Joseph Matthew Rich

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Google Scholar: https://scholar.google.com/citations?user=vtDtrHoAAAAJ

Education

MD/PhD Candidate, USC-Caltech MD-PhD Program Candidate (PhD3) 2021–2029 (Projected)
- **PhD Candidate, California Institute of Technology**, Computational Biology 2023–2027 (Projected)
  - **Lab:** Dr. Lior Pachter
  - **Research Focus:** AI and bioinformatics applied to single-cell RNA-sequencing and medical imaging
- **MD Candidate, Keck School of Medicine of the University of Southern California** 2021–2023, 2027–2029
  - **Step 1**: Pass (First Attempt)

Bachelor of Science, University of California, Los Angeles 2016–2020
- **Field of Study**: Molecular, Cell and Developmental Biology (Major); Biomedical Research (Minor)
- **GPA**: 3.99/4.0 (Summa Cum Laude)
- **MCAT**: 524/528 (100th Percentile)

Professional Objectives

I am a 5th year student in the USC-Caltech MD/PhD program, conducting my PhD in Lior Pachter's lab. My work spans software development for variant detection, analysis of spatial transcriptomics and radiomics data, and AI model training for personalized medicine. I aim to complete medical training in radiology and work as a physician-scientist leading research at in medical data science and precision medicine.

Research Experience

California Institute of Technology, Department of Bioengineering Sept 2023–present
Advisor: Dr. Lior Pachter, PhD

- Co-developed CellSweep, a tool for removing noisy counts from scRNA-seq data by applying the expectation-maximization algorithm to estimate noise from empty droplets and celltype profiles — https://doi.org/10.64898/2026.03.04.709349
- Developed wompwomp, an algorithm and software package for improving visualization of alluvial plots with Hamiltonian path solvers - https://doi.org/10.48550/arXiv.2509.03761
- Created varseek, a pipeline to identify and analyze the cancer-driving mutations in RNA sequencing data by expanding two popular bioinformatics packages from the lab, gget and kallisto-bustools — https://doi.org/10.1101/2025.09.03.674039
- Applied statistical techniques to compare the inherent variance between Seurat and Scanpy, two commonly used packages in single cell RNA sequencing analysis — https://doi.org/10.1101/2024.04.04.588111
- Extending an AI model for single-cell gene expression at spatial resolution, GHIST, by incorporating variant information
- Developing a semi-supervised learning approach for improving contrastive learning with small radiogenomics data
- Developing a suite of tools for AI interpretability with to semantically meaningful subspaces applied to radiology AI.
- Conducting statistical analysis on prospective clinical trial data for CAR T cell immunotherapy in stage 4 breast cancer patients at the City of Hope
- Creating and updating vignettes for the spatial transcriptomics geospatial analysis package Voyager

Children's Hospital Los Angeles (CHLA), Department of Radiology Sept 2023–present
Advisor: Dr. Patricia Acharya, MD

- Performed a retrospective clinical study regarding the impact of time to treatment on outcomes of ileocolic intussusception
- Conducted statistical analysis on reporting rate of overian torsion in the emergency department

California Institute of Technology, Department of Computing and Mathematical Science May–Sept 2023
Advisor: Dr. Anima Anandkumar, PhD (Caltech); Dr. Andrew Hung, MD (Cedars-Sinai Medical Center)

- Trained machine learning algorithms to predict surgical outcomes based on contextualized gesture sequences
- Wrote review papers on pathomics and genomics of renal cell carcinoma, and on different approaches to studying the nerve-sparing step of radical prostatectomy

Children's Hospital Los Angeles (CHLA), Department of Radiology Feb 2023–present
Advisor: Dr. Amit Sura, MD, MBA

- Researched how varying definitions of chronic lung disease of prematurity are applied by radiologists at CHLA – doi: https://doi.org/10.1186/s40748-024-00178-4

Keck School of Medicine of USC, Department of Medical Education Dec 2022–present
Advisor: Dr. Raina Nash, PhD

- Providing insight into designing an MCAT study course for undergraduate students who are underrepresented in medicine at USC
- Involved in designing course syllabuses, creating lesson plans, and making problem sets

Keck School of Medicine of USC, Department of Radiology June 2022–present
Advisors: Dr. Vinay Duddalwar, MD; Dr. Assad Oberai, PhD

