

Neal G. Ravindra, Ph.D.

Machine learning and AI research scientist developing methods to study biology & medicine

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Education

- 2021-2022 **Postdoc in Machine Learning**, Stanford University, **May 2022**
- 2021-2022 **Stanford Graduate School of Business**, Ignite (part-time) program in Executive Education, **March 2022**
- 2019-2021 **Postdoc in Computer Science**, Yale university, **May 2021**
- 2014-2019 **Yale University, Ph.D.**, Integrated Graduate Program in Physical & Engineering Biology and the Biochemistry, Quantitative Biology, Biophysics and Structural Biology track in the Biological & Biomedical Sciences Graduate Program, and the Department of Molecular Biophysics & Biochemistry; Committee: Dr. Jonathan Howard (chair), Dr. Julien Berro (advisor), Dr. Lynne Regan, and Dr. Megan King, **December 2019**
- 2014-2016 **Yale University, M.Phil.**, Molecular Biophysics & Biochemistry, **May 2016**
- 2010-2014 **University of Notre Dame, B.S.**, *cum laude* and *Sigma Pi Sigma* in Physics with a concentration in Advanced Studies, **May 2014**

Honors & awards

- 2022 Best Poster Prize, Illumina R&D Research Symposium
- 2021 YCore Fellowship, Project Lead for non-profit research
- 2020 Best paper award, Graph Representation Learning + Beyond workshop at the 37th International Conference on Machine Learning
- 2019-present NIH Cardiovascular Research Training Fellowship (T32)
- 2019 Synergy of experiment and computation in quantitative biology, EMBO travel award
- 2015-2017 NIH Biophysical Training Grant
- 2014-2015 Raymond & Beverley Sackler Institute Graduate Research Fellowship
- 2015 Physics of Living Systems, travel award
- 2014 Sigma Pi Sigma, Physics Honors Society (top 5% of physics students)
- 2012-2014 Dean's Fellow, University of Notre Dame, College of Arts & Sciences (10 undergraduates/year)
- 2013 Department of Applied & Computational Mathematics and Statistics, Undergraduate Research Fellow
- 2012 Department of Energy Radiation Laboratory, Summer Undergraduate Research Fellowship
- 2011 Summer Service Learning Program Fellow, University of Notre Dame, Center for Social Concerns
- 2010 Andrews Scholar, University of Notre Dame
- 2010 National AP Scholar
- 2011, 2015 American Physical Society and American Chemical Society nominee

Upcoming papers

Ravindra NG, ..., England SK, Aghaeepour N. Deep Representation Learning of Physical Activity and Sleep Patterns During Pregnancy Identifies post-hoc Inferences Associated with Prematurity. (*in revision at npj Digital Medicine*; [website](#))

Sundaram L, Kumar A*, **Ravindra NG***, Salcedo A*, ... TCGA Consortium, Farh K, Greenleaf W. Single-cell analysis of open chromatin landscapes across diverse cancer types. (*under review at Science*)

Aguet F*, **Ravindra NG***, Sundaram L, ... Farh K. Cell-type specific activity of eQTLs across left ventricle identifies causal variants associated with cardiovascular disease risk. (*in submission at Nature Genetics*)

Ravindra NG, Sundaram L, Farh K. Deconfounding copy number variation from single-cell data of cancerous tissue using metadata normalization in tabular data transformers to preserve semantic intermediate representations. (*in preparation for Nature Biotechnology*)

Ravindra NG*, Sehanobish A. sc2drug: a Recommender System using Permutation Invariance for Drug Repurposing Based on Single-Cell Data. (*in preparation for ICLR'24*)

*Corresponding author

Golan N, Kauer DB, **Ravindra NG**, van Dijk D, Cafferty WBJ. Single-cell transcriptional profiling of the adult corticospinal tract reveals forelimb and hindlimb molecular specialization. (*in revision at Nature Medicine*; [pre-print](#))

Ravindra NG, Sehanobish A, Alfajaro MM, Wang B, Foxmann EF, Wilen CB, van Dijk D. Identifying transcriptional determinants of single-cell physiological state with Graph Attention Networks. (*in preparation*)

Tejwani L*, **Ravindra NG***, ... van Dijk D, Lim J. Longitudinal single-cell transcriptional dynamics of the SCA1 cerebellum. (*in revision at Nature Neuroscience*; [pre-print](#))

*Co-first author

Ravindra NG. Comprehensive, endogenous single-copy deletions of endocytic SH3 domains reveal their diverse influences on actin assembly and endocytosis. (*in revision at Cytoskeleton*)

Ravindra NG, Pandit NG, Fernandez R, de la Cruz E, Berro J. Biochemical & mechanical feedback during endocytosis and actin network stiffness dependence on cross-linker elasticity. (*in preparation*)

Publications

2023

Becker M, Nassar H, ... **Ravindra NG**, ... Aghaeepour N. Large-scale Correlation Network Construction for Unraveling the Coordination of Complex Biological Systems. *Nature Computational Science*, 2023. ([paper](#))

De Francesco D, Reiss JD, ... **Ravindra NG**, ... Aghaeepour N. Data-Driven Longitudinal Characterization of Neonatal Health and Morbidity. *Science Translational Medicine*, 2023. (PMID: 36791208; [paper](#))

Espinosa C*, Khan W, ... **Ravindra NG**, ... Aghaeepour N. Multiomic Signals Associated with Maternal Epidemiological Factors Contributing to Preterm Birth in Low- and Middle-Income Countries. *Science Advances*, 2023. (PMID: 37224249; [paper](#))

2022

Becker M*, Dai J*, ... **Ravindra NG**, Gaudilliere B, Aghaeepour N. Revealing the impact of lifestyle stressors on the risk of adverse pregnancy outcomes with multitask machine learning. *Frontiers in*

Pediatrics, 2022. (PMID: 36582513; [paper](#))

Averbuch T, ... **Ravindra NG**, van Spall H. Applications of Artificial Intelligence and Machine Learning in Heart Failure. *European Heart Journal – Digital Health*, 2022. (PMID: 36713018; [paper](#))

Collora JA, Pinto-Santini D, Pasalar S, **Ravindra NG**, ... Spudich S, van Dijk D, Duerr A, Ho YC. Single-cell multiomics reveals persistence of HIV-1 in expanded cytotoxic T cell clones. *Immunity*, 2022. ([pre-print](#); [paper](#); PMID: 35064122)

Unterman A, Sumida TS, ... **Ravindra NG**, ... Hafler DA, Kaminski N, Dela Cruz CS. Single-Cell Multi-Omics Reveals Dyssynchrony of the Innate and Adaptive Immune System in Progressive COVID-19. *Nature Communications*, 2021. (PMID: 35064122; [paper](#))

Ravindra NG, Kao DP. Extracting Vocal Biomarkers for Pulmonary Congestion With a Smartphone App. *JACC HF*, 2022. (PMID: 34969497; [paper](#))

2021

Fuery MA, ... **Ravindra NG**... Felker M, O'Connor CM, Ahmad T, Ezekowitz J, Desai NR. Intercountry differences in guideline-directed medical therapy and outcomes among patients with heart failure. *JACC: Heart Failure*, 2021. (PMID: 33992564; [paper](#))

