

# James Bowden

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## EDUCATION

### California Institute of Technology

B.S. Computer Science, Data Science Minor

2019 – Jun 2023

GPA: 4.0

## EXPERIENCE

### Ryan Adams Group, Princeton

Jun 2022 – Present

- Reframing topology optimization of mechanical structures with deep implicit surfaces to be able to specify functional design priors
- Creating end-to-end differentiable pipeline for rational design of 2/3-D materials given arbitrary mechanical objectives, e.g., precise multi-stability in metamaterials

### Katie Bouman Group, Caltech

Jan – Jun 2022

- Built model from CycleGAN to exaggerate important decision features in image data for model explainability and design of models consistent with domain-expert priors
- Chose medical, black hole, animal datasets and created synthetic datasets to evaluate method on

### Anima Anandkumar Group, Caltech

Jan – Mar 2022

- Worked on efficiently training diffusion models by partitioning ~200K-D data in Fourier domain and hierarchically conditioning high-res. signals on lower-frequency (global) signals
- Cut diffusion sampling time from ~14hrs to ~2hrs in early tests by replacing convolutional network (“overfit” to images) with simpler MLP architectures (ReZero-net) for freq. domain

### Yisong Yue Group, Caltech

Jun 2020 – Present

- Integrated Deep Kernel Learning (DKL) with BayesOpt (BO) to find global optima faster via improved model fitting on complex, high-dimensional datasets where GPs struggle
- Created “fully-Bayesian” active learning pipeline with posterior sampling methods (Thompson sampling and Monte Carlo dropout); currently developing Bayesian neural network-based pipeline
- Helped develop learned region-of-interest DK-BO to adaptively filter candidate datapoints
- Developing (multi-fidelity) DK-BO for real-world rational design applications including COVID antibody engineering and nanophotonics filter design in collaboration with LLNL, UChicago

### Software Engineering Intern, Uber Driver Trip Pricing

Jun – Sept 2021

- Designed conditional models to increase driver offer acceptance, trip completion rates
- Pioneered geo-time embedding to create country-wide model with cold-start prediction capabilities for transfer learning

## PUBLICATIONS & WORKING PAPERS

### Implicit Surface Topology Optimization

D. Oktay, [J. Bowden](#), M. Mirramezani, R. Adams.  
*Working paper.*

### Fiber Monte Carlo

N. Richardson, D. Oktay, Y. Ovadia, [J. Bowden](#), R. Adams.  
*Working paper, ICML 2023 goal.*

### Learning Region of Interest for Bayesian Optimization with Adaptive Level-Set Estimation

F. Zhang, J. Song, [J. Bowden](#), A. Ladd, Y. Yue, T. Desautels, Y. Chen.  
*ICML ReALML Workshop 2022. [realworldml.github.io/files/cr/paper63.pdf](https://realworldml.github.io/files/cr/paper63.pdf). Submitted to AISTATS 2023.*

### Deep Kernel Bayesian Optimization

[J. Bowden](#), J. Song, Y. Chen, Y. Yue, T. Desautels.  
*Pre-print 2021. [www.osti.gov/biblio/1811769](https://www.osti.gov/biblio/1811769). Working paper, ICML 2023 goal.*

### Bridge-Group: An Opt-In Recitation Section to Facilitate the Transition from CS1 to CS2

E. Gurcan, [J. Bowden](#), A. Blank.  
*RESPECT 2022. [james-bowden.github.io/pages/teaching/bridge\\_group](https://james-bowden.github.io/pages/teaching/bridge_group).*

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## TEACHING

### **Head TA: Data Structures/Algorithms, Caltech CS 2**

**Winter 2021, 22, 23**

As Head TA, hired, trained, supported, managed 20 other TAs; heavily involved with course organization, vision. Wrote new assignments, held weekly office hours, led lab section. Pioneered new office hours ticketing system to improve learning outcomes. Helped organize "bridge-group", a DEI initiative to help disadvantaged students transition from CS 1 to CS 2 (poster at RESPECT 2022). ~200 students

### **TA: Machine Learning Projects, Caltech CS 156b**

**Spring 2022, 23**

Researched, chose, and setup new dataset (chest x-rays) for term-long group competition. Helped organize course and held technical office hours for teams on demand. ~80 students

### **TA: Machine Learning, Caltech CS 156a**

**Fall 2021, 22**

Held weekly office hours for first course in ML sequence. ~200 students

### **TA: Intro CS, Caltech FSRI (Freshman Summer Research Institute)**

**Summer 2022**

Held daily office hours for summer-before-college course intended to prepare students of disadvantaged backgrounds to do computational research. Helped write assignments (e.g., NLP essay scorer, autotuner; preparing submission to SIGCSE 2023). Assisted students on creative capstone projects. ~50 students

### **TA: Computing Systems, Caltech CS 24**

**Fall 2021**

Held weekly office hours for notoriously difficult, coding-intensive CS core requirement. ~100 students

### **TA: Software Design, Caltech CS 3**

**Spring 2021**

Gave weekly code reviews, taught good software development practices, held office hours. ~120 students

### **TA: Intro Programming, Caltech CS 1**

**Fall 2020**

Held weekly office hours, graded code. ~220 students

## SERVICE

**Caltech CMS DEI Committee, 2022 - 23.** Improving various facets of department treatment of identity.

**Caltech Academics & Research Committee, 2021 - 22.** Advocated for student interests.

**SURF Ambassador, 2020 & 21.** Advised, supported Caltech summer research fellows.

## AWARDS

**Rypisi SURF Fellow, 2022.** Awarded by the director of Caltech's summer research program.

**Associates SURF Fellow, 2020.** For outstanding research in computer science at Caltech.

**Thermo-Fisher Scholarship, 2019.** For promising biomedical researchers (1 of 6 in US).

**Teaching Mode, 2018.** For best research presentation in cohort of 30 students.