- Compared and quantified the external validity of single-institution vs. multi-institution convolutional neural networks in kidney mass segmentation — https://doi.org/10.1016/j.ejrai.2025.100035
- Assessed the clinical utility of imputed images with conditional generative adversarial networks on four-phase computed tomography renal masses — https://doi.org/10.1371/journal.pdig.0000970
- Applied deep learning image segmentation algorithms to analyze bone metastases of prostate cancer carcinoma, comparing the performance of multiple packages and algorithms including nnUNet and Residual Attention Unet — https://doi.org/10.1016/j.ejrai.2025.100005
- Conducted a literature review to identify genomic markers that differentiate metastatic from primary clear cell renal cell carcinoma - https://doi.org/10.3390/cancers15204934
- Lead a literature review that compares performance of machine learning-based image segmentation algorithms for cancerous lesions of the bone — https://doi.org/10.3389/fradi.2023.1241651
- Wrote two case reports on extremely rare urological endocrine tumors with an emphasis on imaging findings — https://doi.org/10.1159/000533835, https://doi.org/10.1159/000534060

California Institute of Technology, Department of Bioengineering Nov 2021–Aug 2022
Advisor: Dr. Richard Murray, PhD

- Creating a computational model of cells in a gut tube environment using Vivarium, a Pythonic computational biology software
- Designing processes and implementing mathematical models to capture cellular behaviors including adhesion, bond formation, and chemotaxis

University of California, Los Angeles, Department of Chemistry and Biochemistry Aug 2018–Mar 2021
Advisor: Dr. Margot Quinlan, PhD

- Investigated the role of the Wasp-Homology 2C Domain of the actin-nucleating protein Spire in conjunction with the formin Cappuccino, two cytoskeleton-regulating proteins essential for oogenesis
- Investigated the elongation activity of Cappuccino I706A, a widely used mutant of Cappuccino that was designed to be nonfunctional
- Employed total internal reflection fluorescence (TIRF) microscopy, pyrene-actin kinetic assays, and protein expressions and purifications
- Established a microfluidics system to enhance TIRF microscopy assays
- Produced 6 quarterly 15+ page papers for class credit, an abstract for the Biomedical Research Minor, 3 posters (and one with a Dean's Prize for my presentation), and a highest honors thesis

University of California, Los Angeles, Department of Molecular and Medical Pharmacology Nov 2017–July 2018
Advisor: Dr. Harley Kornblum, MD, PhD

- Analyzed the effect of the Let7 microRNA (miRNA) on Glioblastoma Multiforme proliferation
- Studied how best to effectively study and kill Isocitrate Dehydrogenase (IDH) mutant tumors, a mutation present in over 10% of Glioblastomas

- Employed cell culture, miRNA transfection, quantitative polymerase chain reaction (qPCR), immunohistochemistry, and Western Blots

