Helmholtz Portfolio Theme SMHB Supercomputing and Modeling for the Human Brain

JARA Jülich Aachen Research Alliance

Member of the Bernstein Network Computational Neuroscience

JÜLICH Forschungszentrum | JÜLICH SUPERCOMPUTING CENTRE

SIMLAB NEUROSCIENCE

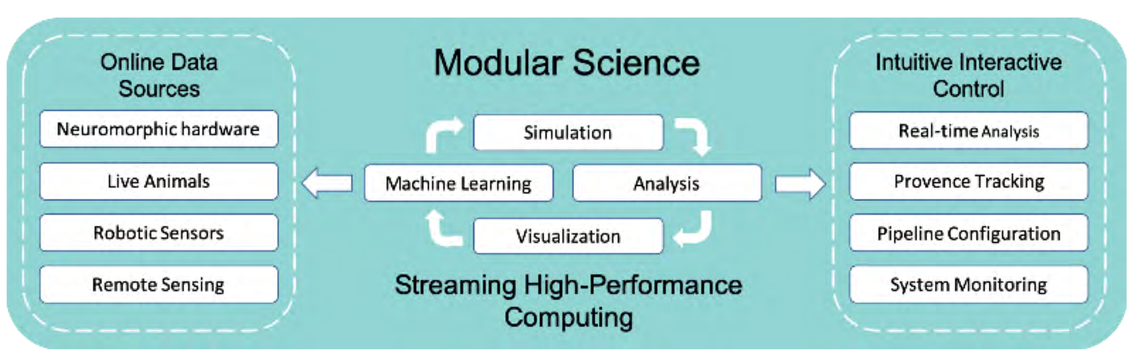
BRIDGING NEUROSCIENCE AND HPC

SimLab Neuroscience is an interdisciplinary team of scientists and engineers which:

- Serves the neuroscience community by providing high-level, community-oriented support to use HPC and data resources
- Carries out in-house research and development of data analytics and simulation technologies
- Ports and optimizes user codes for supercomputers
- Supports the preparation of computing time proposals and preparatory access
- Offers tutorials, courses and workshops

Simulation Engineering & Science

- Arbor: multi-compartment models of neural networks
- NEST: spiking point-neuron simulator (tools and support)
- The Virtual Brain for HPC: neural mass models
- Learning to Learn: machine learning and parameter optimization tool for neuroscience simulations on HPC
- Advanced Computing Architectures: pilot project for long-term initiative to specify a future Neuromorphic Computing Architecture
- Modular Science: co-simulator framework

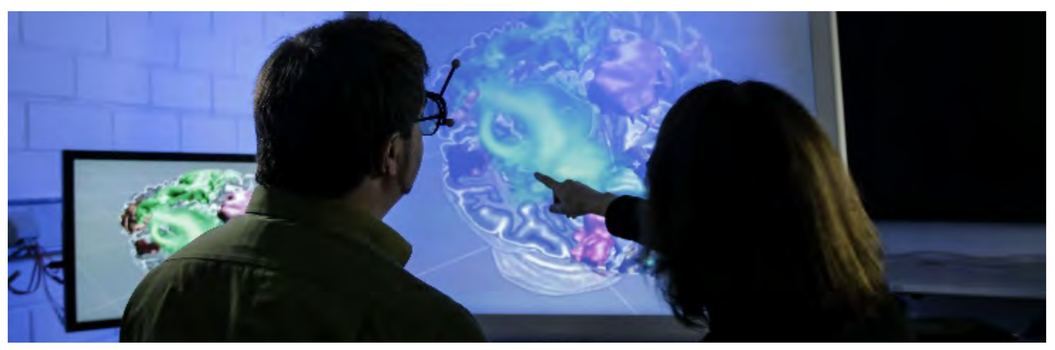


Neuroimaging Pipeline

- High-performance image processing on supercomputers
- Optimization of neuroimaging pipelines for HPC
- Machine learning and deep learning for neuroscience
- Structure tensor analysis and quality control tools for 3D-polarized light imaging

Visualization & Analysis

- Visual connectivity generation
- Optimization of analysis tools for HPC
- Interactive steering and visualization of simulations
- Interactive graph analysis and visualization



Infrastructure Development

- Requirements specification, validation and user support for the Human Brain Project research infrastructure

Supporting Software

- Data and workflow management support
- Software refactoring
- Software installation and maintenance on HPC systems
- Porting and support for evolving HPC architectures, Graphics Processing Units (GPUs) and accelerators

External Collaboration Partners

AMU (FR), Athena RIC (GR), BSC (ES), BU Wuppertal (D), CEA (FR), Charité (D), Cineca (IT), CNR (IT), CNRS (FR), DLR (D), EBRAINS (BE), EPFL (CH), ETHZ/CSCS (CH), FH Bielefeld (D), FT (DK), FU Hagen (D), KTH (SE), NMBU (NO), RWTH Aachen (D), TU Darmstadt (D), TU Graz (AT), TU München (D), UC San Diego (US), U Heidelberg (D), U Manchester (UK), UNIPV (IT), U Oslo (NO), UPM (ES), URJC (ES), U Trier (D)

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