# JEFF WINCHELL

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## EDUCATION

**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 2022 - Present)*
*Assistant Data Scientist (Apr 2022 - Dec 2022)*
*Data Science Intern (Nov 2021 - Apr 2022)*
Advisors: Dr. Bianca Migliori, Dr. Daniel Paull

- Designed, tested, and deployed deep learning tool for focus-level quality analysis of cell culture imaging assays with >98% classification accuracy (published recently in SLAS Discovery)
- Designed a Mask R-CNN-based tool for instance segmentation of DAPI-stained nuclei of diverse cell types to improve quality of single-cell phenotypic screens with ~0.9 mIoU and <5% missed cells
- Predicting embryoid body stemness via bright-field CNN-based image classification combined with known cell line metadata and historical assay ground-truths
- Identifying candidate fluorescent antibody markers for distinguishing between primary and stem-cell-derived fibroblasts through statistical analysis and mapping of Human Protein Atlas metadata to flow cytometry data
- Leveraging post-hoc explainability methods of image classification (saliency maps, counterfactuals) to characterize cellular phenotypes of aging from large-scale, high-content imaging screens of fibroblasts
- Training and mentoring college-level intern on bright-field microscopy nuclei segmentation, enabling cell-level growth tracking prior to cell painting assays

**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

## PUBLICATIONS:

Winchell et al. (2023). FocA: A deep learning tool for reliable, near-real-time imaging focus analysis in automated cell assay pipelines. In SLAS Discovery. Elsevier BV. https://doi.org/10.1016/j.slasd.2023.08.004 (in press).

## PRESENTATIONS/POSTERS:

Biomolecular Imaging and Informatics 2023 Conference (Hosted by SBI2), Boston, MA, October 2023. "FocA: A deep learning tool for reliable, near-real-time imaging focus analysis in automated cell assay pipelines" (invited for poster).

Future Labs Live, Philadelphia, PA, October 2023. "Quality Control in Artificial Intelligence" (panel).

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

## MEMBERSHIP:

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| Society for Biomolecular Imaging and Informatics (SBI2), Member | (Oct 2023 - Present) |
| SPARSE (SPiking And Recurrent SoftwarE) Coding Lab, Research Assistant | (Sept 2020 - May 2021) |
| Drexel Society of Artificial Intelligence, Secretary/Member | (Jan 2021 - May 2021) |
| Drexel Math and Computer Science Club, Vice President | (Winter 2018) |
| Upsilon Pi Epsilon Drexel Chapter, Vice President | (Winter 2018) |
| Drexel University Symphony Orchestra, Principal Oboist | (Summer 2017) |

## TECHNICAL SKILLS:

**Languages:** Python, MATLAB, C++
**Libraries:** Tensorflow, PyTorch, Jupyter, OpenCV, pandas, matplotlib, scikit-learn, pillow
**Machine learning:** GANs, CNNs, sparse coding, transformers, auto-encoders, representation learning
**Software:** Anaconda, VS Code, ImageJ/Fiji, Microsoft SQL Server, LaTeX

## HONORS AND GRANTS

Dean's List (Fall 2019, Winter 2019, Fall 2020)
NSF REU Grant (Summer 2017)