Publications

1. Rich JM, Moses L, Einarsson PH, Luebbert L, Booeshaghi AS, Antonsson S, et al. *The impact of package selection and versioning on single-cell RNA-seq analysis*. Cell Systems. 2026 March 27. https://doi.org/10.1016/j.cels.2026.101560
2. Caskey M*, **Rich J***, Weber R, Mortazavi A, Pachter L, Hallgrimsdottir I. Single-Cell Genomics Decontamination with CellSweep. bioRxiv. 2026 March 6. https://doi.org/10.64898/2026.03.04.709349
3. Pawan SJ, Malewar S, Buren IV, Smith I, **Rich J**, Prajwal R, et al. Analyzing foundation models for segmentation of osseous metastatic lesions in prostate cancer on CT scans. European Journal of Radiology Artificial Intelligence, Volume 5, 100058. 2025 November 21. https://doi.org/10.1016/j.ejrai.2025.100058
4. **Rich J**, Oakes C, Pachter L. Optimizing alluvial plots. arXiv; 2025 Sept 3. https://doi.org/10.48550/arXiv.2509.03761
5. **Rich JM**, Luebbert L, Sullivan DK, Rosa R, Pachter L. *Reference-based variant detection with varseek*. bioRxiv. 2025 Sept 3. https://doi.org/10.1101/2025.09.03.674039
6. **Rich J**, Le J, Raad R, Tejura T, Rastegarpour A, Gill I, et al. Image Imputation with conditional generative adversarial networks captures clinically relevant imaging features on computed tomography. PLOS Digital Health. 2025 Aug 13 https://doi.org/10.1371/journal.pdig.0000970
7. Raman AG, Fisher D, **Rich JM**, Weight C, Heller N, Desai M, et al. Evaluation of nnU-Net for kidney tumor segmentation on a large external patient cohort. European Journal of Radiology Artificial Intelligence. 2025 July 15. https://doi.org/10.1016/j.ejrai.2025.100035
8. Vincent R. Li, Trevor A. Pickering, Karen Kay Imagawa, **Joseph M. Rich**, Amit S. Sura. *An Analysis of Child Abuse Detected by Skeletal Surveys Before and During the COVID-19 Pandemic*. Pediatric Discovery. 3 March 2025. https://doi.org/10.1002/pdi3.2526
9. Lambda Moses, Alik Huseynov, **Joseph M Rich**, Lior Pachter. *Geospatially informed representation of spatial genomics data with SpatialFeatureExperiment*. bioRxiv. 27 February 2025. https://doi.org/10.1101/2025.02.24.640007
10. S. J. Pawan*, **Joseph Rich***, Shreyas Malewar, Daksh Patel, Matt Muellner, et al. *Deep learning-based detection and segmentation of osseous metastatic prostate cancer lesions on computed tomography*. European Journal of Radiology Artificial Intelligence. 6 February 2025. https://doi.org/10.1016/j.ejrai.2025.100005 * co-first authorship
11. S. J. Pawan, **Joseph Rich**, Jonathan Le, Ethan Yi, Timothy Triche, Amir Goldkorn, Vinay Duddalwar. *Artificial Intelligence and Radiomics Applied to Prostate Cancer Bone Metastasis Imaging: A Review*. IRADIOLOGY. 2024 Sept 26. https://doi.org/10.1002/ird3.99
12. **Rich JM**, Lin LJ, Le JL, Abe JRC, Sura A. *Assessing the agreement of chronic lung disease of prematurity diagnosis between radiologists and clinical criteria*. Matern health, Neonatology and perinatology. 2024 Apr 5;10(1):8.
13. **Joseph M. Rich**, Vinay A. Duddalwar, Manju Aron, Ramon Ter-Oganesyan, Peter Hu, Shefali Chopra, Phillip M. Cheng. *Localized Multifocal Retroperitoneal Ganglioneuroma with an Infiltrative Appearance on Imaging: A Case Report*. Case Reports in Oncology 2023
14. Komal A. Dani*, **Joseph M. Rich*,** Sean S. Kumar, Harmony Cen, Vinay A. Duddalwar and Anshika D'Souza. *Comprehensive Systematic Review of Biomarkers in Metastatic Renal Cell Carcinoma: Predictors, Prognostics, and Therapeutic Monitoring*. Cancers 2023.
15. **Joseph M. Rich**, Vinay Duddalwar, Phillip M. Cheng, Manju Aron, Siamak Daneshmand. *Feminizing Adrenocortical Tumor with Multiple Recurrences: A Case Report*. Case Reports in Oncology 2023
16. **Rich JM**, Bhardwaj LN, Shah A, Gangal K, Rapaka MS, Oberai AA, et al. *Deep learning image segmentation approaches for malignant bone lesions: a systematic review and meta-analysis*. Front Radiol. 2023 Aug 8;3:1241651.
17. Knudsen, J. E., **Rich, J. M.**, & Ma, R. (2023). *Artificial Intelligence in Pathomics and Genomics of Renal Cell Carcinoma*. Urologic Clinics of North America. https://doi.org/10.1016/j.ucl.2023.06.002
18. **Rich JM**, Bradley AO, Quinlan ME, *A Widely-Used Negative Control Formin Mutant Retains Some Actin Polymerization Activity*, UCLA Molecular, Cell and Developmental Biology Honors Thesis (Highest Honors) 2020

* co-first authorship

Patents

1. Detecting mutational signatures with k-mer-based pseudoalignment. **Joseph Rich**, Lior Pachter, Laura Luebbert, Delaney Sullivan. CIT-9205-P. Filed 9/3/24. Provisional Patent Application.

Abstracts, Posters, and Presentations

1. Nola Vu, **Joseph Rich**, Amit Sura. *Assessment of Radiology Recommendation Adherence on Pediatric Ultrasound Reporting.* The Society for Pediatric Radiology Conference 2026.