Ravindra NG*, Alfajaro MM*, Gasque V, ... Eisenbarth SC, Chen S, Williams A, Iwasaki A, Horvath TL, Foxman EF, Pierce RW, Pyle AM, van Dijk D, Wilen CB. Single-cell longitudinal analysis of SARS-CoV-2 infection in human airway epithelium identifies target cells, alterations in gene expression, and cell state changes. *PLoS Biology*, 2021. (PMID: 33730024; [pre-print](#); [paper](#))

*Co-first author

Sehanobish A*, **Ravindra NG***, van Dijk D. Gaining insight into SARS-CoV-2 infection and COVID-19 severity using self-supervised edge features and Graph Neural Networks. *Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI '21)*, 2021. ([pre-print](#))

*Co-first author

Song E*, Zhang C*, ... **Ravindra NG**, ... Iwasaki A. Neuroinvasion of SARS-CoV-2 in human and mouse brain. *Journal of Experimental Medicine*, 2021 (PMID: 32935108; [pre-print](#); [paper](#))

Gevaert AB, Tibebu S, Mamas MA, **Ravindra NG**, ... van Spall H. Clinical phenogroups are more effective than left ventricular ejection fraction categories in stratifying heart failure outcomes. *ESC Heart Failure*, 2021. ([paper](#))

Ramaswamy A, Brodsky NN, ... **Ravindra NG**, ... Kleinstein SH, van Dijk D, Pierce RW, Hafler DA, Lucas CL. Immune dysregulation and autoreactivity correlate with disease severity in SARS-CoV-2-associated multisystem inflammatory syndrome in children. *Immunity*, 2021. (PMID: 33891889; [pre-print](#); [paper](#))

Chouairi F, Mullan CW, **Ravindra NG**, ... Ahmad T, Desai NR. Cannabis and Opioid Use Disorder Among Heart Failure Admissions, 2008–2018. *PLoS One*, 2021. (PMID: 34591847; [paper](#))

Schultz B, Zaliani A, ... **Ravindra NG**, DeLong LN, ... Hofmann-Apiius M. A method for the rational selection of drug repurposing candidates from multimodal knowledge harmonization. *Scientific Reports*, 2021. (PMID: 34040048; [pre-print](#); [paper](#))

2020

Mezzacappa C*, **Ravindra NG***, ... Desai NR, Ahmad T. Clinical implications of differences between

real world versus clinical trial use of axial flow left ventricular assist devices for advanced heart failure. *PLoS ONE*, 2020. (PMID: 33270648; [paper](#))

*Co-first author

Sehanobish A*, **Ravindra NG***, van Dijk D. Permutation invariant networks to learn Wasserstein metrics. *Topological Data Analysis workshop at the 34th Conference on Neural Information Processing Systems (TDA workshop at NeurIPS '20)*, 2020. ([pre-print](#))

*Co-first author

- Spotlight talk

Win J, Alfajaro MM, ... **Ravindra NG**, ... van Dijk D, Kadoch C, Simon MD, Yan Q, Doench JG, Wilen CB. Genome-wide CRISPR Screens Reveal Host Factors Critical for SARS-CoV-2 Infection. *Cell*, 2020. (PMID: 33147444; [paper](#))

Sehanobish A*, **Ravindra NG***, van Dijk D. Gaining insight into SARS-CoV-2 infection and COVID-19 severity using self-supervised edge features and Graph Neural Networks. *Graph Representation Learning and Beyond workshop at the 37th International Conference on Machine Learning (GRL+ at ICML '20)*, 2020. ([paper](#); [pre-print](#))

*Co-first author

- Best paper award recipient ([announcement](#))

- Spotlight talk

Haimovich A*, **Ravindra NG***, ... van Dijk D, Taylor RA. Development and validation of the COVID-19 severity index (CSI): a prognostic tool for early respiratory decompensation. *Annals of Emergency Medicine*, 2020. ([paper](#); [pre-print](#))

*Co-first author

- Incorporated into [MDCalc](#), a popular website for clinical risk assessment

- Part of recommended COVID-19 workflow by American College of Emergency Physicians for use as a triage tool ([press release](#))

Caraballo C, ... **Ravindra NG**, ... Wilson FP, Curtis JP, Grant M, Velazquez EJ, Desai NR, Ahmad T. COVID-19 infections and outcomes in a live registry of heart failure patients across an integrated health care system. *PLoS ONE*, 2020. (PMID: 32997657; [paper](#))

Ravindra NG*, Sehanobish, A*, Pappalardo JL, Hafler DA, van Dijk, D. Disease state prediction from single-cell data using Graph Attention Networks. *Proceedings of the ACM Conference on Health, Inference, and Learning (ACM CHIL '20)*, 2020. ([pre-print](#); [paper](#))

Haimovich A, Warner F, Young HP, **Ravindra NG**, ... Taylor RA. Patient factors associated with SARS-CoV-2 in an admitted emergency department population. *Journal of the American College of Emergency Physicians*, 2020. (PMID: 32838371; [paper](#))

Gruen J, Caraball C, Miller PE, McCullough M, Mezzacappa C, **Ravindra NG**, ... Ahmad T, Desai NR. Sex Differences in Patients Receiving Left Ventricular Assist Devices for End-Stage Heart Failure. *Journal of the American College of Cardiology: Heart Failure*, 2020. (PMID: 32653446; [paper](#))

Mullan C, Caraballa C, **Ravindra NG**, ... Desai NR, Ahmad T. Psychiatric Comorbidity and Outcomes After Left Ventricular Assist Device Implantation for End-Stage Heart Failure. *Journal of the American College of Cardiology: Heart Failure*, 2020. (PMID: 32535119; [paper](#))

Vinholo TF, Mullan CW, Mori M, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T. Outcomes of Left Ventricular Assist Device Implantation with Mitral Regurgitation with and without Concomitant Mitral Operation. *Journal of Heart and Lung Transplantation*, 2020. (PMID: 32465748; [paper](#))

Mullan CW, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T. Questionable Value of Concomitant Tricuspid Valve Procedure with Left Ventricular Assist Device Implantation. *Journal of Heart and Lung Transplantation*, 2020. ([paper](#))

Mullan CW, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T. Clinical impact of concomitant tricuspid valve procedures during left ventricular assist device implantation. *Journal of Heart and Lung Transplantation*, 2020. (PMID: 32593561; [paper](#))

Mullan CW, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T. Clinical Implications of Concomitant Surgical Intervention for Aortic Insufficiency with Left Ventricular Assist Device Implantation. *The Journal of Heart and Lung Transplantation*, 2020. ([paper](#))

McCullough M, Caraballo C, **Ravindra NG**... Ahmad T, Desai NR. Neurohormonal blockade and clinical outcomes in heart failure patients supported by left ventricular assist devices. *JAMA Cardiology*, 2019. (PMID: 31738366; [paper](#))

2019 **Ravindra NG**. Molecular Assembly in the Endocytic Pathway. *Yale University Graduate School of Arts & Sciences Dissertation (ProQuest)*, 2019. ([paper](#))

Caraballo C, DeFilippis EM, Nakagawa S, **Ravindra NG**, ... Desai NR, Ahmad T, Topkara VK. Clinical outcomes after left ventricular assist device implantation in older adults: an INTERMACS analysis. *Journal of the American College of Cardiology: Heart Failure*, 2019. (PMID: 31779930; [paper](#))

Miller E, Caraballo C, **Ravindra NG** ... Ayyaz A, Desai NR, Ahmad T. Clinical implications of respiratory failure in patients receiving durable left ventricular assist devices for end-stage heart failure. *Circulation: Heart Failure*, 2019. (PMID: 31707800; [paper](#))

