Reece D. **Huff**

Optimization · Numerical Methods · High Performance Computing

(+1) 651-402-0037 | rdhuff@berkeley.edu | reecehuff.com | reecehuff | reece-huff

Summary

I am a Computational Engineering PhD student at UC Berkeley, working in the Multiphysics Simulation and Optimization Lab. My **research interests** span deep learning and optimization, with a focus on applying these techniques to physical systems. Throughout my PhD, I have worked on blending computational methods with theoretical approaches. Initially, my research involved developing deep learning models for **physics-based simulations** of the human body. More recently, I have focused on using **distributionally robust optimization** to address combinatorial problems, such as vehicle routing. My research has earned me several national awards, including the **NSF Graduate Research Fellowship** and the **Goldwater Scholarship**. I am proficient in multiple programming languages, including `C++`, `Python`, and `Rust`.

I am interested in pursuing a career in quantitative finance and am open to both software development and research roles.

Education

University of California, Berkeley — *Berkeley, CA*

Ph.D. in Computational Engineering — *May 2023 - May 2026*

- Advisor: Tarek Zohdi and Manolis Vlatakis-Gkaragkounis
- Designated Emphasis in Computational and Data Science and Engineering
- Awards: NSF GRFP, Graduate Division Block Grant

University of California, Berkeley — *Berkeley, CA*

M.S. in Computational Engineering (GPA: 3.97/4.00) — *Aug. 2021 - May 2023*

- Advisor: Grace D. O'Connell
- Thesis: Deep learning enables accurate soft tissue deformation estimation *in vivo*

Boston University — *Boston, MA*

B.S. in Biomedical Engineering (GPA: 3.99/4.00) — *Aug. 2018 - May 2021*

- Advisors: Elise Morgan & Paul Barbone

Awards

2023	**SB3C Ph.D. Student Paper Finalist**	**top ∼5% abstracts out of more than 600**
2022	**NSF GRFP**	**$138,000 over three years; <15% acceptance rate**
2021	**UC Berkeley: Graduate Division Block Grant Award**	$69,506 to first-year Ph.D. students
2021	**BU BME: Senior Design 2nd Place Prize**	$500 reward; 2nd out of more than 60 groups
2020	**Barry M. Goldwater Scholarship**	**1 of 59 engineering students awarded nationwide**
2020	**Distinguished Summer Research Fellowship**	Awarded to 10 BU engineering students annually
2019-20	**Boston University UROP Award × 4**	Awarded to high-achieving undergraduate researchers
2019	**Engineering Alumni Book Award Winner**	Awarded to 10 BU engineering upperclassmen annually
2018-21	**BU College of Engineering Dean's List**	Awarded to the top 30% of engineers each semester

Publications

2024	**Mixed Entropy Distributionally Robust Optimization for Routing Problems**, in progress	submitting to ICLR 2025
2023	**Deep learning enables accurate soft tissue tendon deformation estimation *in vivo* via ultrasound imaging**, Sci. Rep.	paper • code • project page
2023	**Relating *in vivo* strain of the FDS tendon with grip force**, Proc. Hum. Factors Ergon. Soc.	paper • project page
2022	**Comparing intervertebral disc geometry measurement method**, JOR Spine	paper • project page
2022	**Finite-element modeling of lumbar disc herniation**, JBME	paper • project page

Presentations

2024	**Advancing clinical evaluation of MSK impairment with a robust kinematic score**, ORS	abstract
2023	**Deep learning enables accurate *in vivo* deformation prediction**, SB3C	abstract
2023	**Relating *in vivo* strain of the FDS tendon with grip force**, HFES	abstract
2022	**Geometry measurement method affects reported IVD joint mechanics**, SB3C	abstract
2022	**Torque- and muscle-driven flexion provoke disparate risk of herniation in vitro**, ISSLS	abstract
2021	**Simulating lumbar spine degeneration for study of fracture** , BU BME Senior Design	paper • abstract
2019	**Optimizing digital volume correlation to study vertebral fractures** , BU UROP Symposium	abstract

Research Experience

University of California, Berkeley — *Berkeley, CA*

Graduate Student Researcher — *Aug. 2021 - present*

Advanced Solutions Sampler for NP-complete Problems

- Engaged in a collaborative project under the mentorship of Prof. Manolis Vlatakis and Prof. Michael I. Jordan.
- Focused on developing a solution sampler for NP-complete problems that models a distributional robust uncertainties.
- Utilized techniques such as policy gradient optimization, Langevin dynamics, simulated annealing, and Markov Chain Monte Carlo (MCMC) methods.