2. Caskey M, **Rich J**, Weber R, Mortazavi A, Pachter L, Hallgrimsdottir I. Single-Cell Genomics Decontamination with CellSweep. Biology of Genomes, Cold Spring Harbor Laboratories. 2026 May 5.
3. **Joseph Rich**, Laura Luebbert, Delaney Sullivan, Reginaldo Rosa, Lior Pachter. *Reference-based variant detection with varseek*. Cold Spring Harbor Laboratory Single Cell Analyses Conference. 2025 November 12.
4. **Joseph Rich**, Conrad Oakes, Lior Pachter. *Alluvial plot optimization with wompwomp*. Cold Spring Harbor Laboratory Single Cell Analyses Conference. 2025 November 12.
5. **Joseph Rich**, Laura Luebbert, Delaney Sullivan, Reginaldo Rosa, Lior Pachter. *Efficient and accurate variant detection applied to cancer transcriptomics with varseek*. American Physician Scientist Association (APSA) West Regional Conference. 2025 March 29.
6. Jonathan Le, **Joseph Rich**, Ragheb Raad, Tapas Tejura, Ali Rastegarpour, et al. *Image Imputation with Conditional Generative Adversarial Networks Captures Clinically Relevant Features on Computed Tomography* (poster presentation). Keck School of Medicine Medical Student Research Forum 2025.
7. **Joseph Rich**, Laura Luebbert, Delaney Sullivan, Reginaldo Rosa, Lior Pachter. *Efficient and accurate detection of cancer mutations in bulk and single-cell RNA-seq data*. California Institute of Technology Merkin Institute Symposium. 2025 February 6.
8. **Joseph Rich**, Laura Luebbert, Delaney Sullivan, Reginaldo Rosa, Lior Pachter. *Efficient and accurate detection of cancer mutations in bulk and single-cell RNA-seq data* (poster presentation). California Institute of Technology graduate student recruitment. 2025 January 24.
9. **Joseph Rich**, Laura Luebbert, Delaney Sullivan, Reginaldo Rosa, Lior Pachter. *Efficient and accurate detection of cancer mutations in bulk and single-cell RNA-seq data* (oral presentation). City of Hope Graduate Student Symposium. 2024 August 30.
10. **Joseph Rich**, Lambda Moses, Lior Pachter. *The impact of package selection and versioning on single-cell RNA-seq analysis*. BioConductor Conference 2024. 2024 July 24.
11. Lambda Moses, Alik Huseynov, **Joseph Rich**, Lior Pachter. *Exploratory spatial data analysis from single molecules to multiple samples*. BioConductor Conference 2024. 2024 July 24.
12. **Joseph Rich**, Jonathan Le, Ragheb Raad, Tapas Tejura, Ali Rastergarpour, Inderbir Gill, et al. *Image imputation with conditional generative adversarial networks captures clinically relevant imaging features on computed tomography*. Co-Clinical Imaging Research Resource Program Conference 2024. 2024 May 20.
13. Runzhuo Ma, Jiayun Wang, **Joseph Rich**, Sherry L. Huang, Maxwell X. Otiato, Istabraq Dalieh, et al. *Contextualized Surgical Gestures in Nerve-Spare Reveal Heterogeneity in Techniques and Predicts Erectile Function Recovery*. The Journal of Urology. 2024 May 3.
14. **Joseph Rich**, Jonathan Le, Ragheb Raad,Tapas Tejura, Ali Rastergarpour, et al. *Image imputation with conditional generative adversarial networks captures clinically relevant imaging features on computed tomography*. UCLA CVIB-USC collaboratory conference. 2024 April 16.
15. Shreyas Malewar, S. J. Pawan, **Joseph Rich**, Daksh Patel, Darryl Hwang, et al. *AI for Prostate Cancer Bone metastases*. UCLA CVIB-USC collaboratory conference. 2024 April 16.
16. Alex G. Raman, David Fisher, **Joseph Rich**, Assad Oberai, Mihir Desai, Inderbir Gill, Vinay Duddalwar. *Evaluation of nnUNet for Kidney Tumor Segmentation on a Large External Patient Cohort*. UCLA CVIB-USC collaboratory conference. 2024 April 16.
17. **Joseph Matthew Rich**, Lydia Jing Lin, Jonathan Luan Le, Justin Ryan Ching Abe, Amit Sura. *Assessing the Agreement of Chronic Lung Disease of Prematurity Diagnosis between Radiologists and Clinical Criteria*. The Society for Pediatric Radiology Conference 2024.
18. Krish Gangal, **Joseph Rich**, Steven Cen, Vinay Duddalwar. *Segment Anything Model on Prostate Cancer Bone Metastases*. Bridge UnderGrad Science (BUGS) Summer Research Program 2023.
19. **Joseph M. Rich,** Alex G. Raman, Vinay A. Duddalwar, Assad A. Oberai. *Image Segmentation with Deep Learning of Prostate Cancer Bone Metastases on Computed Tomography*. International Conference on Machine Learning and Applications 2023.
20. Alex G. Raman, David Fisher, **Joseph M. Rich**, Erum Mushtaq, Assad A. Oberai, Vinay Duddalwar. *Evaluation of the State-of-the-Art Model in Kidney Tumor Segmentation on a Large Independent Patient Cohort*. International Conference on Machine Learning and Applications 2023
21. **Joseph M. Rich,** Vinay A. Duddalwar, Assad A. Oberai. *Deep Learning Based Image Segmentation of Prostate Cancer Bone Metastases with nnUNet*. Keck School of Medicine Medical Student Research Forum 2023.
22. **Joseph M. Rich,** Vinay A. Duddalwar, Assad A. Oberai. *Deep Learning Based Image Segmentation of Prostate Cancer Bone Metastases with nnUNet*. UCLA Center for Computer Vision and Imaging Biomarkers Workshop 2023**.**
23. **Rich JM**, Bradley AO, Quinlan ME, *A Negative Control Formin Mutant Retains Some Actin Polymerization Activity*, Biomedical Research Minor Spring Publication 2020

