

EDUCATION

Carnegie Mellon University , Advised by Zico Kolter <i>Ph.D. in Machine Learning</i>	Aug. 2021– Present
University of California, Berkeley , Advised by Yi Ma <i>5th Year M.S. in Electrical Engineering and Computer Science; Mathematics Breadth</i>	Aug. 2020 – Jun. 2021
University of California, Berkeley <i>B.S. in Electrical Engineering and Computer Science; Minor in Bioengineering</i>	Aug. 2016 – Jun. 2020

EXPERIENCE

Carnegie Mellon University, Department of Machine Learning , Advised by Zico Kolter <i>Research Assistant</i>	Aug. 2021 - Present
<ul style="list-style-type: none">• Focus: out-of-distribution generalization, continual learning• Worked on showing that the disagreement rate between a pair of models trained on different seeds is often exactly equal to their average test error, even for out of distribution test data. In submission to ICLR 2022.• Current working on better understanding the calibration of ensembles.	
UC Berkeley Artificial Intelligence Research Lab , Advised by Yi Ma <i>Research Assistant</i>	Jan. 2020 - Dec. 2021
<ul style="list-style-type: none">• Focus: continual learning, dictionary learning, reinforcement learning• Reformulated the Maximal Coding Rate Reduction loss such that the number of log determinants required does not grow linearly with the number of classes. Saw 10x faster training on Tiny-ImageNet. Currently in submission to CVPR 2022.• Worked on a journal publication theoretically analyzing the improvements in computational complexity we observe in practice when the agent is given intermediate rewards in reinforcement learning tasks. Published in JAIR 2022.• Showed that ReduNet, a network constructed by forward propagation, performs significantly better on class incremental learning tasks than deep networks trained by backpropagation. Worked on global convergence proofs of loss functions over the Steifel manifold. Published in CVPR 2021.	
UC Berkeley Automation Lab , Advised by Ken Goldberg <i>Research Assistant</i>	Jan. 2014 - Oct. 2016
<ul style="list-style-type: none">• Designed a particle filter algorithm to tackle the mechanical search problem of grasping a target object in a cluttered bin.	
UC Berkeley Molecular Cell Biomechanics Lab , Advised by Mohammad Mofrad <i>Research Assistant</i>	Jan. 2019 - Jun. 2019
<ul style="list-style-type: none">• Designed convolutional neural networks to predict the punctual stress during unfolding in molecular dynamics simulations of double globule tethered proteins. Discovered patterns between punctual stress and a protein's secondary structure during protein unfolding.	
Harvard Medical School, Department of Biomedical Informatics , Advised by Chirag Patel <i>Intern for Summer Institute of Bioinformatics</i>	Jun. 2017 - Aug. 2017
<ul style="list-style-type: none">• Created a database of annotated microbiome studies that use whole-genome sequencing https://microbial-genes.bio .• Built a pipeline in R that conducts a metagenome-wide association study of microbiome data and outputs significant genetic/functional markers.	
UC San Diego, Department of Medicine , Advised by John Chang <i>Research Assistant</i>	Jun. 2016 – Jan. 2017
<ul style="list-style-type: none">• Studied the role of TGFβ pathway in cancer. Showed that modulating USP11 expression altered the stability of TGFβ receptor type 2 (TGFBR2) and TGFβ downstream signaling in human breast cancer cells.	

