Kelly Cochran

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EDUCATION

Stanford University   Sep 2019 - Expected Sep 2025

Ph.D. in Computer Science, advised by Dr. Anshul Kundaje
Pierre & Christine Lamond Fellow, Stanford Graduate Fellowship (2019 - 2022)
Centennial TA Award (2024-2025)

Duke University   Aug 2014 - May 2018

B.S. in Computer Science; Minors in Statistics, Computational Biology & Bioinformatics
Angier B. Duke Memorial Full Merit Scholarship

RESEARCH EXPERIENCE

Kundaje Lab - Stanford University   Sep 2019 - Current

Ph.D Candidate, Computer Science

- Dissected how DNA sequence encodes regulation of transcription initiation in humans by developing and interpreting ProCapNet, a state-of-the-art deep learning model
- Applied ProCapNet to improving gene annotations as part of GENCODE consortium
- Mentored several high school and undergraduate students through research projects
- Presented talk at ISMB 2023, poster at CSHL; 1st-author preprint under review

Mahony Lab - Pennsylvania State University   June 2018 - Aug 2019

Research Tech, Center for Eukaryotic Gene Regulation

- Trained neural networks to transfer prediction of transcription factor binding across species; diagnosed a novel source of model bias + corrected it using domain adaptation
- 1st-author publication in *Genome Research;* presented talks at MLCB 2019, ISMB 2021

Kay Lab - Duke University   Dec 2015 - May 2018

Undergraduate Researcher, Neurobiology & Ophthalmology

- Analyzed deep PacBio long-read RNA-seq data to identify hundreds of novel isoforms of neuronal cell-surface receptors, with implications for retinal degenerative disease
- Developed an R package to characterize + visualize isoform diversity, including unsupervised machine learning techniques, as the sole computational project member
- 2nd-author publication in *Nature Communications*; Poster Award at Duke Research Computing Symposium 2018

KEY PAPERS

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

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,* 32: pp. 512-523. [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]

ADDITIONAL PAPERS

Chen, Y., Shah, S.R., Leung, A., Paramo, M.I., **Cochran, K.,** Kundaje, A., Clark, A.G., Lis, J.T., Yu, H. 2024. **Directionality of transcriptional regulatory elements.** *bioRxiv*. Under review. [Preprint]

Mudge, J.M., Carbonell-Sala, S., Diekhans, M., Gonzalez-Martinez, J., Hunt, T., Jungreis, I., Loveland, J.E., Arnan, C., Barnes, I., Bennett, R., Berry, A., Bignell, A., Cerdán-Vélez, D., **Cochran, K.,** *et. al.* 2025. **GENCODE 2025: reference gene annotation for human and mouse.** *Nucleic Acids Research.* 53(D1): pp. D966-D975. [Paper]

Kaur, G., Perteghella, T., Carbonell-Sala, S., Gonzalez-Martinez, J., Hunt, T., Mądry, T., Jungreis, I., Arnan, C., Lagarde, J., Borsari, B., Sisu, C., Jiang, Y., Bennett, R., Berry, A., Cerdán-Vélez, D., **Cochran, K.,** *et al.* 2024. **GENCODE: massively expanding the lncRNA catalog through capture long-read RNA sequencing.** *bioRxiv.* Under review. [Preprint]

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. 2023. **Rewriting regulatory DNA to dissect and reprogram gene expression.** *Cell*. Accepted in principle. [Preprint]

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.

PRESENTATIONS

– Conference Talks –

Modeling the *cis*-regulatory syntax of transcription initiation with ProCapNet.

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

Predicting where proteins bind DNA across species using deep learning.

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

Domain-adaptive neural networks improve cross-species prediction of transcription factor binding.

