Gert-Jan Both

ML Researcher | Physics-based AI | Biomechanical Foundation Models

I build AI systems and scientific software at the intersection of physics, biology, and ML. My work focuses on biomechanical foundation models for inferring neural activity across the Drosophila connectome, and physics-based reconstruction pipelines for X-ray nano-holotomography. I build my tools in close collaboration with experimentalists; they frequently end up as open-source software.

Contact

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🐙 GitHub: GJBoth

Skills

- JAX & PyTorch
- Reinforcement Learning
- Differentiable Programming
- MuJoCo / MJX
- GPU Computing
- Inverse Problems

Languages

Dutch - Native

English - Native

French - Fluent

Work Experience

ML Researcher II

Feb 2024 - Present

Turaga Lab, HHMI Janelia Research Campus — Ashburn, VA

- Building biomechanical foundation models for inferring neural activity across the Drosophila connectome, combining large-scale connectome simulations with MuJoCo/MJX environments trained via reinforcement learning.
- Lead developer of Chromatix (Nature Methods 2026), a GPU-accelerated differentiable wave-optics library used in labs worldwide.
- Building physics-based reconstruction pipelines for X-ray nano-holotomography in JAX on multi-GPU infrastructure.
- Mentor junior colleagues and provide numerical and computational guidance across projects.

Research Scientist

Feb 2022 - Feb 2024

PASQAL — Paris, France

- Developed Horqrux, a compact fully-differentiable quantum circuit simulator, and the first GPU-accelerated differentiable analog Hamiltonian simulator, used for pulse optimisation.
- Built holographic control software on Nvidia Jetson for QPU hardware, enabling trapping of 1,000+ atoms (Physical Review Applied, 2024).
- Co-invented quantum-enhanced neural exchange-correlation functionals for molecular DFT simulation; resulted in PCT patent (PCT/EP2025/059376) and publication in Physical Review A (2026).
- Delivered client solutions in material deformation and computational chemistry.

Selected Publications

- Vaxenburg, …, **Both**, et al. Whole-body physics simulation of fruit fly locomotion. **Nature** 643, 2025.
- Deb*, **Both***, et al. Chromatix: a differentiable, GPU-accelerated wave-optics library. **Nature Methods**, 2026.
- **Both**, et al. DeepMoD: Deep learning for model discovery in noisy data. **J. Computational Physics** 428, 2021.
- Sokolov, **Both**, et al. Quantum-enhanced neural exchange-correlation functionals. **Physical Review A**, 2026.
- Qin, **Both**, et al. Low-loss YIG-based magnonic crystals. **Nature Communications** 9, 2018.

Education

Ph.D. Computational Physics & Machine Learning

2019 - 2021

Paris Sciences & Lettres (PSL) — Paris, France

- Developed DeepMoD, a neural-network approach to automatically discover PDEs from noisy, sparse data (187 citations).
- Introduced normalizing-flow–based density estimation for complex physical systems.

B.Sc. & M.Sc. Applied Physics

2012 - 2018

TU Eindhoven — Eindhoven, NL

- Specialized in condensed matter, theoretical & computational physics.
- M.Sc. internship at Aalto University led to publication in Nature Communications.

Leadership & Service

External Affairs Officer, Wervingsdagen Organized the largest career fair in the Netherlands (>140 companies, €250k revenue); managed all company relations.

Member, University Council TU/e Represented students with the executive board; portfolio covered finance and national affairs during a year of structural reform.