

James Bowden

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EDUCATION

California Institute of Technology

B.S. Computer Science, Data Science Minor

GPA 4.1/4

Grad: 2023

EXPERIENCE

Machine Learning Researcher | Jan. 2022 – Present

Katie Bouman Group, Caltech

- Exploring use of CycleGAN to accentuate deciding features in image data for model performance and explainability

Machine Learning Researcher | Jan. 2022 – Present

Anima Anandkumar Group, Caltech

- Partitioning ~200K-dimension signal data in the frequency domain to train diffusion models more efficiently
- Conditioning models of high-resolution signals on lower-resolution inputs

Machine Learning Researcher | Jun. 2020 – Present

Yisong Yue Group, Caltech

- Integrated Deep Kernel Learning (DKL) with BayesOpt (BO) to enhance model fit and find global optima faster
- Improved performance and runtime via Thompson sampling and Monte Carlo dropout
- Cut regret by over 50% compared to best GP models
- Develop multi-fidelity DK-BO for real applications like COVID protein engineering and nanophotonics filter design

Software Engineering Intern, Uber | Jun. – Sept. 2021

- Designed and analyzed ML models to increase driver offer acceptance rates and overall trip completion rates
- Pioneered geo-time embedding to create country-wide model and do cold-start prediction via transfer learning
- Improved trip completion model via conditional prediction
- Integrated new internal ML platform for increased modeling and training flexibility

Head Teaching Assistant, Caltech | Sept. 2020 – Present

- Serving as TA for:
 - CS 156a: Machine Learning Systems [Fall 2021]
 - CS 24: Computing Systems, C [Fall 2021]
 - CS 3: Software Design, C [Spring 2021]
 - CS 2: Data Structures/Algorithms, Java [Winter 2021, 2022]
 - CS 1: Intro Programming, Python [Fall 2020]
- Hold office hours, give code reviews, lead lab section, grade code, instill good development practices, write lab
- Head TA for CS 2 [Winter 2022]

SKILLS

Languages

Python, C, Java, JavaScript, SQL, MATLAB, HTML, OCaml

Tools

PyTorch, Keras, TF, sklearn, pandas, NumPy, Hive

Techniques

Deep Learning, BayesOpt, Regression, Transfer Learning

COURSEWORK

- ML & Data Mining
- Machine Learning Systems
- Variational Inference
- NN Theory, Control
- Statistical Inference
- Bayesian Statistics
- Probability Models
- Markov Chains, Discrete Stochastic Processes
- Applied Linear Algebra
- Data Structures/Algorithms
- Software Design
- Computing Systems

AWARDS

Thermo-Fisher Sch., 2019

For medical research (1 of 6)

Teaching Mode, 2018

Best research presentation in cohort of 30

Eagle Scout, 2018

ACTIVITIES

Treasurer, Caltech Student Investment Fund

\$1M AUM, STEM sector focus

Ambassador, Caltech SURF

Advise research fellows

Fleming House Social Chair

Caltech Cannon Master

Caltech Water Polo Team

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EXPERIENCE, CONT'D

Machine Learning Researcher | Mar. – June 2021

Group Project, Caltech

- Led independent research project from start to end
- Devised NAS method using PAC-Bayes theory that utilizes untrained architectures to evaluate objectives 50x faster
- Since robust evidence score suggests good generalization, used randomly sampled weights as performance proxy
- Designed perturbation objective employing Monte Carlo dropout to approximate α -robustness and local weight space flatness; this objective is predictive of test accuracy

Machine Learning Engineer | Jan. – Mar. 2020

Group Projects, Caltech

- Wildfire prediction, Kaggle: analyzed and preprocessed noisy data, and tested/tuned a variety of model types with limited queries to the test dataset. Utilized soft voting ensembles to reduce overall variance while using strong models with low bias.
- Movie rating dataset: performed analysis and unsupervised learning (matrix factorization) to generate insights and clustering for movie dataset. Found that genres and popular actors were often mapped to similar regions in our 2D representation.
- Sonnet generation: tokenized words in training set of Shakespearean sonnets and generated look-alike poems with Hidden Markov Models, RNNs (LSTM) that rhymed!

Bioinformatics Researcher | Dec. 2019 – Jan. 2021

Kaihang Wang Lab, Caltech

- Led team of 3 senior students to create automated data pipeline for reconstructing ancestral genomes using Python and integrating various command line tools
- Wrote Python tools to inform and assist wet bench projects like recoding genomes and predicting minimum essential genes for life

Software Developer | Mar. – Jun. 2020

Group Project, Caltech

- Created escape game in C with team of 2 other students
- Implemented A* pathfinding, physics engine, vision, map
- Significantly reduced lag via dynamic programming

Biology Researcher | Aug. – Dec. 2019

Pamela Bjorkman Group, Caltech

- Developed multivalent nanoparticles w/ conserved flu/HIV antigenic regions to elicit cross-strain bnAbs
- Involved in design and expression of constructs for nanoparticles and antigens bound by SpyCatcher

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EXPERIENCE, CONT'D

Biology Researcher | May – Aug. 2019

Jerry Shay Group, UT Southwestern Medical Center

- Showed that NIP45 is first known protein in ALT cancer repertoire to bind SUMO1, implying involvement in formation of PML bodies, recruitment of other HR proteins for telomere extension
- Presented for hour-long group meeting; commended by lab for clarity, understanding in short time

Project Lead | Jan. – May 2019

GHC Science Team, California Nanosystems Institute @ UCLA

- Led design/construction of quantitative gold nanocluster PCR thermocycler + imaging unit from scratch
- Pitched to a panel of scientists, businesspeople at UCLA's CNSI Nanovation Competition as educational kit with potential to make PCR more accessible by undercutting market by \$400

Biology Researcher | May – Aug. 2018

University of Washington Medical Center

- Aided in design/testing of heart failure therapy expressing ribonucleotide reductase in cardiac muscle via AAV6 vector to increase 2-dATP production and accelerate actomyosin crossbridge formation
- Earned PSTP Teaching Mode Award for research presentation (1/30 interns, from program director)

Biology Researcher | May – Aug. 2017

Drexel University College of Medicine

- Tested various polymorphic strains of fungal pathogen *C. glabrata* for physical weaknesses caused by polyN mutations in *Ssk2*, a gene in the osmotic stress response pathway
- Did significant procedural troubleshooting as several assays did not work as intended initially

Biology Researcher | Nov. 2014 – Mar. 2015

Amgen Biotech Lab, Pierce College

- Examined bacterial resistance development in response to repeated exposure to varying concentrations of antibiotics for science fair project.
- Showed that *S. epidermidis* developed resistance faster than *E. coli* despite *E. coli*'s faster division time and thicker cell wall (gram negative vs. positive)
- Presented at LA County, CA State Science Fairs and won 2nd place in Microbiology at both