

Augustine Chemparathy

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EDUCATION

Stanford University, Stanford, CA

Sep 2015-Present

- B.S. with Distinction, Computer Science and Bioengineering, GPA: 4.067/4.00, Phi Beta Kappa
- M.S. candidate, Management Science & Engineering, Health Systems Modelling and Policy track
- Relevant coursework: Computational Structural Biology (CS 279); Analysis of Costs, Risks, and Benefits of Health Care (HRP 392); Healthcare Operations Management (MS&E 263); Technology Assessment and Regulation of Medical Devices (MS&E 256)

EXPERIENCE

Qi Lab, Stanford Bioengineering, Computational Biology RA

September 2019-Present

- Used bioinformatic tools to search the bacterial and archaeal genomes for a family of unidentified novel DNA-cutting proteins. These proteins can provide an alternative to CRISPR-Cas for use in medical applications, including gene therapies. I also use a mathematical score to discover proteins that may act as cofactors to the DNA-cutting proteins. A patent application has been submitted by Stanford University for proteins I identified in this project.
- Working in collaboration with wet lab scientists to develop a CRISPR-Cas13-based antiviral against the SARS-CoV-2 virus. I identified a minimal set of 5 Cas13 guides that can be used to target Cas13 against 90% of known strains of coronavirus, and all but four sequenced strains of patient SARS-CoV-2. I created the website crispr-pacman.stanford.edu to enable researchers to access broad-spectrum guides against ssRNA viruses.
- **Publications:**
 - “Development of CRISPR as a prophylactic strategy to combat novel coronavirus and influenza” Cell (April 2020).
 - “Computational Methods for Analysis of Large-Scale CRISPR Screens”. Annual Review of Biomedical Data Science, Volume 3 (July 2020).

CLABSI Data Analysis Team, Stanford Children’s Hospital

March 2018-Present

- Worked as part of a team to investigate the high rate of central line-associated bloodstream infections (CLABSIs) at Stanford’s Lucille Packard Children’s Hospital (LPCH). Met with doctors, nurses, and administrators to understand problem. Developed and deployed a dashboard within EPIC in late 2017 as part of a hospital-wide suite of interventions aimed at CLABSI reduction. Following the interventions, CLABSI rate at LPCH declined from 1.74 per 1000 line days in 2017 to 0.79 per 1000 line days in 2018.
- **Publications:**
 - “Development and implementation of a real-time bundle compliance dashboard for central line associated bloodstream infections” (2020). In review.

Dror Lab, Stanford Computer Science, Computational Biology Intern

June 2017-June 2020

- Developed a data analysis and machine learning tool to summarize and gather insights from noncovalent interaction data from molecular dynamics (MD) simulations. Available at getcontacts.github.io.
- Optimizing ComBind, a software package for ranking ligand docking poses. My work incorporates nonbinding ligands into Combind’s docking score.
- **Publications:**
 - “Leveraging non-structural data to predict structures of protein-ligand complexes” (March 2020). In Review. Available as BioArXiv pre-print.

- “Uncovering patterns of atomic interactions in static and dynamic structures of proteins” (November 2019). In review. Available as BioArXiv pre-print.

Arbor Biotechnologies, SWE Intern

June 2019-September 2019

- Searched for novel CRISPR-associated proteins in Arbor’s metagenomic database. Developed a machine learning model to predict which computational hits were most likely to function as biologically active CRISPR effectors.

Porteus Lab, Stanford Institute for Stem Cell Biology, Wet Lab Intern

June 2016-August 2018

- Received a research grant from Stanford Undergraduate Advising and Research (UAR) to evaluate methods for genome editing of NK cells using CRISPR-Cas9 to produce chimeric antigen receptor (CAR)-natural killer (NK) cells for cancer immunotherapy against glioblastomas.
- Evaluated a strategy to use CRISPR-Cas9 to repair a mutation causing monogenic Type 1 Diabetes.

Jonikas Lab, Princeton Department of Molecular Biology, Wet Lab Intern

June 2013-August 2014

- Characterized the relationship between synthesis of the biodiesel precursor triacylglycerol (TAG) and cellular redox stress in a model microalgae. Presented research as a finalist at Intel STS 2015.

COURSE PROJECTS

Biomedical device prototyping, Bioengineering Senior Capstone Project

Fall 2018-Winter 2019

I investigated the root causes of involuntary extubations at the neonatal ICU (NICU) at LPCH. In a team of four undergraduates, I interviewed and shadowed doctors in the NICU to identify risk factors for extubation. Our team identified low adherence to capnography in the NICU as a primary driver of extubations. We prototyped a combined endotracheal tube and capnograph as a solution to this process problem and provided our device to NICU doctors to evaluate.

Predicting protein structure from sequence, CS 279: Structural Biology

Fall 2017

Used random forest and support vector machine regression to predict protein 3D structure entirely from sequence. Used sequence-derived features from online dataset to predict protein contact maps, folded the predicted maps using an online service, and validated against ground-truth protein structures.

Deep learning to forecast a structural interaction network, CS 229: Machine Learning

Fall 2017

Trained a long short-term memory (LSTM) neural network using Keras to predict the evolution of a protein’s noncovalent interaction network over successive frames of a protein simulation. Found that the network state could be accurately predicted over as many as forty frames.

Reinforcement learning to create purchasing strategy, CS 221: Artificial Intelligence

Fall 2016

Developed a Markov Decision Process (MDP) to automatically generate optimal hour-by-hour strategies for Stanford University to purchase electricity to heat and cool campus buildings. The model purchased electricity during non-peak hours and emergencies. The model was validated against Stanford’s existing electricity purchasing strategy and performed comparably.

ACTIVITIES

Co-President, Stanford Students in Biodesign (SSB)

May 2017-June 2019

Coordinate recruitment, activities, and club organization for Stanford’s largest undergraduate organization for interdisciplinary biosciences.

Volunteer Organizer

July 2018-Present

I organize undergraduates to cook and serve breakfast at the Palo Alto Opportunity Center, a transitional shelter for the homeless in the Palo Alto community.

Writing Tutor, Stanford Hume Center for Writing And Speaking

Sept 2016-June 2019

Assist undergraduate and graduate students at Stanford with all stages of the writing process for conference publications, theses, term papers, applications, and other academic writing pieces.

Teaching Assistant, Linear Dynamical Systems (EE 263), Stanford University

Sept 2017-Dec 2017

Held office hours, wrote midterm problems, and graded exams for 135 students in Stanford’s highest-enrollment electrical engineering course.

HONORS AND AWARDS

- Phi Beta Kappa 2019
- Frederick E. Terman Award, Top 5% of Stanford Engineering seniors 2019
- President's Award for Academic Excellence, Top 5% of Stanford Class of 2019 by GPA 2017
- Intel Science Talent Search Finalist 2015
- Davidson Fellow for Science 2015