Jeff Winchell

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Education

Carnegie Mellon University, Pittsburgh, Pennsylvania
M.S. in Computational Biology — Expected June 2027

Drexel University, Philadelphia, Pennsylvania
B.S. in Computer Science — June 2021
B.A. in Mathematics — June 2021

Research Experience

Carnegie Mellon University, School of Computer Science
Research Assistant, Unpaid (Sept 2025 - Present)
Advisors: Dr. Jian Ma, Dr. Spencer Krieger
- Beginning research on foundational models for spatial transcriptomics, focusing on post-hoc admixture correction using transformer-based methods

The New York Stem Cell Foundation Research Institute
Associate Data Scientist (Jan 2023 – July 2025)
Assistant Data Scientist (Apr 2022 – Dec 2022)
Data Science Intern (Nov 2021 – Apr 2022)
Supervisors: Dr. Bianca Migliori (Nov 2021 - Nov 2024), Dr. Stefan Semrau (Dec 2024 - July 2025)
- Developed single-cell instance segmentation framework generalizable across cell types and imaging modalities
- Built a scalable pipeline for fixed feature extraction on high-content imaging data for characterizing morphology of different cell types (*iScience, 2024*)
- Developed an efficient, generalizable image classification framework for image focus assessment in brightfield microscopy images (*SLAS Discovery, 2023*)
- Collaborated with Francis Collins' NIH lab on diabetes differentiation project, applying imaging + machine learning to study phenotypic signatures in pancreatic beta cell development
- Applied latent vector space analysis and unsupervised clustering to study sub-cellular protein localization
- Explored modern ML architectures (transformers, autoencoders) for representation learning in biological imaging
- Mentored undergraduate interns on extending internal image analysis tools

Drexel University, Department of Computer Science
Research Assistant, Unpaid (Sept 2020 – May 2021)
Advisor: Dr. Edward Kim
- Adapted sparse coding algorithms from existing course materials to support patch-based dictionary learning on RGB video input (e.g., Weizmann dataset), achieving ~95% reconstruction accuracy and ~50% sparsity

- Explored temporally smooth sparse representations to improve reconstruction fidelity and sparsity for natural video data (~17% and ~45% improvements, respectively, in internal benchmarks)
- Maintained and refactored project codebase post-graduation, including modular data loaders and documentation for reproducibility
- Engaged with literature on sparse coding, neural encoding, and unsupervised learning for biologically inspired vision models

Publications

Comolet, G.*, Bose, N.*, **Winchell, J.***, et al. *A highly-efficient, scalable pipeline for fixed feature extraction from large-scale high-content imaging screens. iScience,* 2024.

Winchell, J., et al. *FocA: A deep learning tool for reliable, near-real-time imaging focus analysis in automated cell assay pipelines*. *SLAS Discovery,* 2023.

Moyer, E., **Winchell, J.**, et al. *Functional Protein Annotation Using a Deep Convolutional Generative Adversarial Network*. *ArXiv,* 2021. (Preprint)

*indicates co-first authorship

Presentations

Winchell, J. *Ensuring Data Quality in High-Content Imaging*. *Future Labs Live*, Philadelphia, PA, Oct 2024. (Talk)

Winchell, J. *An Efficient, Scalable Pipeline for Fixed Feature Extraction.* Biomolecular Imaging and Informatics Conf., Boston, MA, Sept 2024. (Poster)

Winchell, J. *FocA: A deep learning tool for reliable, near-real-time imaging focus analysis in automated cell assay pipelines*. Biomolecular Imaging and Informatics Conf., Boston, MA, Oct 2023. (Poster)

Winchell, J. *Deep learning tools for high-quality data production and analysis in large high-content imaging screens*. NYSCF Conf., New York, NY, Oct 2022. (Poster)

Awards, Membership

NSF Research Experiences for Undergraduates Grant — Summer 2017
Member, Society for Biomolecular Imaging and Informatics (SBI^2) — 2023 – Present

Technical Skills

Programming: Python (PyTorch, Tensorflow, scikit-learn, OpenCV, Matplotlib, pandas, AnnData)
Methods: CNNs, GANs, transformers, autoencoders, representation learning