2018 **Ravindra NG**. Patient-centered and patient-independent technologies in acute neurological injury and the art of making useful medical contributions: an interview with Kevin Sheth, MD. *Yale Journal of Biology and Medicine*, 2018. (PMID: 30258322; [paper](#))

Lacy MM, Ma R, **Ravindra NG**, Berro J. Molecular mechanisms of force production in clathrin-mediated endocytosis. *FEBS Letters*, 2018. (PMID: 30006986; [paper](#))

Ravindra NG. Sensory biology and pain. *Yale Journal of Biology and Medicine*, 2018. (PMCID: PMC5872635; [paper](#))

Teaching

Spring 2019 - Summer 2019 Bystander Intervention Workshop for labs in Molecular Biophysics & Biochemistry Department at Yale University, Co-facilitator

Fall 2018 Bystander Intervention Workshop, curriculum development for Yale Graduate School of Arts & Sciences, Teaching Assistant

Fall 2017 Quantitative and statistical methods in Biophysics & Biochemistry, Graduate-level course at Yale

University, Teaching Fellow

- Fall 2017 Graduate School of Arts & Sciences Sexual Harassment & Climate Orientation, training for incoming graduate and professional students, Instructor
- Winter 2016 Practical Statistics Workshop for graduate students, postdocs, and faculty in Molecular Biophysics & Biochemistry, Teaching Assistant
- Fall 2016 Quantitative Approaches in Biophysics & Biochemistry, Graduate-level course at Yale University, Teaching Fellow
- Summer 2016 Introduction to Programming, Workshop for 1st Year Graduate Students, Integrated Physical and Engineering Biology Graduate program at Yale University, Co-instructor
- Fall 2015 Mathematical Methods in Biophysics & Biochemistry, Graduate-level course at Yale University, Teaching Fellow
- Fall 2015 Statistics for Experimentalists, Physics and Molecular Biophysics & Biochemistry Department Workshop sponsored by the Howard Lab, Teaching Assistant
- Fall 2017 Quantitative and statistical methods in Biophysics & Biochemistry, Graduate-level course at Yale University, Teaching Fellow
- Fall 2017 Graduate School of Arts & Sciences Sexual Harassment & Climate Orientation, training for incoming graduate and professional students, Instructor
- Winter 2016 Practical Statistics Workshop for graduate students, postdocs, and faculty in Molecular Biophysics & Biochemistry, Teaching Assistant
- Fall 2016 Quantitative Approaches in Biophysics & Biochemistry, Graduate-level course at Yale University, Teaching Fellow
- Summer 2016 Introduction to Programming, Workshop for 1st Year Graduate Students, Integrated Physical and Engineering Biology Graduate program at Yale University, Co-instructor
- Fall 2015 Mathematical Methods in Biophysics & Biochemistry, Graduate-level course at Yale University, Teaching Fellow
- Fall 2015 Statistics for Experimentalists, Molecular Biophysics & Biochemistry Department Workshop sponsored by the Howard Lab, Teaching Assistant

Presentations

- 2023 **Alzheimer's Association Annual Meeting**, Amsterdam, Netherlands 2023
 - *Title 1*: Prediction of multiple neuropathologic changes from features available during life
 - *Title 2*: Prediction of neuropathologic lesions from clinical data
 - *Authors*: Phongpreecha T, ... **Ravindra NG**, ... Aghaeepour N.
- 2022 **illumina 2022 R&D Symposium**, Foster City, December 2022
 - *Title*: Prioritizing non-coding somatic mutations in cancer using deep learning

2021

Research in progress seminar for NIH T32 Fellows at Yale, virtual, May 2021

- *Title*: Leveraging geometric deep learning for single-cell data

29th Conference on Intelligent Systems for Molecular Biology and the 20th European Conference on Computational Biology (ISMB/ECCB 2021), virtual, July, 2021

- *Poster*: Prioritization and Proposition of Novel COVID-19 Therapies based on Network Representation Learning
- *Authors*: DeLong LN, ... **Ravindra NG**, van Dijk D, Fröhlich H.

40th American Society for Virology Annual Meeting, virtual, September 2021

- *Talk*: Single-cell longitudinal analysis of SARS-CoV-2 infection in human airway epithelium identifies target cells, alterations in gene expression and cell state changes
- *Authors*: Alfajore MM*, **Ravindra NG***, ... van Dijk D, Wilen CB.

Conference on Retroviruses and Opportunistic Infections, virtual, March 2021

- *Spotlight talk*: Cytokine dysregulation and antigen responses drive T-cell expansion in HIV infection
- *Authors*: Collara JA, ... **Ravindra NG**, ... Spudich SS, van Dijk D, Duerr AC, Ho Y.

35th AAAI Conference on Artificial Intelligence (AAAI '21), virtual, February 2021

- *Main track, contributed talk*: "Gaining insight into SARS-CoV-2 infection and COVID-19 severity using self-supervised edge features and Graph Neural Network"

The American College of Cardiology's 70th Annual Meeting, virtual, May 2021

- *Poster*: Assessing How Reader Reporting of Severe Aortic Stenosis Differs from Guideline-Based Criteria on Transthoracic Echocardiography: Observations from a Large Academic Health System
- *Authors*: Shah N, **Ravindra NG**, ... Krumholz H, Velazquez EJ, Faridi KF.

2020

Topological Data Analysis Workshop at the 34th Conference on Neural Information Processing Systems (TDA workshop at NeurIPS '20), virtual, December 2020

- *Spotlight talk*: "Permutation invariant networks to learn Wasserstein metrics"

Yale Cardiovascular Research Center Research Seminar, virtual, September 2020

- *Talk*: "Identifying transcripts associated with severe COVID-19 and SARS-CoV-2 cell tropism using scRNA-seq" ([slides](#))

Graph Representation Learning and Beyond Workshop at the 37th International Conference on Machine Learning (GRL+ at ICML '20), virtual, Summer 2020

- *Spotlight talk*: "Gaining insight into SARS-CoV-2 infection and COVID-19 severity using self-supervised edge features and Graph Neural Networks" ([slides](#))
- Recipient of Best Paper Award

Association for Computing Machinery Conference on Health, Inference, and Learning (ACM CHIL '20), virtual, Summer 2020

- *Spotlight talk*: "Disease State Prediction From Single-Cell Data Using Graph Attention Networks" ([slides](#))

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: "Use of advanced analytics to examine the incremental prognostic impact of

comorbidities in left ventricular assist device patients” ([abstract](#))

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: “Real-world versus clinical trial outcomes from LVADs” ([abstract](#))

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: “Impact of pre-operative atrial fibrillation/flutter in left ventricular assist device recipients” ([abstract](#))
- *Authors*: Clarke JR, Caraballo C, **Ravindra NG**, ... Desai NR, Freeman J, Ahmad T, Freeman DJ

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: “The impact of social support on outcomes after left ventricular assistance device (LVAD) implantation” ([abstract](#))
- *Authors*: Lawrence J, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: “Clinical impact of psychiatric comorbidities on outcomes after left ventricular assist device implantation” ([abstract](#))
- *Authors*: Mullan C, Mori M, Caraballo C, **Ravindra NG**, ... Geirsson A, Desai NR, Ahmad T

American College of Cardiology, Annual Meeting, virtual, Spring 2020

- *Poster*: “Clinical implications of diabetes among patients with left ventricular assist devices” ([abstract](#))
- *Authors*: Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T