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. (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., 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 session 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 isoform diversity in targeted PacBio long-read sequencing experiments. R package. Companion to Ray *et al.* 2020. [[Docs]()][[Code]()]

TEACHING EXPERIENCE

Graduate Course Design Institute, Stanford University

Co-Facilitator   Spring Break, March 2025

- Guided workshops on research-grounded pedagogy and course design fundamentals

CS109: Intro to Probability for Computer Scientists, Stanford University

** Received the **Centennial TA Award** for contributions to teaching this course*

Head TA   Fall 2023, Fall 2024, Winter 2025

- 2nd-year CS major course; covers from basics up to intro ML, integrating math + code
- Managed 290-420 students and led a team of 13-20 TAs; handled most course logistics, covered 3 lectures, co-wrote exams, created + led review sessions, organized grading
- Designed TA training workshop + resources; mentored TAs weekly in pedagogical skills
- Designed and guided significant revisions of course content + structure; implemented novel strategies for improved exam outcomes that received positive student feedback

Teaching Fellow (Instructor of Record)   Summer 2024

- Taught 11 lectures for 40 students, handled all course logistics including final grades, wrote majority of exams, and adjusted course to a shortened summer quarter
- Course evaluation student feedback: "This class completely redefined the bar for me for what a 'well-taught' class looks like." Avg. student rating for course overall: 4.5/5

TA   Fall 2022

- Led weekly discussion sections + office hours, wrote exam problems, graded projects and assignments, and answered 200+ student questions online (most of any TA)

CS197: Computer Science Research, Stanford University

Computational Biology Section TA   Fall 2021
- Coached 3 groups of 3 students through realistic research projects, teaching scientific writing/literacy, crash-course biology and deep learning, and the field's best practices
- Course targeted undergraduates from underrepresented backgrounds in CS research

Python & Unix Workshops, Stanford University

Co-Instructor   Fall 2020
- Co-taught a week-long virtual Intro Python workshop to 60+ biomedical researchers
- Prepared and led a 2-session Unix crash course for 1st-year Genetics Ph.D. students

Code-In-Place, Virtual

Section Leader   Spring 2020
- Developed lessons for and led 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

Undergraduate TA   Spring 2017
- Advised students at regular code reviews + office hours; graded >1000-line codebases

RESEARCH MENTORING

Genomics Research Internship Program at Stanford (GRIPS)   Summer 2023
- Mentored 2 high school students "from scratch" through complex research projects
- Integrated intern contributions with authorship into Cochran *et al.* 2024

Kundaje Lab Research Interns   Summers 2020 - 2022
- Mentored 2 additional students; interviewed applicants; fostered intern community

CS197 TA / Research Mentor   Fall 2021
- Advised 9 students in 3 groups; coached research + general academic skills, including conducting literature reviews, giving short talks, and managing interpersonal conflict

TEACHING TRAINING

CIRTL@ Stanford Teaching Certificate, Practitioner Level   Expected Summer 2025
Evidence-Based Undergraduate STEM Teaching, Local Learning Community   Fall 2024
Teaching-As-Research, Stanford Graduate Summer Institute   Summer 2024
IDEAL Pedagogy, Local Learning Community   Winter 2024

ACADEMIC SERVICE

Admissions, Stanford University
- Evaluated 200+ applications while on CS Ph.D. Admissions Committee   2021
- CS DEI Applicant-Support Program volunteer (early application feedback)   2020 - 2021
- Volunteer for CS Admit Weekend's DEI + comp. biology programming   2020 - 2022
- Alumni interviewer for Duke Undergraduate Admissions   2021

Inclusion in AI, Stanford University   2019 - 2021
- Co-organized bi-monthly Women in AI networking + support group and the Humans of AI speaker series, aimed at fostering more inclusive community in the CS department
- 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
- Machine Learning In Computational Biology (MLCB) Conference   2020 - 2024
- Genome Research   2024
- RECOMB Conference (subreviewer)   2024
- Bioinformatics   2023 - 2024
- Intelligent Systems for Molecular Biology (ISMB) Conference   2023 - 2024
- Springer Machine Learning   2023
- Asian Conference in Machine Learning (ACML)   2023
- Northern Lights Deep Learning (NLDL) Conference   2023
- IEEE/ACM Transactions on Computational Biology and Bioinformatics   2022

OTHER SERVICE & LEADERSHIP

Volunteer, Pets-In-Need Palo Alto, CA   Fall 2024 - Current
- Provide animal care support, socialize cats, and serve as "Parking Commander" weekly
- Volunteer of the Month, November 2024

Assistant Band Director, St. Ignatius College Prep, CA   2021 - 2023
  - Helped found the "Spirit of SI" Pep Band program from scratch
  - Coached novice 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   2016 - 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"