Kelly Cochran

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EDUCATION

Stanford University Sep 2019 - Current

Computer Science Ph.D. candidate, advised by Dr. Anshul Kundaje
Pierre & Christine Lamond Fellow, Stanford Graduate Fellowship (2019 - 2022)

Duke University Aug 2014 - May 2018

B.S. in Computer Science (GPA: 3.8)
Minors in Statistical Science, Computational Biology & Bioinformatics
Angier B. Duke Memorial Merit Scholarship

RESEARCH EXPERIENCE

Kundaje Lab - Stanford University Sep 2019 - Current

Ph.D Candidate, Computer Science Department

- Developed ProCapNet to dissect how genomic sequence regulates transcription via a state-of-the-art, interpretable deep learning framework, as part of ENCODE
- Worked with the GENCODE consortium to improve gene annotations using ProCapNet
- Mentored several high school and undergraduate students through research projects

Mahony Lab - Pennsylvania State University June 2018 - Aug 2019

Research Tech, Center for Eukaryotic Gene Regulation

- Trained neural networks to predict transcription factor binding events across species, diagnosed cross-species model pitfall, and proposed an effective solution
- Presented talks at MLCB 2019, ISMB 2021; 1st-author publication in *Genome Research*

Kay Lab - Duke University Dec 2015 - May 2018

Undergraduate Researcher, Neurobiology & Ophthalmology Departments

- Analyzed PacBio deep long-read sequencing data to discover unannotated isoforms
- Sole developer of R package to validate, characterize, and visualize isoform diversity

Wang Lab - University of California, Los Angeles Summer 2017

Bruins-In-Genomics Fellowship

- Assisted development of a statistical method to detect Type II Diabetes in patients using gut microbiome RNA-seq data; won Best Poster Award

PUBLICATIONS

Cochran, K., Yin, M., Mantripragada, A., Schreiber J., Marinov, G., Yu, H., Lis, J.T., & Kundaje, A. 2024. Dissecting the *cis*-regulatory syntax of transcription initiation with deep learning. *bioRxiv*. [Preprint] [Code]

Martyn, G.E., Montgomery, M.T., Jones, H., Guo, K., Doughty, B.R., Linder, J., Chen, Z., **Cochran, K.**, Lawrence, K.A., Munson, G., Pampari, A., Fulco, C.P., Kelley, D.R., Lander, E.S., Kundaje, A., Engreitz, J.M. 2024. Rewriting regulatory DNA to dissect and reprogram gene expression. *bioRxiv*. [Preprint]

Cochran, K., Srivastava, D., Shrikumar, A., Balsubramani, A., Hardison, R.C., Kundaje, A., & Mahony, S. 2022. Domain-adaptive neural networks improve cross-species transcription factor binding prediction. *Genome Research.* [Paper] [Code]

Ray, T., **Cochran, K.**, Kozlowski, C., Wang. J., Alexander, G., Cady, M.A., Spencer. W.J., Ruzycki, P.A., Clark, B.S., Laeremans, A., He, M-X., Wang, X., Park, E., Hao, Y., Iannaccone, A., Hu, G., Fedrigo, O., Skiba, N.P., Arshavsky, V.Y., & Kay, J.N. 2020. Comprehensive identification of mRNA isoforms reveals the diversity of neural cell-surface molecules with roles in retinal development and disease. *Nature Communications*, 11(1): pp. 1-20. [Paper] [Code]

Ray, T., **Cochran, K.**, & Kay, J. 2019. The enigma of *CRB1* and *CRB1* retinopathies. In: Bowes Rickman C., Grimm C., Anderson R., Ash J., LaVail M., Hollyfield J. (eds) Retinal Degenerative Diseases. *Advances in Experimental Medicine and Biology*, vol 1185. Springer, Cham.

TALKS

Intelligent Systems For Molecular Biology (ISMB), Lyon, France — July 2023
- World's largest bioinformatics conference; 12% talk acceptance rate

Symbolic Systems Forum, Stanford, CA — January 2022
- Invited to give 1-hour research presentation to Stanford undergraduates

Intelligent Systems For Molecular Biology (ISMB), Virtual — July 2021
- Selected for 20-minute "Long Talk" + Poster

Machine Learning in Computational Biology (MLCB), Vancouver, CA — Dec 2019
- Co-located with NeurIPS; 1 of 10 talks chosen from 118 submissions - [Video]

Great Lakes Biology Conference (GLBio), Madison, WI — May 2019

POSTERS

Cochran, K., Yin, M., Schreiber, J., & Kundaje, A. (July 2023). *Modeling the cis-regulatory syntax of transcription initiation with ProCapNet*. Presented at ISMB, Lyon, France.

Cochran, K., Yin, M., Schreiber, J., & Kundaje, A. (May 2023). *Modeling the cis-regulatory syntax of transcription initiation with ProCapNet*. Presented at Biology of Genomes, Cold Spring Harbor Labs, NY.

Cochran, K., Srivastava, D., Shrikumar, A., Balsubramani, A., Kundaje, A., & Mahony, S. (July 2021). *Domain-adaptive neural networks improve cross-species prediction of transcription factor binding*. Presented at Intelligent Systems for Molecular Biology (ISMB), virtually. [Video]

Cochran, K., Srivastava, D., Balsubramani, A., Kundaje, A., & Mahony, S. (July 2019). *Cross-species transcription factor binding prediction using neural networks*. Presented at the Penn State Summer Symposium in Molecular Biology, State College, PA.

Cochran, K., Ray, T., & Kay, J. (April 2018). *A bioinformatics pipeline for characterizing isoform diversity in PacBio sequencing data*. Presented at the Computer Science Undergraduate Project Showcase, Durham, NC.