PUBLICATIONS

* denotes equal contribution

- [1] **Assessing Generalization of SGD via Disagreement** [\[arxiv\]](#)
Yiding Jiang*, Vaishnavh Nagarajan*, **Christina Baek**, J. Zico Kolter
International Conference in Machine Learning (ICML) Workshop on Overparameterization: Pitfalls & Opportunities, 2021. In Submission to ICLR 2022.
- [2] **Computational Benefits of Intermediate Rewards for Hierarchical Planning** [\[arxiv\]](#)
Yuxiang Zhai, **Christina Baek**, Zhengyuan Zhou, Jiantao Jiao, Yi Ma
Journal of Artificial Intelligence Research (JAIR), 2022.
- [3] **Incremental Learning via Rate Reduction** [\[arxiv\]](#)
Ziyang Wu*, **Christina Baek***, Chong You, Yi Ma
Conference of Computer Vision and Pattern Recognition (CVPR), 2021
- [4] **The Landscape of Genetic Content in the Gut and Oral Human Microbiome** [\[pubmed\]](#)
Braden Tierney, Zhen Yang, Jacob Lubner, Marc Beaudin, Marsha Wibowo, **Christina Baek**, Chirag Patel, Aleksandar Kostic
Cell Host and Microbe, 2019
- [5] **Ubiquitin specific peptidase 11 (USP11) enhances TGF β -induced epithelial-mesenchymal plasticity and human breast cancer metastasis** [\[pubmed\]](#)
Daniel Garcia, **Christina Baek**, M Valeria Estrada, Tiffani Tysl, Eric Bennett, Jing Yang, John Chang.
Molecular Cancer Research, 2018.
- [6] **Inhibition of Spontaneous and Experimental Lung Metastasis of Soft-Tissue Sarcoma by Tumor-Targeting Salmonella typhimurium A1-R** [\[pubmed\]](#)
Shinji Miwa, Yong Zhang, **Kyung-Eun Baek**, Fuminari Uehara, Shuya Yano, Mako Yamamoto, Yukihiro Hiroshima, Yasunori Matsumoto, Hiroaki Kimura, Katsuhiko Hayashi, Norio Yamamoto, Michael Bouvet, Hiroyuki Tsuchiya, Robert Hoffman, Ming Zhao.
Oncotarget, 2014.

EDITOR

- [1] **High-Dimensional Data Analysis with Low-Dimensional Models: Principles, Computation, and Applications**
Yi Ma, John Wright
Cambridge University Press.

TEACHING

- CS189/289A Introduction to Machine Learning** Summer 2019 – Spring 2021
Content TA, Spring 2021: Designed exam questions, held discussion sections. Instructor: Jonathan Shewchuk.
Project-Lead TA, Fall 2020: Designed the final project, studying a machine-learning perspective of the night sky and the evolution of our understanding of it across cultures and time. Instructor: Anant Sahai.
Head TA, Spring 2020: Lead course staff, wrote supplementary material. Instructor: Jonathan Shewchuk.
Content TA, Summer 2019: Designed exam questions, held discussion sections. Instructor: Jonathan Shewchuk.
- CS170 Efficient Algorithms and Intractable Problems** Fall 2019
Reader: Held weekly office hours and designed homework rubrics. Instructor: Satish Rao.
- CS70 Discrete Mathematics and Probability Theory** Spring 2018
Mentor: Held mini-discussion sections for a group of 4 students. Prepared students for exams. This was a part of UC Berkeley's Computer Science Mentors club.

HONORS & SCHOLARSHIPS

CMU Presidential Fellowship in Machine Learning <i>Awarded to 1 student per graduate school application cycle.</i>	2021
Outstanding GSI Award <i>Awarded by UC Berkeley for outstanding work in teaching on campus.</i>	2021
Koret Research Scholarship <i>Received \$4000 from UC Berkeley to conduct my proposed research with Professor Yi Ma over Summer 2020</i>	2020
Thermo Fisher Scientific Scholarship <i>Received \$20,000 for scholastic excellence.</i>	2016-2020
Eta Kappa Nu Honors Society <i>National Electrical Engineering and Computer Science Honors Society.</i>	2018
Tau Beta Pi Engineering Honors Society <i>National Engineering Honors Society.</i>	2017
Regents' and Chancellor's Scholarship <i>Awarded to < 2% of entering class for creativity and leadership.</i>	2016

RELEVANT COURSEWORK

STAT 240: Robust Statistics	STAT 210: Theoretical Statistics
EE 229: Information Theory	EE 227C: Convex Optimization
CS 285: Deep Reinforcement Learning	CS 288: Natural Language Processing
CS 270: Combinatorial Algorithms	MATH 140: Differential Geometry
MATH 104: Intro to Real Analysis	BIOE 145: Intro to Machine Learning in Computational Biology