

# Jessica Zhou

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## EDUCATION

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### University of California, San Diego

Ph.D., Bioinformatics and Systems Biology

La Jolla, CA

Sep. 2017–Jul. 2023

### University of Southern California

B.S., Biomedical Engineering

Los Angeles, CA

Aug. 2013–May 2017

## EXPERIENCE

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- **Cold Spring Harbor Laboratory** Cold Spring Harbor, NY  
*Postdoctoral fellow* Oct. 2023 -
  - **Ensemble distillation for neural networks:** Using ensemble distillation to distill complex state-of-the-art deep learning models with boosted predictive performance and improved model interpretability to reduce computational overhead associated with use of large ensembles
  - **Estimating predictive uncertainty of neural networks:** Developing uncertainty-aware neural network models to address challenges with out-of-distribution data and improve trustworthiness of deep neural networks for genomic sequence data
- **UC San Diego & Salk Institute for Biological Studies** La Jolla, CA  
*Ph.D. Candidate* Sep. 2017 - Jul. 2023
  - **Single-cell genomics analysis:** Developed computational pipelines for analyzing single-cell sequencing datasets, including scRNA-seq and scATAC-seq, as well as multiplexed single-cell CRISPR regulatory screens.
  - **Modeling enhancer activity:** Designed generalized linear models for discovering enhancer gene pairs from single-cell CRISPR regulatory screens and studying interactions between enhancers
  - **Machine learning for genomics:** Used convolutional neural networks to predict cell type-specific accessible chromatin from scATAC-seq data.
  - **Science communication:** Wrote successful research grant applications (e.g. Fulbright, NIH F31) and presented research at numerous conferences. Highly skilled at communicating research and findings to broad audiences.
- **Hasso-Plattner Institute & Berlin Institute for Medical Systems Biology** Berlin, Germany  
*Fulbright Scholar* Sep. 2019 - Mar. 2020
  - **Statistical modeling:** Developed statistical models for identifying regulatory elements from single-cell CRISPR regulatory screens
  - **Collaboration:** Led a highly collaborative project between lab at home and abroad as multilingual visiting researcher.
- **University of Southern California** Los Angeles, CA  
*Undergraduate Researcher* Feb. 2015 - Jun. 2017
  - **Cancer metabolism:** Performed integrative statistical analysis of multi-omics datasets to study cancer metabolism
  - **Gene set enrichment analysis:** Identified genes driving dysregulation of oxidative phosphorylation across breast, ovarian and uterine cancers
  - **Pipeline design:** Designed Rscript pipeline to study correlation between tumor copy number alterations and protein levels
- **Harvard Medical School** Boston, MA  
*Research Intern* Jun. 2016 - Aug. 2016
  - **Summer Bioinformatics Program:** Accepted into prestigious Harvard-MIT Health Sciences and Technology (HST) Summer Bioinformatics Program
  - **Algorithm development:** Developed algorithm for identifying enrichment of transcription factor binding motifs in ChIP-seq data

## SKILLS

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- Programming languages & tools: Python, R, Bash, awk/sed, Snakemake, git, MATLAB, SQL
- Machine learning & statistics: PyTorch, Tensorflow, keras, neural networks, generalized linear models, maximum likelihood estimation, hypothesis testing
- Data analysis and visualization: ggplot, matplotlib, seaborn, pandas, dplyr
- High performance computing (HPC): Microsoft Azure, SGE, slurm