Ray, T., **Cochran, K.**, & Kay, J. (January 2018). *Targeted sequencing and bioinformatics pipeline for capturing and characterizing isoform diversity*. Presented at the Duke University Research Computing Symposium, Durham, NC. **2nd Place Poster Award.**

Cochran, K., Mitchell, D., Ju, C. J.-T., & Wang, W. (August 2017). *A genome-independent and alignment-free approach for improved disease prediction using k-mer counts from metagenomic reads*. Poster presentation for Bruins-in-Genomics Summer Research Fellowship program, Los Angeles, CA. **Best Poster Award.**

SOFTWARE

Choe, C., Wayment-Steele, H., **Cochran, K.**, Sharma, E., Kim, D.S., & Das, R. [authors unordered]. **RiboTree:** Software to Design Functional DNA & RNA Medicines. Patented software. Featured in Leppek *et al.* 2022: Combinatorial optimization of mRNA structure, stability, and translation for RNA-based therapeutics. [Access]

Cochran, K. & Ray, T. **IsoPops:** Framework for analyzing output of PacBio sequencing experiments. R package. Companion to Ray *et al.* 2020. [Docs][Code]

TEACHING EXPERIENCE

TA, cs109: Probability for Computer Scientists, Stanford University

Teaching Fellow (Co-Instructor) Summer 2024

- Taught 11 lectures, handled nearly all course logistics including final grades, wrote majority of exams, and managed adjusting the course to fit a shorter summer quarter
- Student feedback: “Kelly is an amazing instructor - I hope she continues to teach in the future. She is very clear, while also being funny and engaging, and her super high level of commitment to the course and the students is obvious.”; “This class completely redefined the bar for me for what a "well-taught" class looks like.”

Head TA Fall 2023

- Managed 19 TAs + 420 students; handled course logistics, trained + mentored new TAs, led several review sessions, taught a lecture, revised exams, held office hours
- Student feedback: “one of the best TAs I’ve had”, “exactly the TA I want to have”
- Other TA feedback: “seriously helped me grow as a teacher”, “the GOAT”

TA Fall 2022

- Led weekly discussion sections + office hours, wrote exam problems, graded assignments, and answered 200+ student questions online

TA, cs197: Computer Science Research, Stanford University Fall 2021

- Led the Computational Biology section, mentoring 3 groups of students through research projects, teaching best practices in the field, and advising on scientific writing
- Course targets undergraduates from under-represented backgrounds in CS research
- Student feedback: “incredibly supportive”, “dedicated”, “very knowledgeable”

Instructor, Unix & Python Virtual Workshops, Stanford University Fall 2020

- Co-taught a week-long virtual Intro Python workshop to 60+ biomedical researchers; student feedback: “The best online learning I’ve done in any setting”, “You are a great teacher”, “You made it so that Python was no longer overwhelming!”
- Prepared and led a 2-session Unix crash course for 1st-year Genetics Ph.D. students; feedback: “The best ‘unix basics’ that I’ve witnessed”

Section Leader, Code-In-Place, Virtual Spring 2020

- Developed lessons for and taught a 10-person discussion group in a massive (~10,000 students) international virtual offering of Stanford’s cs106a Intro Python course

TA, Software Design & Implementation, Duke University Spring 2017

- Advised students in monthly code reviews, office hours, and lecture; graded projects

ACADEMIC SERVICE

Admissions 2020 - 2022

- Evaluated 200+ applications for Stanford CS Ph.D. Admissions Committee, Winter 2021
- Volunteer for Stanford CS DEI Applicant-Support Program (early application feedback)
- Assisted with Admit Weekends in Winter 2020 - 2022 through DEI programming and as comp-bio liaison by coordinating student-admit meetups, Q & As, and social events
- Alumni interviewer for Duke Undergraduate Admissions, Winter 2021

Inclusion in AI, Stanford University 2019 - 2022

- Co-organized a bi-monthly Women in AI support group, the Humans of AI speaker series, and Queer in AI quarterly dinners, aimed at fostering more inclusive community
- Organized and supported DEI advocacy within the CS department, working with faculty and staff, the DEI Committee, and the Grad Student Advisory Council

Peer Review 2020 - Current

- Machine Learning In Computational Biology (MLCB) 2020 - 2024
- Genome Research, 2024
- RECOMB 2024 (subreviewer)
- Bioinformatics, 2023
- Intelligent Systems for Molecular Biology (ISMB) 2023 - 2024
- Springer Machine Learning, 2023
- Asian Conference in Machine Learning (ACML) 2023
- Northern Lights Deep Learning (NLDL) 2023
- IEEE/ACM Transactions on Computational Biology and Bioinformatics, 2022

OTHER SERVICE & LEADERSHIP

Assistant Band Director, St. Ignatius College Prep, CA Winter 2021 - Spring 2022

- Helped found the “Spirit of SI” Pep Band program from scratch
- Coached new-to-band directors on athletic band management, logistics, and culture
- Mentored students in leadership roles; developed solid musical and social foundations

Foster Volunteer, Centre County PAWS, PA & Pets-In-Need Palo Alto, CA 2018 - 2020

- Fostered 10 cats and kittens; responsible for medical care and socialization

Drum Major, Duke University Marching Band Fall 2016 - Spring 2018

- Senior conductor, mentor, and academic tutor to 130+ band members, and a driving force behind organizational growth, both musically and as a community
- Received the Charles Hogan Memorial Band Award for "dedication, leadership, enthusiasm, and a willingness to serve the band"

SELECTED COURSEWORK

Computational Genomics
Machine Learning (cs229)*
The Modern Algorithmic Toolkit*
Mining Massive Datasets*
(*) denotes Stanford courses

Experimental Molecular Biology (Lab)
Structure & Organization of Biomolecules*
Cell & Developmental Biology
Systems Biology