

# 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

PHD IN MULTI-PHYSICS SIMULATION AND OPTIMIZATION

- Advisor: Tarek Zohdi
- Dissertation Title: Sequential Materials Optimization for 3D printing
- Topics: optimization, ODEs/PDEs, machine learning

Berkeley, California

Aug 2019 - May 2024 (expected)

### University of California, Berkeley

MSC IN MECHANICAL ENGINEERING

Berkeley, California

Aug 2019 - Dec 2021

### Brigham Young University

BSC IN CHEMICAL ENGINEERING

Provo, Utah

Jan 2013 - April 2017

## Experience

### Google X, the moonshot factory

AI RESIDENT: materials optimization, physics simulation, & machine learning

Mountain View, California

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

STAFF SCIENTIST/ENGINEER: 3D printing

Livermore, California

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

GRADUATE STUDENT INSTRUCTOR (GSI)

Berkeley, California

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

RESEARCH ASSISTANT: energetic materials

West Lafayette, Indiana

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