14th Annual Machine Learning Symposium of the New York Academy of Sciences, virtual, Spring 2020

- *Poster*: Graph Attention Networks with Contextually Embedded Edge Features Predict Disease State from Single-Cell Data

2019

American Heart Association (AHA) 2019 Scientific Sessions, Philadelphia, PA, November 2019

- *Poster*: Heart Failure Therapies and Survival for Patients With Left Ventricular Assist Devices ([abstract](#))
- *Authors*: McCullough M, Caraballo C, **Ravindra NG**, ... Ahmad T, Desai NR

American Heart Association (AHA) 2019 Scientific Sessions, Philadelphia, PA, November 2019

- *Talk for Young Investigator Award*: Clinical Implications of Respiratory Failure in Patients Receiving Durable Left Ventricular Assist Devices for End Stage Heart Failure ([abstract](#))
- *Authors*: Miller PE, Caraballo C, **Ravindra NG**, ... Desai NR, Ahmad T

Synergy of experiment and computation in quantitative systems biology, EMBO Workshop, Nove Hradý, Czech Republic, Summer 2019

- *Invited talk*: “Quantifying molecular assembly dynamics during endocytosis: multi-valency and the influence of mechanics on assembly”

American College of Cardiology Annual Meeting, Chicago, IL, Summer 2019

- *Poster*: “Impact of a multi-disciplinary heart failure clinic with health psychology on 30 day readmissions for high-risk veterans with heart failure”
- *Authors*: Levin A, **Ravindra NG**,... Parul Gandhi, MD

6th Annual Symposia on Biophysics & Structural Biology, New Haven, CT, Spring 2019

- *Poster*: "Comprehensive single-copy deletions of SH3 domains in *S. pombe* reveals their diverse influence on actin assembly in endocytosis"

All Points West Research Forum at Yale's West Campus, West Haven, CT, Spring 2019

- *Poster*: "Comprehensive single-copy deletions of SH3 domains in *S. pombe* reveals their diverse influence on actin assembly in endocytosis"

2018

Yale University Molecular Biophysics and Biochemistry Department Retreat, Woods Hole, MA, Fall 2018

- *Poster*: "SH3 domains in endocytosis are not redundant, help regulate actin assembly, and are the single strongest protein connector in endocytic pathway assembly"

Improving the STEM Experience, Summit at Yale University, Spring 2018

- *Poster*: "Building a safe & supportive community through bystander intervention: workshops, conversations, and surveys in one department at Yale"

Yale University Nanobiology Institute Research Seminar, Spring 2018

- *Talk*: "The interchangeability of SH3 domains in endocytosis"

2017

Yale University Molecular Biophysics and Biochemistry Department Retreat, Woods Hole, MA, Fall 2017

- *Poster*: "The interchangeability of SH3 domains in endocytosis"

Yale University Davenport College Graduate Affiliate Research Forum, Spring 2017

- *Talk*: "The specificity of protein interactions in a biological pathway"

2016

Yale University Molecular Biophysics and Biochemistry Department Retreat, Jiminy Peak, MA, Fall 2016

- *Poster*: "Molecular mechanisms of endocytosis borne of varied binding specificity between SH3 domains"

Yale University Nanobiology Institute Research Seminar, Spring 2016

- *Talk*: "Specificity in modular protein interaction domains"

Yale University Raymond & Beverly Sackler Institute Physical & Engineering Biology Research Seminar, Spring 2016

- *Talk*: "Implications of specificity of modular protein interaction domains"

Quantifying Cell Dynamics, NSF Quantitative Biology Conference, Half Moon Bay, CA, Winter 2016

- *Talk*: "SH3 domains: a mismatch between specificity and affinity"

Yale University Nanobiology Institute Research Seminar, Fall 2015.

- *Talk*: "Investigating the role that SH3 domains play in recruiting and stabilizing the endocytic machinery"

2015

National Science Foundation Physics of Living Systems Conference, Arlington, VA, Summer 2015

- *Poster*: "Automating and quantifying the optimal conditions for two dyes in single-molecule switching nanoscopy"

Yale University Molecular Biophysics and Biochemistry Department Retreat, Woods Hole, MA, Summer 2015

- *Poster*: "The role of SH3 domains in the assembly of the endocytic machinery"

Yale University Biological and Biomedical Sciences Graduate Student Recruitment, Spring 2015.

- *Poster*: "Protein turnover and force generation considerations in clathrin-mediated endocytosis"

Mentoring

Spring
2022-Summer
2022

Undergraduate student, mentored in the lab of Nima Aghaeepour

- Omeed Tehrani, Computer Science undergrad at University of Texas

Postdocs, mentored in the lab of Nima Aghaeepour on computational biology & bioinformatics

- Shilpi Sehgal, postdoc in omics in the lab of Virginia Winn at Stanford
- Purnima Narasimhan Iyer, Research Associate in Virginia Winn's lab at Stanford

Graduate Students, mentored in the lab of Nima Aghaeepour on deep learning for time-series

- Camilo Espinosa, Computer Science and Immunology Grad Student
- Samson Mataraso, Biomedical Data Science Graduate Student

Fall 2019-
Summer 2021

Rotation students, mentored in the lab of Prof. David van Dijk

- Mamie Wang, Computational Biology Graduate Program at Yale University (Fall 2019)
- Biqing Li, Computational Biology Graduate Program at Yale University (Fall 2019)
- Jason Bishai, Microbiology Graduate Program at Yale University (Fall 2019)
- Jeremy Gygi, Computational Biology Graduate Program at Yale University (Winter 2019)
- Paul Lee, Neuroscience Graduate Program at Yale University
- Noah Y Lee, Computational Biology Graduate Program at Yale University (Fall 2020)

Graduate students, on use of artificial deep neural networks to assess EHR data quality using graph-based methods, mentored in the lab of Dr. Andrew Taylor and Prof. van Dijk

- Vimig Socrates, Computational Biology Graduate Program at Yale University (Fall 2020 - present)
- David Chang, Computational Biology Graduate Program at Yale University (Fall 2020 - present)

Fall 2019-
present

Postgraduate research associates, mentored in the lab of Prof. David van Dijk

- Victor Gasque, visiting medical student researcher from Universite Paris-Saclay and Faculte de Medecine Lyon Est (Fall 2019 - Fall 2020)
- Aagam Shah, Computer Science postgraduate researcher (Winter 2019 - Winter 2020)
- Sajid Hossain, Medical Student at Yale School of Medicine (Summer 2020 - Fall 2020)

Fall 2020-
present

Undergraduate students, mentored in the lab of Prof. David van Dijk

- Ramon Canziales, Physical and Engineering Biology NSF REU (summer 2020)
- Juanru Guo, Applied Mathematics student at Tsinghua University (Fall 2020 - present)

Summer 2018-
Fall 2019

Ruhira Ray, Undergraduate Student in Data Science & Statistics at Yale and Yale Summer Research Fellow, mentored in the lab of Prof. Julien Berro

2017-2018

Lukas Fuentes, 1st Year Graduate Student in Cell Biology, mentored through Yale Biological & Biomedical Sciences mentorship program

Yishu Zhou, 1st Year Graduate Student in Applied Physics, mentored through Yale Office of Graduate Student Diversity & Development mentorship program

2016-2017 I-Chieh Wang, 1st Year Graduate Student in Molecular Biophysics & Biochemistry, mentored through Yale Biophysics, Biochemistry, and Structural Biology mentorship program

