CHRISTINA K.E. BAEK

ke.baek@berkeley.edu | 480-580-8903 | kebaek.github.io

EDUCATION

University of California, Berkeley

5th Year M.S. in Electrical Engineering and Computer Science. *Advised by Yi Ma.* 2020 –2021
Mathematics Breadth

B.S. in Electrical Engineering and Computer Science *with High Honors*. 2016 –2020
Minor, Bioengineering.

RESEARCH EXPERIENCE

UC Berkeley Artificial Intelligence Research Lab Jan. 2020 –

Research Assistant | Advised by Professor Yi Ma

- Focus: dictionary learning, generalization, continual learning
  Studied deep learning from an information-theoretic perspective. Worked on several global convergence proofs of functions over the Steifel manifold.

UC Berkeley Automation Lab Jun. 2019 – Aug. 2019

Research Assistant | Advised by Professor Ken Goldberg

- Implemented 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 Jan. 2019 – Jun. 2019

Research Assistant | Advised by Professor Mohammad Mofrad

- 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, *Dep. Of Biomedical Informatics* Jun. 2017 – Aug. 2017

Intern for Summer Institute of Bioinformatics | Advised by Professor Chirag Patel

- 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, *Dep. Of Medicine* Jun. 2016 – Jan. 2017

Research Assistant | Advised by Professor John Chang

- Studied the role of TGF-beta 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.

BOOKS & PAPERS

Author (* denotes equal contribution)

2020 Incremental Learning via Rate Reduction
Z Wu*, **C Baek***, C You, and Y Ma
Under Review at *Conference of Computer Vision and Pattern Recognition (CVPR)* 2021. arxiv.org/abs/2011.14593.

2019 The Landscape of Genetic Content in the Gut and Oral Human Microbiome
B Tierney, Z Yang, J Luber, M Beaudin, M Wibowo, **C Baek**, C Patel, and A Kostic
Cell Host and Microbe, 26(2): 283-295.

2018 Ubiquitin specific peptidase 11 (USP11) enhances TGF-b-induced epithelial-mesenchymal plasticity and human breast cancer metastasis
D Garcia, **C Baek**, MV Estrada, T Tysl, EJ Bennett, J Yang, and JT Chang.
Molecular Cancer Research, 16(7): 1172-1184.

2014 Inhibition of Spontaneous and Experimental Lung Metastasis of Soft-Tissue Sarcoma by Tumor-Targeting Salmonella typhimurium A1-R
S Miwa, Y Zhang, **KE Baek**, F Uehara, S Yano, M Yamamoto, Y Hiroshima, Y Matsumoto, H Kimura, K Hayashi, N Yamamoto, M Bouvet, H Tsuchiya, R Hoffman, and M Zhao.
Oncotarget, 5(24): 12849-12861.

Editor

2020 High-Dimensional Data Analysis with Low-Dimensional Models: Principles, Computation, and Applications
Y Ma and J Wright.
Cambridge University Press.

Misc. Projects

2016 Life Cycle of a Lytic Phage (T4 Bacteriophage)
C Baek
Wolfram Demonstrations Project.

TEACHING

Project-Lead Student Instructor. **CS189/289A Introduction to Machine Learning** Fall 2020

- Worked with Professor Anant Sahai to design the final class project studying a machine-learning perspective of the night sky and the evolution of our understanding of it across cultures and time.

Head Student Instructor. **CS189/289A Introduction to Machine Learning** Spring 2020

- Worked with Professor Jonathan Shewchuk to lead a course staff of 20 and class size of 750+.

Student Instructor. **CS189/289A Introduction to Machine Learning** Summer 2019

- Held weekly discussion sections and office hours. Wrote exam questions. Was interested in providing students geometric interpretations of classical machine learning algorithms (SVM, LLS, QDA, etc.).

Reader. **CS170 Efficient Algorithms and Intractable Problems** Fall 2019

- Held weekly office hours and designed homework rubrics.

Mentor. **CS70 Discrete Mathematics and Probability Theory** Spring 2018

- 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

2020 **Koret Research Scholarship** *Received $4000 from UC Berkeley to conduct my proposed research with Professor Yi Ma over Summer 2020.*

2016-2020 **Thermo Fisher Scientific Scholarship** *Received $20,000 for scholastic excellence.*

2018 **Eta Kappa Nu Honors Society** *National Electrical Engineering and Computer Science honors society.*

2017 **Tau Beta Pi Engineering Honors Society** *National Engineering honors society.*

2016 **Regents' and Chancellor's Scholarship** *Awarded to <2% of entering class for creativity and leadership.*

AWARDS

2019 **Google Games Tech Challenge**
1st place in Word Association, 3rd in Speed Coding Challenge, Team: foobar

- Google's puzzle + coding competition made up of 3 rounds (Speed Coding Challenge, Word Association, Puzzles) between 57 teams from Stanford/Berkeley. Solved 50% of the coding problems for the team under the given time limit.

2018 **CS188 Introduction to AI: Pacman Capture the Flag Multi-Agent Reinforcement Learning Competition**
2nd Place in Spring 2018 CS188

- Competed against teams in a class size of 600 on a multi-player capture-the-flag variant of Pacman where agents control Pacman and ghosts in coordinated strategies. The goal of the competition was to design an algorithm that allows these agents to make optimal decisions under 1 second.

2015 **Intel International Science and Engineering Fair**
Finalist

- Project: Cancer Targeting Activity of Salmonella Invasion Protein A
  Self guided project studying whether Salmonella Invasion Protein A (SipA) can be utilized to improve the specificity of cancer drug carriers.

2014 **International Genetically Engineered Machine (iGEM) World Jamboree**
2nd Place and Best Poster Prize

- Project: Engineering E.coli Capable of Extracellular Secretion of Mycotoxin-Detoxifying Enzymes
  Engineered E. coli to efficiently produce detoxification enzymes, Aflatoxin Detoxifizyme (ADTZ) and Zearalenone Hydrolase (ZHD101), as a solution to mycotoxin outbreaks caused by improper storage of crops.

COURSEWORK

Relevant Coursework

EE 229: Information Theory *(Current)*
STAT 210: Theoretical statistics *(Current)*
EE 227C: Convex Optimization *(Audit)*
CS 285: Deep Reinforcement Learning *(A)*
CS 270: Combinatorial Algorithms *(A)*
CS 189: Machine Learning *(A)*
MATH 140: Differential Geometry *(A)*
MATH 104: Intro to Real Analysis *(A)*
CS 162: OS and Systems Programming *(A)*
CS 170: Efficient Algorithms and Intractable Problems *(A)*
BIOE 145: Intro to Machine Learning in Computational Biology *(A+)*