICI) is an HPC Research Institute established at Centrale Nantes in January 2015, awarded with the Pays de la Loire ConnecTalent Project Call. It associates a high performance computing research laboratory and supercomputing facilities. The objectives of this project are related with the democratization of the numerical tools for massively parallel computing for a wide range of applications and challenges.

RESEARCH FIELDS

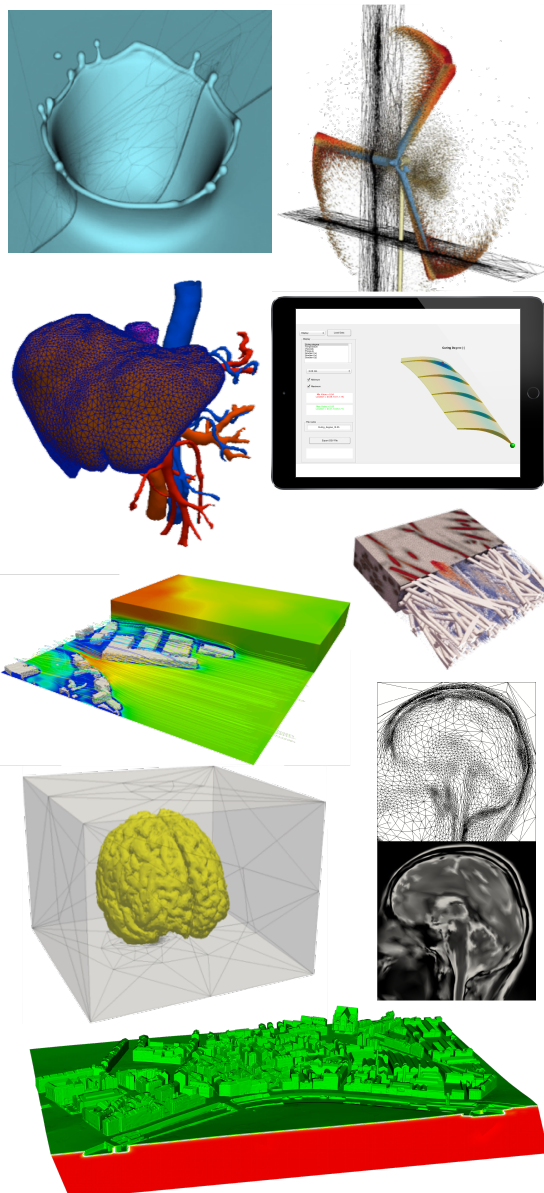
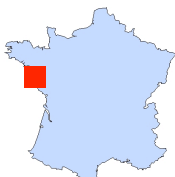
ICI promotes scientific advances and technological innovations through advanced computational modelling, simulation and visualisation methods and tools.

- **Supercomputing and Innovative Parallel Methods:** *innovative and massively parallel* numerical techniques for multiphase computational fluid dynamics, such as anisotropic mesh adaptation (theory and applications) and its coupling with immersed volume methods; imaging, with automatic reconstruction of numerical models from 3D images, offline and online computations.
- **Advanced Modelling & Numerical Methods for Engineering:** *Advanced Model Order Reduction* methods for real time simulation, optimization, inverse analysis, control, uncertainty quantification and real time decision making in computational physics and engineering; *Data based engineering science and technology* for material, processes, structures and systems: monitoring, times series and images analysis. Data-driven, data-mining, machine and manifold learning and BigData. An ESI Group chair is endorsed to these research activities.
- **Engineering Applications:** *Multiscale Computational Composites Processing and Rheology*, from the flowing microstructures and flows in microstructures in suspensions or nanocomposites, to process simulators applied to RTM, SMC, compression, etc. by developing homogenization and upscaling techniques; *Bio-engineering and Bio-physics*, computational surgery for real time simulators, computational anatomy and statistical shape analysis for patient specific treatment; Urban modeling and simulation and Building Physics.

SERVICES

- **Computational Vademecums** (parametric solutions) & **Simulation Apps** development is a unique expertise of the ICI-Lab.
- **ICI-Tech** offers a massively parallel framework for scientific high performance computing: massively parallel adaptive APIs and higher order finite elements and meshing, industrial, academic and teaching software applications.
- **ICI SuperComputing Centre** is the 3rd french fastest Tier2 class machine as a regional supercomputing facilities, hosting an efficient BULLx DLC Parallel Scalar Supercomputer running 6384 nodes with a 280 Tflop/s peak performance.

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