## PUBLICATIONS

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1. **Zhou, J. L.**, G. de Guglielmo, A. J. Ho, M. Kallupi, N. Pokhrel, H.-R. Li, A. S. Chitre, D. Munro, P. Mohammadi, L. L. G. Carrette, O. George, A. A. Palmer, G. McVicker & F. Telese. Single-nucleus genomics in outbred rats with divergent cocaine addiction-like behaviors reveals changes in gene amygdala GABAergic inhibition. en. *Nat Neurosci*. Publisher: Nature Publishing Group, 1–12. ISSN: 1546-1726 (Oct. 2023).
2. **Zhou, J. L.**, K. Guruvayurappan, H. V. Chen, A. R. Chen & G. McVicker. *Genome-wide analysis of CRISPR perturbations indicates that enhancers act multiplicatively and without epistatic-like interactions* en. Pages: 2023.04.26.538501 Section: New Results. Apr. 2023.
3. Flores, A., J. Schell, A. S. Krall, D. Jelinek, M. Miranda, M. Grigorian, D. Braas, A. C. White, **J. L. Zhou**, N. A. Graham, T. Graeber, P. Seth, D. Evseenko, H. A. Collier, J. Rutter, H. R. Christofk & W. E. Lowry. Lactate dehydrogenase activity drives hair follicle stem cell activation. en. *Nat Cell Biol* **19**. Number: 9 Publisher: Nature Publishing Group, 1017–1026. ISSN: 1476-4679 (Sept. 2017).

## PRESENTATIONS

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- *Predicting model uncertainty in genomic deep learning with knowledge distillation*. Poster presentation at Biology of Genomes. May 7-11, 2024.
- *Genome-wide analysis of CRISPR perturbations indicates that enhancers act multiplicatively, but provides no evidence for epistatic-like enhancer interactions*. Selected talk at the International Conference for Intelligent Systems for Molecular Biology. July 23-27, 2023.
- *Single-cell sequencing links reduced glucose metabolism to cocaine addiction-like behavior in rats*. Poster presentation at the American Society of Human Genetics Annual Meeting. Oct. 25-29, 2022. Recipient of Reviewer's Choice Award.
- *Cocaine addiction is associated with long-term changes in gene regulation, metabolic pathways, and GABAergic inhibition within the amygdala*. Selected talk at the Complex Traits Community conference. September 29-30, 2022.
- *snRNA-seq reveals that reduced glucose metabolism is linked in cocaine addiction in HS rats*. Selected talk at the NIDA P50 Center for GWAS in Outbred Rats Retreat. Nov. 4, 2022.
- *Cell type-specific multiomic analysis of substance use disorders in outbred rats*. Selected talk at the Probabilistic Modeling in Genomics conference. May 14-16, 2021.
- *A novel statistical method for identifying combinatorial regulatory elements from multiplexed single-cell CRISPR regulatory screens*. Poster presentation at the Probabilistic Modeling in Genomics conference. October 6-9, 2019.

- *Enhanced breast cancer risk prediction from imputed gene expression.* Poster presentation at the American Society of Human Genetics Annual Meeting. October 17, 2018.

## AWARDS

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NIH Ruth L. Kirschstein Predoctoral Individual National Research Service Award (F31)  
 UCSD Interdisciplinary Research Award  
 Fulbright Study/Research Award  
 National Science Foundation Graduate Research Fellowship Program Honorable Mention  
 University of California Trustee Scholar  
 University of Southern California Provost's Research Fellowship  
 Women in Science and Engineering Research Fellowship  
 Rose Hills Foundation Research Fellowship

## TEACHING & OUTREACH

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- **American Society of Human Genetics** USA  
*Public Education and Awareness Committee Member* *Jan. 2020 - Dec. 2022*
  - Brainstorm subjects for public-facing online Discover Genetics fact sheets and advise on content
  - Run and judge annual ASHG DNA Day Essay Contest for high schoolers
  - Participate in AskScience Reddit panels
- **Fleet Science Center** San Diego, CA  
*Volunteer* *2017-2023*
  - Volunteer with Two Scientists Walk Into a Bar program, where pairs of local scientists visit local breweries and invite the public to ask questions about science
  - Volunteer with BE WiSE program, which engages local young women (grades 7-12) in STEM
- **UC San Diego** La Jolla, CA  
*Bioinformatics Bootcamp Instructor* *Sep. 2018 - Sep. 2019*
  - Designed and taught lectures on statistical concepts (e.g. p-values, statistical distributions, OLS, MLE) paired with interactive Jupyter notebooks to incoming first year students in the Bioinformatics PhD program
  - Planned and organized welcome week events for the Bioinformatics PhD program
- **University of Southern California** Los Angeles, CA  
*MATH 226 Supplemental Instructor* *Aug. 2015 - May 2017*
  - Designed and taught weekly lectures (3x/week) to supplement undergraduate vector calculus course