24. **Rich JM**, Bradley AO, Quinlan ME, *A Negative Control Formin Mutant Retains Some Actin Polymerization Activity*, Undergraduate Research Center Poster Day 2020
25. **Rich JM**, Bradley AO, Quinlan ME, *The Synergy of the Actin-Nucleating Proteins Spire and Cappuccino In Vitro*, Molecular, Cell and Developmental Biology Poster Day 2019
26. **Rich JM**, Bradley AO, Quinlan ME, *The Synergy of the Actin-Nucleating Proteins Spire and Cappuccino In Vitro*, Undergraduate Research Center Poster Day 2019

Grants, Fellowships, Honors, and Scholarships

SURF Program Mentor June 2026

- Mentored Caltech undergraduate David Jin who received a SURF fellowship for helping develop a radiogenomics contrastive learning model. The SURF program is a selective program that awards $8,110 for performing summer research at Caltech.

Merkin Spark Grant Oct 2025

- $10,000 grant awarded by the Merkin Institute for Translational Research of Caltech for my project entitled *Efficient and accurate variant detection applied to cancer transcriptomics with varseek*

AI West Med Conference Grant Feb 2024

- $5,000 one-year research grant awarded by the Keck School of Medicine of USC for my project entitled *Image Imputation with Conditional Generative Adversarial Networks Captures Clinically Relevant Imaging Features on Computed Tomography*

RSNA Research Medical Student Grant June 2023

- $6,000 one-year research grant awarded by the Radiological Society of North America (RSNA) for my project entitled *Deep Learning Image Segmentation of Prostate Cancer Bone Metastases*

Best Presentation Award, ICMLA Conference 2023 Apr 2023

- Awarded for presenting the best presentation at the conference for the project entitled *Evaluation of the State-of-the-Art Model in Kidney Tumor Segmentation on a Large Independent Patient Cohort*.