2016-2017 Rotation students, mentored in the lab of Prof. Julien Berro

- Peter Nimii, Biochemistry, Quantitative Biology, Biophysics, and Structural Biology Graduate Program at Yale University (Fall 2017)
- Catherine Amaya, Biochemistry, Quantitative Biology, Biophysics, and Structural Biology Graduate Program at Yale University (Fall 2016)

2015-2018 Undergraduate students, mentored in the lab of Prof. Julien Berro

- Michael Najem, Undergraduate Student in Molecular Biophysics & Biochemistry and Yale Summer Research Fellow (Summer 2017 - Spring 2018)
- Stephanie Warnken, Undergraduate Student and Physical and Engineering Biology NSF REU (Summer 2015)

Professional experience

September
2022-present

Staff Deep Learning and AI Research Scientist, Illumina AI Research Lab and Genome Interpretation Department, Foster City, CA

- Built multimodal Transformer-based and Variational Inference based Deep Learning models to build on structure prediction and evolutionary conservation to score and interpret genetic variants and identify drug candidates by associating pathogenic variants with clinical phenotypes and lab assays across large publicly available datasets (UK BioBank, Genomics England).
- Developed Representation Learning methods, Alignment constraints, and Interpretable Deep Learning models to debias and deconfound intermediate representations using Contrastive Learning approaches
- Developed a new Deep Learning method to remove the bias of copy-number variation in cancer cells to integrate single-cell omics data and model genome regulation more accurately using deep learning
- Built massively parallelized and distributed training and inference tooling for mutation scoring and prioritization that allow researchers to derive insights from big data in biology using ML/AI approaches while ensuring that models do not make provide wrong, biased, and confounded putative mechanisms
- Developed a massively distributed framework to identify important genetic subsequences and targets, and to filter and score contexts of variants using in silico mutagenesis to improve the fidelity and accuracy of deep learning modeling in genetics.
- Lead to **2 patents** and at least **3 publications**.
 - Denoising autoencoder for correcting copy number variation in cancer scATAC data (*provisional*; **Ravir Farh K, Sundaram L**)
 - Prioritizing somatic non coding mutations in cancer using scATAC data (*provisional*; Kumar A, **Ravir Salcedo A, Farh K, Sundaram L**)

June 2022-
September
2022

Senior Deep Learning/AI Research Scientist at Illumina AI Lab, Foster City, CA

Deep learning research for decoding genomic sequences, i.e., connecting sequence to protein structure, cellular expression, and clinical phenotype data. Broadly, worked on projects to learn life's languages and transferred these systems' insights to personalized medicine and drug discovery applications.

- July 2021-
June 2022 (deferred) **Assistant Professor** in the *Department of Pulmonary & Critical Care* and the *Department of Computer Science*, and faculty of the *Institute on Complex Systems* at *Northwestern University* in Chicago, IL
Research focus: machine learning at the intersection of clinical and biological sciences
Activity: advised 5+ postdocs and graduate students and wrote grants to set up a dry lab. Developed curriculum to teach dozens of students foundations of ML and AI and biomedical data science.
 *Still determining the start date, resigned in June 2021 to pursue research in industry.
- May 2021-
June 2022 **Postdoctoral Fellow** in the *Department of Biomedical Data Science* and the *Department of Anesthesiology* at *Stanford University* in Stanford, CA
Advisors: Dr. Nima Aghaeepour
Research focus: Applied machine learning research, ML4biology, ML4healthcare, XAI, time-series, echocardiograms and electrocardiography, multi-modal representation learning.
 Developed a new applied deep learning architecture for time-series based on convolutions and self-attention (similar to ConViT but for time-series) and applied this model to a large actigraphy dataset to better understand the associations between physical activity, sleep, chronodisruption, and poor pregnancy outcomes. Developing an interpretable, contrastive GNN model to better understand the role of sociodemographic factors in SARS-CoV-2 infectivity across California (collaboration with SafeGraph and Jure Leskovec). Developing an explainable AI tool using electrocardiogram data to provide tracked metrics from echocardiograms during surgery. Preparing a manuscript, on "Predicting gestational age from activity data with an error analysis of a new deep learning model for time-series that portends risk of pre-term birth" for *Nature Medicine*.
- Winter 2021-
present **Intern** in the *University of California San Francisco (UCSF) Clinical & Translational Science Institute Catalyst Program*
Track: Digital Health, Therapeutics
 Reviewed and participated in the UCSF Catalyst Awards Program and partnered with academic applicants in interacting with industry contacts. Learned how to advance academic discovery through a translational path of commercialization through workshops, experts at UCSF, and partnering venture capital firms.
- Sept 2019-
Summer 2021 **Postdoctoral Fellow** in the *Department of Internal Medicine* (Cardiovascular Research Center of the Section of Cardiovascular Medicine) at the *Yale School of Medicine* and the *Department of Computer Science* at *Yale University* in New Haven, CT
Advisors: Dr. David van Dijk and Dr. Jeffrey Bender
Research focus: I developed a number of machine learning models to study biology & medicine and spearheaded applied ML research on electronic health records (EHR) and single-cell transcriptomics data in collaboration with clinicians and biologists. I wrote several NIH and foundation grants with Prof. van Dijk and collaborators in cardiovascular research, immunology, and microbiology using denoising autoencoders, segmentation and self-supervised learning computer vision tasks to process microscopy images as well as multi-task learning to analyze multi-modal omics data for preliminary results. I have focused primarily on graph neural networks and attention mechanisms in my research. I have also developed new DL architectures, namely, permutation invariant networks to learn Wasserstein metrics and gain insight into the properties of representations learned by ANNs, developed clinical decision support models for implementation in the clinic, and developed ML methods to study the dynamics of single-cell transcriptomics data. I shifted specialization to causal inference and disentangled representations, while continuing to develop applications of Graph Neural Networks for self-supervised and supervised learning tasks and permutation invariant networks for unsupervised learning tasks before moving to Stanford.

March 2020-
Dec 2020

Computational sciences researcher (volunteer) at *Yale University's* COVID-19 Research Collaboration Initiative

Advisors: primarily advised by Dr. Craig B. Wilen, Dr. Andrew Taylor, and Dr. David van Dijk

Research focus: I developed a new computational method in unsupervised learning, CONditional DENsity Embedding (CONDENSE), to characterize and compare temporal gene dynamics in response to infection using single-cell transcriptomics data of SARS-CoV-2 infected human bronchial epithelium organoids. I also developed a new self-supervised learning algorithm using Graph Attention Networks to improve performance with novel edge features and to use techniques from explainable AI (XAI) to learn transcriptomic and cellular signatures associated with SARS-CoV-2 infection and severe COVID-19. I also developed a clinical model based on emergency department electronic health records data to predict disposition of SARS-CoV-2+ patients and a simplified model (quick COVID-19 Severity Index) that ER physicians can use to triage patients during the pandemic. Finally, I worked with a number of labs to analyze multi-omics data (scRNA-seq, single-cell CRISPR screens, CITE-SEQ, and ATAC-Seq) related to clinical trials for COVID-19 treatments (tocilizumab) and to identify phenotypes and molecular & cellular determinants of increased susceptibility for multi-inflammatory syndrome in children associated with severe acute respiratory syndrome coronavirus 2 (MIS-C).

Dec 2020-
present

Founder of mycoML, a non-recurring engineering services and consulting LLC for ML.