Wearable Technology Development for Stroke Rehabilitation

- Rotated in Dr. Preeya Khanna's lab to develop a custom printed circuit board for an inertial measurement unit system.
- Future work would focus on e-skins and IMU integration for kinematic measurement.

StrainNet: Deep-Learning for Tissue Deformation Analysis

- Spearheaded the development of `StrainNet`, a deep-learning framework for measuring *in vivo* tissue deformation.
- Achieved significant improvements in measuring deformation, outperforming traditional techniques by 90%.
- Designed a user-friendly website with documentation to make `StrainNet` accessible to the broader research community.

Boston University — *Boston, MA*

Undergraduate Research Assistant — *Mar. 2019 - Aug. 2021*

Physics-based modeling of the human lumbar spine in age and disease

- Investigated the interplay between vertebral fractures and disc degeneration with physics-based models.
- Simulated aging of trabecular bone through heterogeneous loss of bone mineral density.

Parallelizing image texture correlation algorithms for study of vertebral fracture

- Optimized bone tracking algorithm that measures the displacement field in a fracturing vertebra.
- Created a novel isoparametric interpolation program that (1) provides voxel-by-voxel assessments of DVC accuracy and (2) evaluates DVC estimations of non-linearly deformation.

Leadership

Kaplan Test Prep — *Boston, MA*

Standardized Test ACT and SHSAT Instructor & Tutor — *August 2018 – January 2020*

- Collaborated with a team of faculty to foster meaningful relationships among students.
- Utilized various teaching strategies to minimize learning gaps and engage students.
- Improved test scores by focusing on reading comprehension, mathematics, grammar, and scientific analysis.
- Tracked progress statistically to identify areas of weakness and help students grow.

Biomedical Engineering Society, Boston University Student Chapter — *Boston, MA*

President — *April 2019 – May 2020*

- Established a mentorship program connecting close to 100 underclassmen with upperclassmen.
- Provided students with opportunities including company visits, career development workshops, faculty lectures, and graduate student panels.

Boston University, College of Engineering — *Boston, MA*

Transfer-Student Resources and Advising Community (TRAC) Mentor — *September 2019 – present*

- Helped transfer students establish themselves in the BU College of Engineering.
- Led a series of workshops to familiarize students with courses, professors, and tutoring.

Boston University, College of Engineering — *Boston, MA*

Academic Conduct Committee (ACC) Chair Member — *April 2020 – present*

- Served on a committee of professors and students to review academic misconduct cases.

Coursework

Computational	Machine Learning, Parallel Computing, Reinforcement Learning, Computational Linear Algebra & Numerical Methods, Convex Optimization, Natural Language Processing, Randomness and Computation, Combinatorial Algorithms and Data Structures
Mathematics	High-dimensional Statistics, Applied Mathematics, Linear Algebra, Probability, Statistics, Advanced Calculus, Differential Equations
Physics	Finite Element Modeling, Continuum Mechanics, Elasticity, Thermodynamics, Statics, Dynamics, Fluids, Statistical Mechanics
General	Chemistry, Molecular Biology, Engineering Design, Circuits, Physiology, Biomechanics, Biomaterials

Skills

Programming	Python • C/C++ • Rust • Julia • HTML+CSS • SQL • Bash • LaTeX • Git • Metal • Swift • MATLAB • Mathematica
Software	PyTorch • TensorFlow • Tensorboard • CUDA • CVXPY • pandas • sklearn • OpenMP • MPI • OpenCL • OpenGL
Techniques	parallel computing • deep learning • computer vision • markerless motion capture • finite element modeling
General	Google Suite • Adobe Creative Cloud • Microsoft Office