Simulation from single cells to whole hearts

openCARP brings modeling, scalable computation and reproducible experiments into one community-driven environment

Cardiac electrophysiology across scales

FEATURES & SCOPE

One platform, many scales

Model cardiac electrophysiology from isolated cells to organ-scale excitation—and choose the fidelity the question demands.

Single cells & ionic models

bench, EasyML/limpet, CellML exchange and populations of models

Tissue & organ electrophysiology

Monodomain and bidomain propagation, heterogeneity and stimulation

Fast activation models

Eikonal, reaction-eikonal and DREAM for pacing and reentry

Cell-by-cell physics

EMI explicitly resolves cells and membranes where microstructure matters

Signals, mapping & analysis

ECGs/electrograms, LAT and APD maps, reentry protocols and sweeps

Reproducible and scalable

carputils experiment bundles; MPI and GPU execution from laptop to HPC

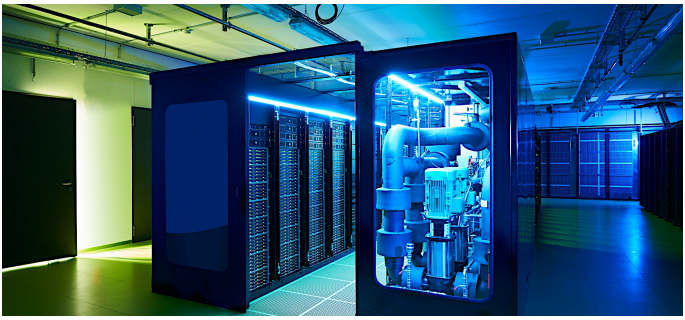
Focused on research and education

openCARP is not a medical device, image-segmentation suite or fluid-dynamics solver. Source code is public and academic use is free.

MICROCARD CONTRIBUTIONS

Making cell-by-cell simulation practical

MICROCARD combines cardiac modeling, numerical methods and HPC to strengthen openCARP for exascale research.



EMI cell-by-cell model

Explicit extracellular, membrane and intracellular domains

Mesh generation & remeshing

Workflows for detailed and evolving cellular geometries

Tailored numerical schemes

Ginkgo numerical backend designed for scalable cardiac EP on heterogeneous hardware

Heterogeneous acceleration

GPU support and MLIR-generated kernels for modern hardware

Robust, reproducible workflows

CI/CD, installation, benchmarking, asynchronous output, resilience and experiment bundling

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COMMUNITY

Built by—and for—researchers

Start with guided material, ask questions, share reproducible work or contribute directly to the codebase.

Learn

Hosted Jupyter onboarding, examples, videos and documentation

Connect

Question & Answer forum, LinkedIn, newsletter and regular user meetings, global community

Share

Community experiments and curated modeling resources

Contribute

Issue tracker, public source code, contributor agreement and developer meetings

opencarp.org/community

LinkedIn

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