Summa Cum Laude June 2020

- Awarded for achieving a GPA in the top 5% of the graduating class (>3.93 GPA)

MCDB Highest Departmental Honors June 2020

- Awarded for my top academic achievement and MCDB research culminating in an Honors Thesis

Chancellor's Service Award June 2020

- Awarded to students after a rigorous review process who demonstrated the "most significant contributions in leadership and service to UCLA and the community"

Science Dean's Prize May 2020

- Awarded to 6 presenters in the Chemistry and Biochemistry Department for excellence in presentation and high research potential at the Undergraduate Research Center Poster Day in Spring 2020

EMT-B Certification Apr–July 2018

- Graduated from the UCLA EMT Program, which required 230 hours of didactic and skills training over 11 weeks.
- Passed the NREMT on July 7th, 2018

Biomedical Research Minor Dec 2017

- Admitted into the Biomedical Research Minor for my previous academic achievements, promise to conduct high quality research while at UCLA, and top performance in the prerequisite class Biomedical Research 5HA (~12% acceptance rate)

Leadership Development Program (LDP) Scholarship Aug 2017

- $1,000 award given to 2 Alumni Scholars who demonstrated exemplary leadership and participation in LDP

Dean's List (every quarter) Sept 2016–June 2020

- Awarded for achieving a 3.7+ GPA and 12 units per quarter

UCLA Harry M. Warner Alumni Scholarship June 2016

- $6,000 merit-based scholarship and membership to the Alumni Scholars Club
- Awarded to top ~1% of the incoming UCLA class based on academic, extracurricular, and leadership pursuits

Teaching and Mentorship

Graduate Student Mentor, Pachter Lab June 2024–present

- David Jin (Undergraduate and SURF fellow, Caltech, Jan 2026–present): Worked on encoder pretraining methods and self-supervised learning techniques for our radiogenomics contrastive learning model. Received a SURF fellowship for this work ($8,110 for Summer 2026)
- Derbhla Duffy (Undergraduate, University of Glasgow, June 2025–Sept 2025): Applied our variant detection tool *varseek* to novel datasets for cell type identification
- Ashrith Valluri (High school student, June–Aug 2025): Created a database of variants associated with environmental health outcomes that was used for variant screening in population genomics datasets
- Samuel Wagenaar (High school student, June-Aug 2024): Developed multiple *gget* modules (cbio, opentargets, bgee) and an efficient genome alignment tool

Volunteer MCAT and Interview Tutor Aug 2021–present

- Provide free MCAT and graduate school interview preparation for students from underserved backgrounds
- Assisted students in getting into their top choice programs including Stanford medical school, UC Irvine medical school (full scholarship), UC San Diego Medical School (full scholarship), Kaiser Permanente Medical School, and Touro University in Los Angeles Physician Assistant School

Mentor, UCLA Alumni Mentor Program Oct 2020–present

- Act as a mentor for UCLA undergraduates interested in careers in medicine and science
- Discuss career and education options with students, review résumés and CV's, conduct mock interviews

Master Tutor, MedSchoolCoach April 2020–Nove 2025

- Over 750 hours of tutoring experience with over 30 students
- Provided pre-med students with personalized instruction to create lesson plans for the MCAT, review content, and go through practice problems
- Underwent rigorous training that tested my MCAT knowledge in all four sections and pedagogical techniques
- Promoted to Mater Tutor for accumulating 300 tutoring hours with top client ratings

Leadership

Founder and President, USC-Caltech MD/PhD Student and Alumni Association Apr 2023–present

- Founded this organization to create cohesiveness and mentorship opportunities between MD/PhD cohorts
- Planning biyearly events and newsletters to bring together students and graduates, and highlight accomplishments of members
- Creating an MD/PhD handbook to help students navigate logistics of the program

President, Medical Computer Science Student Interest Group Jan 2022–Jan 2023
Neurology Student Interest Group
Pathology Student Interest Group
Radiology Student Interest Group

- Organize lunch talks with guest speakers to inform students about the field or the speaker's specific work
- Serve as the main contact point for student inquiries regarding the specialty/field including research and shadowing opportunities
- Lead teams of board members in organizing events and opportunities

Student Interviewer, Keck School of Medicine Oct 2021–present

- Individually interview and assess MD and MD/PhD applicants for admission to the Keck School of Medicine

Founder and Editor-in-Chief, Medical Literature Society (MLS) Sept 2017–present
- Founded and managed MLS, an online publication in which students write articles on current topics in medicine and science
- Managed 50+ columnists and 7 other board members
- Designed and maintained the website, organized meetings, and marketed the group on campus and social media
- Oversaw the publication of 60+ articles
- Website: http://www.ucla-mls.com

Community Service

Volunteer, Cancer Support Community Greater San Gabriel Valley Sept 2024–present
- Cancer Support Community provides free support groups, communities, and resources for patients and loved ones suffering from cancer
- Over 42 affiliates across the country and internationally
- Assist with setup and organization of monthly physician-led talks discussing psychosocial methods for managing cancer

