

# Brian M. Howell

numerical optimization

physics engines

numerical computing

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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. For my doctoral work, I built in-house solvers for PDEs and optimization methods in C++. I am always open to new crusades that will allow me to work at the intersection of hardware and code.

## Professional Experience

**Apple, Cupertino, CA.**

**Feb. 2024 - Present**

Computational Physics Intern:

- **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 - Present**

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. I taught computing tricks for speed in Python, Matlab and C++. I have become very efficient at debugging others' code.

- **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
- **Micro Course TA:** Robust Optimization and Applications - Professor Laurent El Ghaoui
- **Head GSI:** Modeling and Simulation Tools for Industrial Research Applications - Professor Tarek Zohdi
- **Received 2021 Outstanding GSI Award** by the university

## 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:** *Physics Informed Machine Learning & Optimization for Advanced Manufacturing*

**Advisor:** Prof. Tarek Zohdi

**Brigham Young University**

BS in Chemical Engineering

**2013-2017**