Jeff Winchell

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Education

Carnegie Mellon University, Pittsburgh, Pennsylvania
Master of Science in Computational Biology — Expected: June 2027

Drexel University, Philadelphia, Pennsylvania
Bachelor of Science in Computer Science — June 2021
Bachelor of Arts in Mathematics — June 2021

Research Experience

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 - Present)

- *Image Analysis & Machine Learning:*
  - Develop an efficient, generalizable image classification framework for image focus assessment, bacterial contamination detection, and embryoid body morphology characterization in brightfield microscopy images
  - Build a scalable pipeline for fixed feature extraction on high-content imaging data for characterizing morphology of different cell types
  - Develop single-cell instance segmentation framework generalizable to different cell types and imaging configurations
  - Quantitatively analyze sub-cellular localization of fluorescent tags via deep image embeddings, unsupervised clustering, and deep image classifiers for millions of cells
  - Characterize phenotypic signatures of diabetes-affected cells at various stages of differentiation from induced pluripotent stem cells into pancreatic beta cells via image analysis/machine learning
- *Leadership & Communication:*
  - Mentor multiple college-level interns on projects expanding functionality of existing internal image analysis tools
  - Present progress, project-related literature, and final results to colleagues, external collaborators and at conferences and in manuscripts

Drexel University, Department of Computer Science
Research Assistant (Sept 2020 – May 2021)
Advisor: Dr. Edward Kim

- Improved sparse coding feature extraction performance for natural videos using temporally smooth representations leading to ~45% greater sparsity and ~17% greater reconstruction fidelity
- Extended the functionality of sparse coding model to use patch-based dictionary learning with RGB input with 95% reconstruction accuracy and 50% sparsity

- Reviewed and discussed academic literature relating to sparse coding, representation learning, and causal inference

Drexel University, Department of Mathematics
Research Assistant (June 2019 – Feb 2020)
Advisor: Dr. Hugo Woerdeman
- Explored minimal rank properties of matrices and their corresponding augmentations via their Kronecker products with identity matrices of progressively higher dimensions
- Experimented with partial matrix patterns, their minimal rank completions, and the minimal rank completions of their sub-patterns

Drexel University, Department of Engineering
Research Assistant (Aug 2017 – Mar 2018)
Advisors: Dr. Gary Friedman, Dr. Dmitri Vainchtein
- Applied classical image processing techniques to segment and track magnetized bead moving through clear agarose gel for a real-time, vision-based sensor control system
- Validated and compared image segmentation methods using statistical evaluation metrics

Drexel University, Department of Computer Science
Research Assistant (May 2017 – Aug 2017)
Advisor: Dr. Ali Shokoufandeh
- Shadowed PhD student on project related to 3D Object Recognition under NSF Research Experiences for Undergraduates grant
- Wrote Python scripts to ingest RGB-Depth videos from the Xbox Kinect and fit meshes to 3D point clouds using Blender

Publications

Comolet, G.*, Bose, N.*, **Winchell, J.***, et al. (2024). *A highly-efficient, scalable pipeline for fixed feature extraction from large-scale high-content imaging screens.* In *iScience* (Vol. 27, Issue 12, 111434). *Elsevier BV.* https://doi.org/10.1016/j.isci.2024.111434

Winchell, J., et al. (2023). *FocA: A deep learning tool for reliable, near-real-time imaging focus analysis in automated cell assay pipelines*. In *SLAS Discovery* (Vol. 28, Issue 7, pp. 306–315). *Elsevier BV*. https://doi.org/10.1016/j.slasd.2023.08.004.

Moyer, E., **Winchell, J.**, et al. (2021). *Functional Protein Annotation Using a Deep Convolutional Generative Adversarial Network.* arXiv preprint arXiv:2104.08969. https://doi.org/10.48550/ARXIV.2104.08969. (Preprint).

*indicates co-first authorship

Presentations

Winchell, J. (October 2024). *Ensuring Data Quality in High-Content Imaging*. Future Labs Live, Philadelphia, PA, United States. (presentation)

Winchell, J. (September 2024). *An Efficient, Scalable Pipeline for Fixed Feature Extraction from Large High-Content Imaging Screens.* Biomolecular Imaging and Informatics Conference, Boston, MA, United States. (poster)

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

Albahra, S., **Winchell, J.**, Migliori, B., & Wendel, W. (October 2023). *Quality Control in Artificial Intelligence*. Future Labs Live, Philadelphia, PA, United States. (panel)

Winchell, J. (October 2022). *Deep learning tools for high-quality data production and analysis in large high-content imaging screens*. NYSCF Conference, New York, NY, United States. (poster)

Membership, Honors, Awards

Membership

Society for Biomolecular Imaging and Informatics (SBI^2)	Member	Oct 2023 – Present
SPARSE (SPiking And Recurrent SoftwarE) Coding Lab	Research Assistant	Sept 2020 – May 2021
Drexel Math and Computer Science Club	Vice President	Winter 2018
Upsilon Pi Epsilon Drexel Chapter	Vice President	Winter 2018

Awards

Drexel University Dean's List	Fall/Winter 2019, Fall 2020
NSF Research Experiences for Undergraduates Grant	Summer 2017

Technical Skills

Languages: *Python, MATLAB*
Libraries: *PyTorch, Tensorflow, Jupyter, OpenCV, Matplotlib, Pillow, pandas, scikit-learn*
Tools: *Anaconda, VS Code, Snakemake, ImageJ/Fiji, Microsoft SQL Server, LaTeX, AWS*
Machine learning: *CNNs, GANs, transformers, auto-encoders, representation learning*