About mycoML: I incorporated a company to serve as a consulting and collaboration service that relies on talented ML researchers to continually develop new machine learning methods to analyze and study translational, clinical, and biomedical research datasets. mycoML aims to advance healthcare by identifying novel therapeutic targets and biomarkers from large biomedical data sets, proposing novel therapeutic targets or ranking drugs for repurposing, and for implementing and distributing AI-powered clinical decision support models and tools.

Activities: mycoML sponsored a collaboration speed dating event at the Yale School of Medicine to allow clinicians and biologists to meet data scientists, statisticians, and other quantitatively-minded individuals, and filled the gap in personnel for projects with our own analysts. We also rely on a growing trove of in-house, pre-processed datasets to provide insights to researchers and healthcare institutions in transfer learning tasks.

May 2015-
Sept 2019

Ph.D. dissertation research in the *Department of Molecular Biophysics & Biochemistry* and the *Nanobiology Institute* at *Yale University* in New Haven, CT

Advisor: Dr. Julien Berro; *Thesis committee:* Dr. Jonathan Howard (chair), Dr. Megan King, and Dr. Lynne Regan; *External reviewer:* Dr. Bruce Goode, Brandeis University

Dissertation title: "Molecular assembly in the endocytic pathway"

Research focus: I studied molecular assembly within living cells from the perspective of quantitative biology, synthetic and systems biology, and computational biology as part of an interdisciplinary graduate program. To study molecular assembly, I experimented with SH3 domains, a sub-molecular domain that spatiotemporally brings molecules together to effect function, in the cellular context of endocytosis, during which molecules are rapidly assembled at the cell's membrane to internalize cargo. I found that SH3 domains have diverse influences on actin assembly in the cell and engineered a synthetic membrane scaffold system in vivo to study the extent to which SH3 domains recruit proteins. I also developed an approach to distinguish between two models of interaction specificity and supported the hypothesis that SH3 domains achieve interaction specificity primarily through domain-mediated specificity, in which SH3 domains' unique biophysical properties are more critical determinants of function than their molecular or cellular context. I evaluated several different models of force production in endocytosis and relied on physical simulations and protein engineering to show that there is feedback between biochemical recruitment and the underlying mechanical properties of the endocytic molecular machinery. Lastly, I helped to develop in vivo force biosensors, demonstrating a proof-of-concept experiment, which can be used to distinguish between different models of force production during endocytosis.

- Jan 2019- May 2021 **Biomedical data science research associate** (volunteer) with the *Section of Cardiovascular Medicine*, Department of Internal Medicine at *Yale University* in New Haven, CT
Advisors: Dr. Tariq Ahmad & Dr. Nihar R Desai
Research focus: I applied various big data analytical techniques, biostatistics, and statistical machine learning for observational studies of national registry data & to clinical trial data for various post-hoc statistical analyses and clinical reports. I applied classical biostatistics methods and led projects using statistical ML or ensemble learning to predict outcomes, evaluate time-to-event or time-varying survival analyses to predict various cardiovascular-related outcomes and adverse event frequencies, implemented various kernel-based methods to identify high-risk patient cohorts, used techniques from explainable AI to rank variable importance for various outcomes-prediction tasks, and implemented Markov models to suggest clinical decision making processes. Primarily, I worked with a number of cardiologists to study outcomes for patients who received mechanical circulatory support (INTERMACS dataset), cost for heart failure related procedures (HCCI dataset), in-depth clinical trials of heart failure (GUIDE-IT dataset), outcomes and adverse events related to heart transplantations (UNOS dataset), and outcomes related to practices at a single-cell center (Yale New Haven Health data).
- Fall 2017- Spring 2018 **Research Assistant** in scientific communication for a book written by Carl Zimmer, science writer, and published by *Dutton Books, Penguin Random House*
Advisor: Carl Zimmer, adjunct professor at Yale University and *New York Times* columnist
Research focus: I transcribed, researched, fact-checked, and edited the science and non-fiction book written by the *New York Times* columnist and popular science writer, Carl Zimmer. My work focused on accurately presenting genetics for a popular audience, accurately summarizing a history of heredity, and proper scientific interpretation of contemporary genetics research. The book was critically acclaimed and nominated for a PEN award.
Book title: “She Has Her Mother’s Laugh: the Powers, Perversions, and Potential of Heredity,” Dutton Books, 2018
- Jan 2015- June 2015 **Interdisciplinary research** as part of Sackler Institute’s Graduate Program for *Physical and Engineering Biology* Integrated Workshop at *Yale University*
Research focus: Worked on two projects: (1) I developed and implemented a systematic, automated and quantitative characterization of organic dyes to optimize imaging conditions for super-resolution microscopy (PALM/STORM) experiments. This project was supervised by *Dr. Joerg Bewersdorf* in *Cell Biology, Biomedical Engineering, and Applied Physics* at Yale University. (2) I studied the effect of core residue’s influence on protein folding by computational mutation analyses. Specifically, I employed Voronoi tessellations on a set of high-quality crystal structures from the PDB to calculate a residue’s volume and identify core residues, then I estimated angular distributions per residue using a Lennard-Jones’ potential to predict and generate a core residue’s possible torsion angles. This project was supervised by *Dr. Lynne Regan & Dr. Corey O’Hearn* in *Mechanical Engineering & Materials Science, Physics, Computational Biology & Bioinformatics, and Molecular Biophysics & Biochemistry* at Yale University.
- Nov 2014- Feb 2015 **Graduate Program Rotation Research** in *Molecular Biophysics & Biochemistry, Computational Biology, and Cell Biology* at *Yale University’s Nanobiology Institute*
Advisor: Dr. Julien Berro
Research focus: I utilized super-resolution microscopy and *S. pombe* to study protein recruitment and turnover at the plasma membrane for endocytic-associated proteins and developed a mechanical simulation of actin networks that treated actin protein filaments as rigid rods interconnected by springs, representing protein crosslinkers. Simulation was constructed with stochastic polymerization kinetics and classical mechanics in C++ to simulate the scission of the plasma membrane in endocytosis.

Departmental research presentation: “Protein turnover and force generation considerations in clathrin-mediated endocytosis”

Aug 2014–
Nov 2014

Graduate Program Rotation Research in *Biomedical Engineering* and *Cell Biology* at *Yale University*

Advisor: Dr. Joerg Bewersdorf

Research focus: I calculated and compared estimations of background noise in PALM/STORM images using various machine-learning algorithms (SVM and Gaussian Mixture Models), eigen-backgrounds, and spatiotemporal filters to improve post-processing results after denoising and developed an automated protocol to train stimulation and depletion laser beam pulses to optimally overlap in time before capturing STED microscopy images, theoretically improving imaging resolution.

Departmental research presentation: “A comparison of various background models in PALM/STORM microscopy and a method for optimizing temporal overlap of stimulation and depletion pulses in STED microscopy using machine-learning”

June 2014–
Sept 2014

Graduate Program Rotation Research in *Applied Physics* and *Molecular Biophysics & Biochemistry* at *Yale University*

Advisor: Dr. Jonathon Howard

Research focus: I developed a 2D-error function fitting and automated tracking method to analyze the motion of isolated Chlamydomonas axonemes at the base of the structure and performed experiments to fit tracking results to a new analytical description of the axoneme's wave-like motion.

