Brian M. Howell

numerical optimization | *numerical methods* | *numerical simulation*

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Summary

I am an engineer interested in high-performance numerical simulation/optimization/linear algebra and its applications in scientific computing, machine learning, finance, and manufacturing. I am battle-hardened in building in-house solvers for PDEs and optimization methods in C/C++/CUDA/Python.

Professional Experience

Apple, Cupertino, CA. **Feb. 2024 - Present**
Computational Physics Intern:

- Platform Architecture - parallel/distributed + high performance computing
- ***Software***: Full stack distributed computing via MPI and CUDA, with C++ back end and Python front end.

Google X, the moonshot factory, Mountain View, CA. **Jan 2022 - Dec 2022**
AI Resident:

- My project aimed at bringing modern computing tools for materials optimization to a very large industry. My colleague and I cracked the problem with geometric/thermodynamic + convex modeling/optimization.
- ***Machine Learning/Optimization***: Gaussian processes + Bayesian optimization, deep learning, convex optimization
- ***Physics Simulation/Modeling***: Discrete element method, convex geometry
- ***Hardware***: Sensor development and data processing, high-throughput experimentation, feedback control systems for complex fluid flow
- ***Publicly Available Output***: Two patent applications (one as lead inventor)

Lawrence Livermore National Lab., Livermore, CA. **June 2017 - Jan 2022**
Staff Scientist:

- ***My work*** at LLNL was primarily focused on materials development & optimization for 3D printing
- ***Software/Simulation***: Controllers, sensors, toolpath generation and optimization, digital twins for additive manufacturing
- ***Hardware/Chemical***: Hardware integration, CAD modeling & design, chemical formulation
- ***Testing***: Rheology & UV kinetics, mechanical (Instron), Scanning Electron Microscope (SEM)
- ***Publicly Available Output***: Two patents (one as lead inventor), one publication, work featured in Advanced Science News

UC Berkeley, Berkeley, CA. **Jan 2021 - Jan 2022**
Graduate Student Instructor:

- ***My position*** focused on computational modeling that brought applied mathematical techniques in numerical methods, optimization and machine learning to raw, custom code.
- **Head GSI:** Modeling and Simulation of Advanced Manufacturing Processes - Professor Tarek Zohdi
- **Head GSI:** Modeling and Simulation Tools for Industrial Research Applications - Professor Tarek Zohdi
- ***Received*** 2021 Outstanding GSI Award by the unversity

Skills

Programming Tools: C/C++, Python, CUDA, OpenMP, MPI, PyTorch, JAX, LaTeX, Git, Linux
Computational Methods: Numerical Methods/Optimization/Linear Algebra, Machine Learning, Parallel Computing

Education

UC Berkeley
PhD/MS in **Computational/Mechanical Engineering** **2019-2024**
Dissertation: *Materials Discovery & Optimization for Advanced Manufacturing*
Advisor: *Prof. Tarek Zohdi*

Brigham Young University
BS in **Chemical Engineering** **2013-2017**