

# William Connell

RESEARCH SCIENTIST, MACHINE LEARNING · PH.D.

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## Summary

At Vevo Therapeutics, I led the initial machine learning initiatives from seed funding. I developed the core scientific hypotheses around discriminative and generative modeling for a phenotype-based drug discovery platform. I am interested in computational methods that practically influence drug discovery, particularly through a systems perspective. I enjoy working with quickly moving, collaborative teams.

## Education

### University of California, San Francisco

San Francisco, CA

PHD IN PHARMACEUTICAL SCIENCES AND PHARMACOGENOMICS

2018 - 2022

- Advisor: Michael Keiser
- Committee: Hani Goodarzi, Luke Gilbert

### University of California, Los Angeles

Los Angeles, CA

BS IN MICROBIOLOGY, IMMUNOLOGY AND MOLECULAR GENETICS

2012 - 2016

## Experience

### Vevo Therapeutics

San Francisco, CA

RESEARCH SCIENTIST, MACHINE LEARNING

September 2022 - January 2024

- Developed and executed strategy for a scRNA-seq foundation model (scFM), expanding the pretraining corpus 65x and significantly improving target retrieval, sensitivity prediction, and biological recapitulation tasks
- Conceived and delivered a multimodal model aligning transcriptomes and chemical structures, achieving a 10x increase in top-k accuracy
- Initiated the ML strategy for chemical graph generation using transcriptional profiles for phenotype-guided chemical design
- Led a proposal accepted into the AWS Gen AI Accelerator program (<1%), securing \$300k compute credits and industry recognition
- Managed contractors, recruited three FTEs, and mentored an intern, growing the ML team by 50%

### Department of Pharmaceutical Chemistry, UCSF

San Francisco, CA

GRADUATE RESEARCHER ADVISED BY MICHAEL KEISER

March 2019 - December 2022

- Pioneered the application of self-supervised learning to scRNA-seq, advancing the pretrain/finetune framework in biological modeling
- Developed an *in silico* model for chemical probing (+10% baseline), finding new indication responses and potential ferroptosis drug targets
- Identified a genomic biomarker to stratify mAb ustekinumab response in psoriasis, advancing personalized treatment decisions

### AI Research Group, Invitae

Remote

COMPUTATIONAL BIOLOGY RESEARCH INTERN

May 2021 - August 2021

- Aided in developing a hierarchical Bayesian model to enhance polygenic risk scoring accuracy
- Involved in comprehensive software and pipeline engineering for efficient management and analysis of large-scale datasets

### UCSF Innovation Ventures

San Francisco, CA

CATALYST AWARDS INTERN

September 2018 - September 2019

- Assessed scientific translation potential of a diagnostic gene expression biomarker panel, collaborating with corporate strategy experts
- Headed a team of four scientists to develop a Target Product Profile, resulting in a \$100k translational funding award
- Performed product development feasibility studies, yielding a comprehensive report and pitch to venture investors

### Datacamp

Remote

PROJECT DEVELOPER

November 2019 - January 2019

- Crafted and delivered a data science project for a premier online educational platform
- Developed an interactive data analysis course in R, *Data Science for Social Good: Crime Study*
- Successfully engaged over 2000 learners, achieving a course rating of 4.7/5

## Publications

### JOURNAL ARTICLES

#### Learning chemical sensitivity reveals mechanisms of cellular response

William Connell, Kristle Garcia, Hani Goodarzi, Michael J. Keiser

*bioRxiv (under review)* (Aug. 2023). Cold Spring Harbor Laboratory, 2023. doi: 10.1101/2023.08.26.554851

#### Genome-wide association study of ustekinumab response in psoriasis

William Connell, Julie Hong, Wilson Liao

*Frontiers in Immunology* 12 (Jan. 2022). 2022. doi: 10.3389/fimmu.2021.815121

#### A single-cell gene expression language model

William Connell, Umair Khan, Michael J. Keiser

**Predicting cellular drug sensitivity using conditional modulation of gene expression**

William Connell, Michael J. Keiser

Learning Meaningful Representations of Life Workshop, NeurIPS 2020 (Dec. 2020). 2020. doi: 10.1101/2021.03.15.435529

**Helical antimicrobial peptides assemble into protofibril scaffolds that present ordered dsDNA to TLR9**

Ernest Y. Lee, Changsheng Zhang, Jeremy Di Domizio, Fan Jin, Will Connell, Mandy Hung, Nicolas Malkoff, Veronica Veksler, Michel Gilliet, Pengyu Ren, Gerard C.L. Wong

Nat. Commun. 10.1 (Mar. 2019) p. 1012. 2019. doi: 10.1038/s41467-019-08868-w

**A single-cell transcriptomic atlas of human neocortical development during mid-gestation**

Damon Polioudakis, Luis Torre-Ubieta, Justin Langerman, Andrew G. Elkins, Xu Shi, Jason L. Stein, Celine K. Vuong, Susanne Nichterwitz, Melinda Gevorgian, Carli K. Opland, Daning Lu, William Connell, Elizabeth K. Ruzzo, Jennifer K. Lowe, Tarik Hadzic, Flora I. Hinz, Shan Sabri, William E. Lowry, Mark B. Gerstein, Kathrin Plath, Daniel H. Geschwind

Neuron 103.5 (Sept. 2019) 785-801.e8. 2019. doi: 10.1016/j.neuron.2019.06.011

**PRESENTATIONS**

**Quantifying the similarity of transcriptomic states in cancer**

William Connell, Michael J. Keiser

CZI Neurodegeneration Challenge Network 2020 Annual Meeting. Poster. 2020. Virtual.

**Target deconvolution across phenotypic space**

William Connell, Garrett Gaskins, Michael J. Keiser

Northern California Computational Biology Symposium. Oral. 2019. Davis, CA.

**Extracurricular Activity**

**ICLR**

MLGenX WORKSHOP REVIEWER

Remote

2024

**OpenBioML**

DNA DIFFUSION, CONTRIBUTING MEMBER

Remote

August 2023 - Present

- Contributed to OS research focusing on *in silico* generative sequence design
- Led the creation of an oracle model for assessing DNA sequences, improving baseline model 18x
- Coordinated scientific and technical efforts among a diverse group of global collaborators

**Skills**

<b>programming</b>	python [numpy, pandas, pytorch, scikit-learn, huggingface, wandb, lightning, pytorch-geometric, hydra], AWS, R, bash, git, plink, snakemake
<b>OS contributions</b>	enformer-finetune, pytorch-metric-learning, scikit-learn sprint (WiMLDS)
<b>featured blog posts</b>	Blockchain: Tumber Network Analysis; Kanye West: Lyric Analysis