Educational Advisor, Everyday Responder Project Apr 2023–present
- Assist in designing presentations that teach high schoolers and laypeople across the world about basic life safety skills
- Presentation topics include cardiopulmonary resuscitation, stroke recognition, and pulmonary education such as recognizing lung sounds and chronic lung conditions

Volunteer, Keck School of Medicine Interdisciplinary Community Outreach Team (Student-Run Clinic) May 2023–present
- Volunteer at free clinics and health fairs for underinsured populations
- Conduct history and physical exams, provide nutrition and chronic disease counseling, take vitals, check wounds

Volunteer, TimeOut at UCLA Dec 2018–June 2020
- Volunteered weekly with Alzheimer's patients to keep their minds stimulated and provide respite for their caregivers
- Talked with the patients and played games with them such as card games puzzles
- Organized and led group activities including a pumpkin-decorating arts and crafts session

Volunteer, No One Dies Alone program at UCLA Health June 2018–June 2020
- Volunteered on-call during evenings and nights to provide companionship for terminally ill patients at UCLA Ronald Reagan Medical Center without friends or family
- Talked with patients, played music, read books, and ensured their comfort as much as possible

Private Tae Kwon Do Instructor June–Aug 2018
- Earned a Second Degree Black Belt through Rolling Hills Tae Kwon Do after 7 years of training
- Instructed 5 private Tae Kwon Do lessons per week to kids between 6-12 years old in Rancho Palos Verdes and Torrance at local parks with 5-10 children per lesson
- Taught Tae Kwon Do forms, self-defense techniques, and life lessons involving responsibility and good behavior

Volunteer, Saving Hearts Foundation Oct 2017–Dec 2019
- Performed free EKG heart screenings at local high schools to screen for sudden cardiac arrest risk in students
- Provided CPR courses to teach others what to do when witnessing a sudden cardiac arrest episode
- Shadowed Cardiologists who interpreted complex results

Lead Patient Transport Volunteer, Ronald Reagan Medical Center July 2017–June 2020
- Discharged patients; transported patients throughout hospital; and worked with physicians, nurses, and other healthcare staff
- Trained new volunteers and helped with the more difficult transportation cases as a Lead Volunteer

Life-Skills Mentor, Mentorship at UCLA Oct 2016–Apr 2019

- Mentored an underserved elementary schooler to encourage higher education, trust, support, creativity
- Met weekly to participate in engaging educational group activities and field trips
- Taught my mentee a weekly science lesson per his request in order to increase his passion for science and education

Relevant Coursework

Graduate School, Caltech

- Biology 250C – Topics in Systems Neuroscience (A)
- Biology 183 – Introduction to Computational Biology and Bioinformatics (A-)
- Biology 250A – Topics in Molecular and Cellular Biology (A-)
- Biology 252 – Responsible Conduct of Research (P)

Medical School, USC

Pre-clinical (all first-attempt passes)

- Biochemistry and genetics
- Immunology
- Pathology
- Infectious Disease
- Hematology
- Cardiovascular System
- Pulmonary System
- Renal system
- Gastrointestinal System
- Reproductive System
- Neural System
- Musculoskeletal System
- Dermatology
- Endocrinology

Clinical

- Radiology research elective
- Pediatrics — inpatient and outpatient (High Pass)
- General and laparoscopic surgery (High Pass)
- Surgical Subspecialty research elective — Urology

