

# JEFF WINCHELL

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## EDUCATION

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**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

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**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 error 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, greatly improving cell detection and morphology characterization compared to previous thresholding method
- Built a scalable pipeline for fixed feature extraction on high-content imaging data for characterizing morphology of different cell types, enabling analysis of multi-terabyte imaging datasets (*iScience*, 2024)
- Developed an efficient, generalizable image classification framework for image focus assessment in brightfield microscopy images, eliminating need for daily manual review of plate scans (*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

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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

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**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

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NSF Research Experiences for Undergraduates Grant

Summer 2017

Member, Society for Biomolecular Imaging and Informatics (SBI<sup>2</sup>)

2023 – Present

## TECHNICAL SKILLS

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**Programming:** Python (PyTorch, Tensorflow, scikit-learn, OpenCV, Matplotlib, pandas, AnnData)

**Methods:** CNNs, GANs, transformers, autoencoders, representation learning