# Brian **Howell**

NUMERICAL OPTIMIZATION · PHYSICS SIMULATION · HIGH PERFORMANCE COMPUTING

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## Summary

I am interested in applications for high performance computing. I specialize in numerical optimization applied to physics-based simulations. I write custom solvers and ML algorithms from scratch in C++ and Python, and have experience in writing low-level parallel code in CUDA and OpenMP.

## Education

**University of California, Berkeley** — *Berkeley, California*

PhD in Multi-physics simulation and optimization — *Aug 2019 - May 2024 (expected)*

- Advisor: Tarek Zohdi
- Dissertation Title: Physics-Informed Machine Learning and Optimization for Advanced Manufacturing

**University of California, Berkeley** — *Berkeley, California*

MSc in Mechanical Engineering — *Aug 2019 - Dec 2021*

**Brigham Young University** — *Provo, Utah*

BSc in Chemical Engineering — *Jan 2013 - April 2017*

## Experience

**Google X, the moonshot factory** — *Mountain View, California*

AI Resident: *materials optimization, physics simulation, & machine learning* — *Jan. 2022 - Dec. 2022*

- ***Machine Learning/Optimization***: Gaussian processes + Bayesian optimization, deep neural networks, 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 lead as inventor)

**Lawrence Livermore National Laboratory** — *Livermore, California*

Staff Scientist/Engineer: *3D printing* — *May 2017 - Jan. 2022*

- ***Software/Simulation***: Controllers, sensors, toolpath generation and optimization, digital twins for extrusion and curing
- ***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 publication, work featured in *Advanced Science News*.

**University of California, Berkeley** — *Berkeley, California*

Graduate Student Instructor (GSI) — *Jan. 2021 - Dec. 2021*

- **Head GSI:** Modeling and Simulation of Advanced Manufacturing Processes - Professor Tarek Zohdi
  - Received UC Berkeley Outstanding GSI Award
- **Micro Course TA:** Robust Optimization and Applications - Professor Laurent El Ghaoui
- **Head GSI:** Modeling and Simulation Tools for Industrial Research Applications - Professor Tarek Zohdi

**Zucrow Propulsion Lab, Purdue University** — *West Lafayette, Indiana*

Research Assistant: *energetic materials* — *June 2016 - Aug. 2016*

- ***Formulation***: Developed methods for modulating ignition sensitivity in propellants via piezoelectric polymers and varying electric fields.

## Relevant Graduate Coursework

Dynamic Optimization · Robust Optimization · Convex Optimization 1/2 · Machine Learning Tools for Energy Transport · Bayesian Analysis and Machine Learning for Physicists · Deep Reinforcement Learning, Decision Making, and Control · Numerical Solutions to ODEs/PDEs 1/2 · Finite Element Method · Modeling and Simulation of Advanced Manufacturing Processes · Parallel Computing · Quantitative Finance

## Skills

**Programming Tools** Python · PyTorch · C++ · OpenMP · CUDA

**Computational Methods** Numerical Methods · Convex opt. · Derivative-free opt. · Machine learning