Undergraduate, UCLA

- Biomedical Research 5HA – Biomedical Research Concepts and Strategies (A+)
- Biomedical Research 5HB – Biomedical Research Skills and Concepts (A)
- Biomedical Research 193H – Journal Club: Current Topics in Biomedical Research (A)
- Biomedical Research 194H – Research Group Seminars: Data Presentation in Biomedical Research (A)
- Biomedical Research 199 (x3) – Directed Biomedical Research (A)
- Biostatistics 100A – Introduction to Biostatistics (A)
- Chemistry 14A – Atomic and Molecular Structure, Equilibria, Acids, and Bases (A+)
- Chemistry 14B – Thermodynamics, Electrochemistry, and Kinetics (A+)
- Chemistry 14BL – General and Organic Chemistry Laboratory I (A)
- Chemistry 14C – Structure of Organic Molecules (A+)
- Chemistry 14CL – General and Organic Chemistry Laboratory II (A)
- Chemistry 14D – Organic Reactions & Pharmaceuticals (A+)
- Chemistry 153A – Biochemistry: Introduction to Structure, Enzymes and Metabolism (A)
- Life Science 1 – Evolution, Ecology, and Biodiversity (A+)
- Life Science 2 – Cells, Tissues, and Organs (A)
- Life Science 3 – Molecular Biology (A)
- Life Science 4 – Genetics (A)
- Life Science 15 – Life: Concepts and Issues (A)
- Life Science 23L – Introduction to Laboratory and Scientific Methodology (A)
- Life Science 192A – Introduction to Collaborative Learning Theory and Practice (A)
- Math 3C – Linear Algebra and Differential Equations for the Life Sciences (A+)
- MCDB 60 – Biomedical Ethics (A)
- MCDB 138 – Developmental Biology (A+)
- MCDB 144 – Molecular Biology of Cellular Processes (A+)
- MCDB 160 – Principles of Light Microscopy (A)
- MCDB 165A – Biology of Cells (A+)
- MCDB 191 – Cardiovascular Development & Disease (A+)
- MCDB 191 – Mechanisms of Plant Development (A)
- MCDB 198A-C – Honors Research in MCDB (A)
- Nursing C155 – Globalization, Social Justice, and Human Rights (A+)
- Physics 5A – Mechanics and Energy (A+)
- Physics 5B – Thermodynamics, Fluids, Waves, Light, and Optics (A+)
- Physics 5C – Electricity, Magnetism, Modern Physics (A)
- Spanish 3 – Elementary Spanish (A)
- Stats 10 – Introduction to Statistical Reasoning (A+)

Self-Study (Computer Science, Mathematics)

- Computer Science XL 31 – Introduction to Computer Science I (UCLA Extension)
- Object Oriented Programming in Java (UC San Diego – Coursera, 39 hours)
- Data Structures (UC San Diego – Coursera, 25 hours)
- Algorithms Specialization (Stanford – Coursera, 61 hours)
- Discrete Math Specialization (UC San Diego – Coursera, 110 hours)
- Multivariable Calculus (MIT online courseware, 30 hours)
- Linear Algebra (MIT online courseware, 30 hours)
- Differential Equations (MIT online courseware, 30 hours)
- Probability (Harvard – Edx, 45 hours)
- Introduction to Logic (Stanford – Coursera, 54 hours)
- Computer Science: Algorithms, Theory, and Machines (Princeton – Coursera, 20 hours)
- Digital Design (Harvey Mudd – Edx, 70 hours)

- Automata Theory (Stanford – Edx, 45 hours)
- Programming Languages Parts A–C (University of Washington – Coursera, 65 hours)
- Finding Hidden Messages in DNA (Bioinformatics I) (UC San Diego – Coursera, 24 hours)
- Machine Learning (Stanford – Coursera, 60 hours)
- Deep Learning Specialization (DeepLearning.AI – Coursera, 140 hours)
- AI for Medicine Specialization (DeepLearning.AI – Coursera, 60 hours)

Professional Organizations

- American College of Radiology
- American Society of Clinical Oncology
- Radiological Society of North America
- American Physician Scientist Association
- Bioinformatics.org

Skills and Interests

Programming: Python (Expert), R (Expert), SQL (Intermediate), HTML (Basic), C++ (Basic)
Development Environments: VSCode, Jupyter Notebook, Google Colab, Google Cloud Computing
Tools: Github, Conda, Docker, shell scripting (MacOS, Linux), SSH, WordPress, Zotero, Covidence, LaTeX/Overleaf, Box, Electronic Health Records, Microsoft office and Google suite
Data Analysis Libraries: PyTorch, Numpy, Pandas, BeautifulSoup4, Tidyverse, Pyradiomics
Data Visualization Libraries: Matplotlib, Tensorboard, Wandb, OpenCV, ggplot2
Lab techniques: Spatial transcriptomics, RNA-sequencing, TIRF microscopy, protein expression + purification, kinetic assays, qPCR, western blot, microfluidics
Hobbies: Basketball, jazz/ragtime piano, weight-lifting, video games, audiobooks (technology, psychology, classics)