Departmental research presentation: “Tracking isolated and motile axonemes with nanometer precision at the base to add a sliding term to the axoneme's equation of motion”

Spring 2014

Undergraduate Thesis Research in the *Department of Physics* and the *Department of Applied and Computational Mathematics and Statistics* at the University of Notre Dame

Advisor: Dr. Mark Alber

Research focus: I used Monte Carlo methods and an Ising model with chemotaxis, rule-based simulations in MATLAB to explain how molecular factors associated with angiogenesis can lead to blood-vessel growth and nutrient exploitation by tumors. Using independent component analyses, I studied the parameter space that influences tumor growth and proposed metrics to estimate drug efficacy at indirectly reducing tumor growth.

Thesis title: “Tumor induced angiogenesis: a mathematical model across multiple time and length scales”

Spring 2013–
Summer 2014

Undergraduate Research Assistant in the *Department of Physics* and the *Department of Applied and Computational Mathematics and Statistics* at the University of Notre Dame

Advisors: Dr. Mark Alber and Dr. Cameron W. Harvey

Research focus: I developed MATLAB simulations to model periodic reversal behavior and swarming in mycobacteria. I also segmented and analyzed experimental movies to record cell division, reversals in motion, and social behavior in bacterial swarms. I worked on fitting a constructed model with experimental data and developing image analyses routines to track single bacterial cells. I also focused on numerical computation and partial differential equation solvers to quantify population-scale fluid-dynamic behavior in a bounded volume.

University of Notre Dame, 2014 Undergraduate Research Symposium presentation: “Swarming and periodic bacteria in cellular populations: analogies with fluid-dynamics to align experiment and theory”

Fall 2011–
Spring 2013

Undergraduate Research Fellow at the **Department of Energy, Radiation Research Laboratory** and the *Department of Physics* at the University of Notre Dame

Advisor: Dr. Sylwia Ptasinska

Research focus: I analyzed DNA mono- and bi-layers on silicon surfaces exposed to radiation with atomic force microscopy. I also utilized X-ray photoelectron spectroscopy to observe chemical changes

in DNA layers and helped to set up the spectrometer as well as a lab server (Linux) and data analysis pipelines with MATLAB and LabView.

University of Notre Dame, 2013 Undergraduate Research Symposium poster: “In situ observations of single-stranded breaks in DNA using x-ray photoelectron spectroscopy calibrated with atomic-force microscopy”

Fall 2009-
Summer 2010

Research Assistant at Community Howard Regional Health Clinical Research Center and the Department of Hematology and Oncology

Advisors: Dr. Naftali Bechar and Dr. Mark Salter

Research focus: I conducted chart-review and investigated the incidence of embolisms in orthopedic post-operative patients. I compared the hospital's adherence to the American College of Surgeons guidelines in totem and on a provider basis. I presented my findings and recommendations to the hospital's administration and proposed a post-op guidelines checklist to be completed by attending surgeons.

2011-2014

Student work study, Hesburgh Library Information Technology Support Employee at the University of Notre Dame

2011-2014

Student work study, Physics & Engineering Library Employee at the University of Notre Dame

Service & outreach

Winter 2021-
present

Reviewer for *BioMed Central*

Fall 2021

Reviewer for Neural Information Processing Systems 2021, Datasets and Benchmarks track

Winter 2021-
present

Reviewer for *Signal Processing*

Spring 2021-
present

Reviewer for the journal *Frontiers in Immunology*

Fall 2020-
present

Statistics Reviewer for the *Journal of the American College of Cardiology: Heart Failure*

Fall 2020-
present

Reviewer for the journal *Genome Biology*

Fall 2020-
present

Reviewer for the journal *Frontiers in Public Health*

Fall 2020

Reviewer for the 15th conference for Machine Learning in Computational Biology (MLCB '20)

Spring 2020-
present

Reviewer for the *Yale Journal of Biology & Medicine*

Summer 2017-
Summer 2019

Co-chair of the Bystander Intervention Committee, sub-committee of the Committee on Climate and Diversity in the Department of Molecular Biophysics & Biochemistry at Yale University

Overview of activities: A small group of students, postdocs and staff, and faculty in the Department of Molecular Biophysics & Biochemistry started a committee to collect data, recommend actions, and implement interventions to make the department more inclusive. As a committee member, I helped to organize, plan, and implement training workshops, lectures, and town-hall meetings to continually improve professional conduct and individual behaviors. I joined a sub-group in pursuing curricular

development for a Bystander Intervention Training Workshop to be given to small groups of labs. I co-facilitated 3 courses with Tara Alpert and co-chaired the sub-committee from Summer 2018 - Summer 2019. We partnered with the Graduate School of Arts and Sciences Office for Graduate Student Development & Diversity to give an hour long workshops to various groups of labs throughout the science departments at Yale University and Yale School of Medicine.

Fall 2018-
Summer 2019

Managing Editor at the *Yale Journal of Biology & Medicine*

Overview of activities: I oversaw the peer-review process and the arrangement of a variety of special journal issues, including Nutrition & Food Science, Medical Technology, Ecology & Evolution, Attention Science, Cycles and Clocks, Organelles, and Death. I also maintained the online submission system (Scholastica) and updated the manuscript editor guidelines, which trains incoming editors how to solicit manuscripts, manage the peer review process, handle author correspondence, and how to prepare an accepted submission for publication. I also tracked and analyzed our performance metrics to prepare YJBM for a second Impact Factor application, which was successful for the subsequent leadership team. I also oversaw the arrangement of the colloquium series for 4 special issues.

Fall 2018-
Spring 2019

Podcast Coordinator at the *Yale Journal of Biology & Medicine*

Overview of activities: I oversaw the content creation and recording of podcasts on Clocks and Cycles, Comparative Medicine, Death, Drug Development, Medical Technology, Nutrition and Food Science, Organelles, and Attention Science. I managed a team of 5 podcast producers and hosts (graduate and professional students at Yale) in weekly meetings (dubbed the YJBM PodSquad) to create content related to YJBM's quarterly focus topics, interviews of notable with recent research advances pertinent to our focus topics, and author and editor interviews of the content featured in YJBM.

Spring 2016-
Summer 2019

Projects Editor, Podcast Producer, and Co-Host at the *Yale Journal of Biology & Medicine*

Overview of activities: I have hosted, edited, researched, produced, and written over 15 podcasts, interviewing notable Yale faculty members like David Hafler, Richard Prum, Jessica Cardin, and Pasquale Patrizio. I have also published, open-access book reviews, issue intros, and interview pieces through YJBM.

Spring 2017-
Spring 2018

Deputy Editor at the *Yale Journal of Biology & Medicine*

Overview of activities: I arranged an issue on Nutrition & Food Science in June 2018, Sensory Biology & Pain in March 2018, and Gene Editing in December 2017 and managed manuscript editors to oversee the review process and prepare manuscripts for publication.

Spring 2016-
Spring 2017

Manuscript Editor at the *Yale Journal of Biology & Medicine*

Overview of activities: Solicited authors, reviewers, and handled the correspondence, peer-review, and copy editing process for issues on Infection Diseases, Epigenetics, Comparative Medicine, Gene Editing, Nutrition and Food Science, and Cycles and Clocks.

