

Evan E. Seitz

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Summary

Computational biologist with expertise in interpretable machine learning for regulatory genomics and structural biology, seeking research-focused roles that bridge deep learning and biology.

Education

PhD in Biological Sciences, with Distinction – Columbia University
Departments of Biological Sciences & Biochemistry and Molecular Biophysics

MPhil and MA – Columbia University

BS in Physics, with Highest Honors – Georgia Institute of Technology

BA in Mass Communication – Georgia College

Experience

Cold Spring Harbor Laboratory, Postdoctoral Fellow with Drs. [Peter Koo](#) and [Justin Kinney](#)
[Simons Center for Quantitative Biology](#) March 2022 – Present

Developed a surrogate modeling framework—[SQUID](#)—to mechanistically interpret deep neural networks trained on genomic data, enabling robust dissection of cis-regulatory logic in high-throughput functional assays.

- Modeled additive and higher-order interactions between sequence features while removing confounding effects from nonlinearities and experimental noise using shallow neural networks as interpretable surrogates.
- Demonstrated SQUID identifies more consistent motifs across genomic loci and improves single-nucleotide variant effect prediction, outperforming established attribution methods like DeepSHAP.

Invented a meta-explainability framework—[SEAM](#)—that systematically investigates how mutations reshape regulatory mechanisms, enabling interpretable insights into mutational effects on gene regulation.

- Enabled unbiased discovery of mutations poised to reprogram cis-regulatory mechanisms and function, illuminating evolutionary trajectories and supporting the rational design of synthetic regulatory sequences.
- Distinguished sequence features that are robust to mutation from those that are readily reprogrammable, enabling visual separation of motif-driven signals from biologically important background patterns.
- Demonstrated SEAM reduces noise and better highlights regulatory features than other attribution methods.

Columbia University, PhD Researcher with Nobel laureate Dr. [Joachim Frank](#)
[Departments of Biological Sciences & Biochemistry and Molecular Biophysics](#) May 2017 – February 2022

Invented a geometric machine learning method—[ESPER](#)—to interpret latent manifolds derived from cryo-EM ensembles of macromolecular complexes, enabling accurate reconstruction of 3D structures across the free-energy landscape.

- Improved the interpretability of spectral embeddings by introducing a novel eigenbasis realignment procedure that extracts conformational degrees of freedom along eigenfunctions of the Laplace–Beltrami operator.
- Enabled reconstruction of conformational continua and free-energy landscapes in key biomolecular systems, including the 80S ribosome, V-ATPase, and SARS-CoV-2 Spike protein.

Awards

NIH F32 Postdoctoral Fellowship — National Human Genome Research Institute (F32HG013265), 2024–2027

John S. Newberry Prize — awarded to the most promising PhD student, Columbia University, 2022

PhD with Distinction — awarded for dissertation excellence by faculty committee, Columbia University, 2022

BS with Highest Honors — top distinction for academic excellence in physics (GPA 3.74/4), Georgia Tech, 2017
Sigma Pi Sigma — National Physics Honor Society

Skills

- **Supervised learning:** Deep neural networks, convolutional neural networks, nonlinear regression
- **Unsupervised learning:** Dimensionality reduction, spectral methods, manifold learning, latent space analysis
- **Model interpretability:** Explainable AI (XAI), attribution analysis, surrogate modeling, meta-explainability, global importance analysis, high-dimensional data visualization
- **Computational tools:**
 - Languages and frameworks* — Python, Bash, LaTeX, TensorFlow, PyTorch, NumPy, SciPy, Pandas, Conda
 - Development and reproducibility* — GitHub, ReadTheDocs, HPC environments
 - Molecular modeling* — UCSF Chimera, PyMOL, VMD, RELION, Phenix
 - Visualization and media* — Adobe Creative Suite, Cinema4D, Final Cut Pro, Matplotlib, Mayavi

Select Publications

Seitz et al., [ICLR GEM Workshop](#), 2025 — Decoding the mechanistic impact of genetic variation with deep learning.
Seitz et al., [Nat Mach Intell](#), 2024 — Interpreting genomic deep neural networks using surrogate models.
Seitz et al., [RSC Digital Discovery](#), 2023 — Geometric relationships between manifolds of cryo-EM conformers.
Seitz et al., [IEEE Trans Comput Imaging](#), 2022 — Recovery of cryo-EM conformations using manifold embedding.
Sztain et al., [Nat Chem](#), 2021 — Conformational mapping of the SARS-CoV-2 spike protein receptor binding domain.

A complete publication list is available on my [Google Scholar profile](#).

Presentations

Talks: [ICLR GEM Workshop](#) (2025), Quantitative Biology and AI In-house Seminar Series (2023–2025), Bioinformatics and Computational Neuroscience Lecture Series (2023, 2024), [Cryo-EM Microscopy Center Fall Workshop](#) (2021)
Posters: [CSHL Biology of Genomes](#) (2023, 2025), [Genome Informatics](#) (2023), [Biological Data Science](#) (2024), [Probabilistic Modeling in Genomics](#) (2025) and In-House Symposium (2024, 2025)

Teaching and Mentoring

Teaching Assistant, Columbia University 2018–2019
BCHM GU4323: Biophysical Chemistry — Recitation instructor (Prof. John Hunt and Prof. Art Palmer)

Learning Assistant, Georgia State University Spring 2015
PHYS 1111K: Introductory Physics — Lab instructor (Prof. Joshua Von Korff)

Educational Media and Animation

Georgia Institute of Technology — Creative Director for physics MOOCs (Prof. Michael Schatz, 2016–2017)
Stanford University — Creative Director for behavioral science education (Prof. Jennifer Aaker, 2013–2015)

Undergraduate Research Advisor 2023
Nika Chuzhoy (Computer Science, Caltech) — Research on surrogate modeling for interpreting genomic DNNs

High School Research Mentor 2024
Tinu Yu (Syosset High School, NY) — Research on surrogate modeling for interpreting genomic DNNs

Referee Service

2024: Nature (×2), Nature Genetics (×2), American Journal of Human Genetics, RECOMB, ICML AI4Science
2023: Nature, Nature Machine Intelligence, Genome Research, Cold Spring Harbor Perspectives in Biology, NeurIPS AI4Science Workshop, NeurIPS Generative AI and Biology Workshop, ICML Workshop on Computational Biology
2020: Journal of Chemical Information and Modeling