Fall 2020-
present

Peer Specialist (volunteer) at the *NYC Well* and *Here2Help Connect Crisis Call Center*, part of the National Suicide Prevention Lifeline network

Overview of activities: Received counselor training to be on call and available for a mental health and suicide prevention peer support for 2h/week

Spring 2017-
Spring 2019

Founding Board Member and **Editor** at *Distilled* (<https://yaledistilled.sites.yale.edu/>), a scientific communication magazine run by students

Overview of activities: Coordinated annual issue topics and goals for each issue, solicited writers and external funding, and content and copy edited long-form essays for two issues

- Fall 2014-present **Reviewer and Committee Member** of the *Scientific Review Committee* for New Haven Public Schools (NHPS) as part of the annual NHPS Science Fair Program for K-12 students
Overview of activities: Read and reviewed K-12 science fair project proposals. Offered students recommendations, comments, and acceptance/rejection of projects based on safety regulations. Reviewed and enumerated safety considerations for projects involving human subjects and hazardous materials or substances.
- Summer 2019-present **“Friday Night Run” volunteer** part of the *Healthcare for the Homeless* program at *Cornell Scott Hill Health*
Overview of activities: Every Friday night, a handful of volunteers assist Phil Costello and Chloe Andree to offer medical services, supplies, follow-up consultations, or walk-in clinic scheduling to New Haven’s homeless shelter. I primarily function in a triage assistance role and scribing, and we visit locations throughout New Haven as well as shelters.
- Fall 2016-Summer 2019 **Mentor and Graduate Student Fellow** at *Davenport College* at Yale University
Overview of activities: I was an undergraduate mentor and an affiliate of an undergraduate college. Primarily, I advised undergraduate students on getting involved with research and reviewed science graduate school applications, in addition to planning two programming events per semester.
- Fall 2016-Summer 2017 **Science Fair Mentor** for the 2nd Grade Class at Barnard Magnet Elementary School as part of the annual New Haven Public Schools annual Science Fair program
Overview of activities: I mentored a second grade class to complete a project investigating the effect of different soil and sand compositions on the extent of runoff and their effect on plant growth and helped them complete the project and present it at the NHPS Annual Science Fair.
- Fall 2010-Summer 2014 **Tutor and volunteer** at the *Center for the Homeless* in South Bend, IN
Overview of activities: I assisted families with children of all ages as a tutor in math, history, reading, and writing and I helped students with weekly homework assignments (2h/week study hall). I also supervised weekly recreation time in the library, reading room, and grounds.
- Summer 2011 **Long-term volunteer** at Operation Helping Hands in New Orleans, LA
Overview of activities: Along with 3 other students and 2 AmeriCorps volunteers, I completed construction of a residence destroyed by Hurricane Katrina and worked on various carpenter projects at two other NOLA homes damaged by the storm. I also volunteered with other organizations through Catholic Charities, such as a partnership with Habitat for Humanity, as funded by the Summer Service Learning Program at the University of Notre Dame. On weekends, I traveled to Tuscaloosa, AL, to assist with clearing and demolishing damaged houses from the 2011 Tuscaloosa-Birmingham tornado.

Leadership

- Summer 2021-present **Project Lead, YCore -- Latinas Contra Cancer** partnership
 Lead a team of 4 YCore fellows to automate data collection from participants in health education programming events organized by Latinas Contra Cancer, a local, community based non-profit, and integrate and analyze this data into their Salesforce application. We created pre-registration, post-course, and follow-up surveys and templates and constructed a dashboard analysis pipeline to track the impact of Latinas Contra Cancer on empowering Latinas and their family & friends in managing their health and wellbeing, regardless of documentation status.
- Spring 2019-Summer 2019 **Bystander Intervention Committee Co-Chair and Co-facilitator for Training**, Committee on Climate & Diversity, Department of Molecular Biophysics & Biochemistry at Yale University

Overview of duties: I co-led (with Tara Alpert) a small group of students, postdocs, and faculty in developing and adapting a curriculum that aimed to teach our scientific community bystander intervention techniques as a way to improve the climate and promote inclusivity within our scientific community. We partnered with the Graduate School of Arts and Sciences Office for Graduate Student Development & Diversity to give an hour long workshops to various groups of labs throughout the sciences at Yale University and Yale School of Medicine.

Sept. 2016-
Summer 2019

Yale Journal of Biology & Medicine Managing Editor, Podcast Coordinator, and Deputy Editor Spring 2018 – Spring 2019, and Deputy Editor, Spring 2016 – Fall 2017.

Overview of duties: As the managing editor, I ran twice-monthly editorial and executive board meetings, managed manuscript submissions and reviews, and ran the podcast team associated with producing episodes for each quarterly issue. As deputy editor, I lead a team of manuscript editors to complete 3 special issues (~10 original research articles per issue).

Spring 2012-
Spring 2013

Junior Class Vice President, University of Notre Dame Class of 2014 Student Government

Overview of duties: As vice president, I ran weekly council meetings, directed class fundraising efforts, organized various committee projects, represented the class at monthly meetings with university administrators, and aided in deciding which programs and events to sponsor and fund.

Spring 2011-
Spring 2012

Director of the Department of Academic Affairs, University of Notre Dame Student Government

Overview of duties: Represented the student body on university governing bodies. Founded two new lecture series. Founded two informal interdisciplinary bi-monthly informal seminars. Secured indefinite university funding for programs promoting intellectual engagement on campus. Established a database for course syllabi. Wrote an approved amendment to the university's Academic Code for expanded opportunity for pass/fail course grading options.

Other training certifications & workshops

Spring 2021

Mental Health First Aid, virtual, training by the *National Council for Behavioral Health*

Fall 2018

Bystander Intervention Facilitator Training, at Yale University, by the Office of Diversity & Inclusion and the Office of the Provost

Skills

Programming Languages: Python, R, C++, Julia, Perl, HTML

Tools: Mathematica, MATLAB, LaTeX, Origin, LabView, PyTorch, TensorFlow, SQL, RAID, LVM, Jax, coLaboratory, Kubernetes, Apache Spark, Databases (Salesforce/MongoDB)

Technical skills: deep learning (computer vision, denoising autoencoders, CNNs and ResNets), causal inference (DAG learning), generative modeling (VAEs, GANs), time-series and sequence modeling (autoregressive models, transformers), contrastive learning, self-supervised learning, curriculum learning, mathematical modeling (Markov models, Monte Carlo simulations), yeast genetics, CRISPR-Cas9 genome editing, quantitative microscopy, super-resolution microscopy (LM, STED), bulk FRET, FRAP, TIRF, circuit board design, machine learning (dimensionality reduction, clustering and unsupervised learning, self-supervised and supervised learning), ensemble learning, observational study design, Linux system administration (RAID, LVM), cloud

computing, basic website design, single-cell omics analysis, time-to-event or survival analysis, propensity-matching, basic graphic design (Illustrator)

References

Prof. David van Dijk ~ Postdoc Mentor

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Dr. Andrew Taylor ~ Mentor in using ML for healthcare and informatics

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Dr. Nihar Desai ~ Mentor in using ML for healthcare and implementation science

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Prof. Jonathan (Joe) Howard ~ Graduate Thesis Committee Chair

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Prof. Lynne Regan ~ Graduate Thesis Committee Member

Chair of Interdisciplinary Science at the Centre for Synthetic & Systems Biology, University of Edinburgh

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Prof. Megan King ~ Graduate Thesis Committee Member

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Dr. Jeffrey Bender ~ YJBM Faculty Mentor and PI overseeing my postdoctoral funding award

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Prof. Craig B. Wilen ~ Collaborator for COVID-19 related biological research projects

Assistant Professor of Laboratory Medicine and of Immunobiology

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