

# Michael Lin

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## Education

### Carnegie Mellon University

Pittsburgh, PA

M.S. in Computer Vision (Robotics Institute)

August 2025 – December 2026

- **Relevant coursework:** Machine Learning, Advanced Computer Vision, Learning for 3D Vision, SLAM

### Boston College

Chestnut Hill, MA

B.S. in Computer Science, B.A. in Mathematics

August 2021 – May 2025

- **Relevant coursework:** Multivariable Calculus, Linear Algebra, Probability Theory, Mathematical Statistics, Algorithms, Computational Complexity, Computer Vision

## Experience

### Computer Vision Researcher (Near Earth Autonomy)

January 2026 – Present

- Researched runway localization frameworks using multi-model deep learning and geometric registration
- Constructed YOLO-based methods for runway segmentation from aerial monocular images
- Investigated SIM2Real transfer from simulator data to real-world testing for failure validation testing

### Graduate Research Assistant (Carnegie Mellon University)

January 2026 – Present

- Conducted research in learning language embeddings for 3D Gaussian splatting in urban environments, continuing work from a previous project in Gaussian splatting, in collaboration with Professor Katia Sycara's Advanced Agent-Robotics Technology Lab

### Undergraduate Research Fellow (Boston College)

January 2022 – August 2025

- Developed UNet-based machine learning pipelines for cell segmentation in electron microscopy imagery over multiple projects. Fine-tuned and scaled models during deployment to generate segmentation maps on terabytes of data. Advised by Professor Donglai Wei and collaborated with labs at USC, Columbia University, and UMichigan to publish multiple papers in high-profile biology conferences (Nature, Cell)
- Organized and facilitated lab's onboarding program and instructed new team members on MLOps tools (Numpy, PyTorch, PyTorch Connectomics, Slurm) through weekly in-person meetings and coding exercises
- Prepared weekly presentations for multiple interdisciplinary groups of researchers. Presented on machine learning pipeline development to undergraduate, graduate, and post-graduate collaborators

### Undergraduate Teaching Assistant (Boston College)

August 2022 – May 2023

- Instructed over 40 students on computer hardware (Verilog) and foundational machine learning packages (Numpy, OpenCV, Pytorch) across two semesters. Held weekly office hours for two courses (Computer Organization and Lab, Biomedical Image Analysis)
- Graded problem sets and labs, delivering reports on student performance to supervising professor

### General Service Server (Boston College Dining Services)

May 2022 – August 2022

- Coordinated with group of ten for setup and breakdown of venue for school orientation, serving over 8000 guests over ten weeks
- Delivered excellent customer service with an amenable and welcoming attitude, promptly clearing tables for expedited table turnaround time and improving customer experience

## Projects

### Open-Vocabulary Scene Understanding for 3D Gaussian Splatting

September 2025 – December 2025

- Developed a 3D Gaussian splatting tool based on OpenGaussian and StreetGaussian for zero-shot semantic understanding. Used 2D segmentation masks from Segment Anything to facilitate learning of a discrete codebook of open vocabulary language embeddings and utilized cosine distance as a guiding metric for answering natural language queries
- Continued this project as an independent study in Professor Katia Sycara's Advanced Agent-Robotics Technology Lab at CMU, conducting research in extending this method to accomplish 3D time sequence scene understanding

### 3D Cell Segmentation and Center-line Extraction

May 2025 – August 2025

- Developed cell segmentation, center-line fitting, and signal extraction pipelines using PyTorch Connectomics and Segment Anything to study gene regulation dynamics. Completed in collaboration with

the Spatial Biodynamics Lab at the University of Michigan. Created over 5000 cell instance segmentation and center-line prediction pairs with precision/recall scores of 0.6/0.7 during deployment

- Optimized model hyperparameters using algorithms built on Scipy and the Optuna sampling framework, increasing model recall by 10%

### **Large-scale 3D Segmentation in Electron Microscopy Volumes**

May 2024 – March 2025

- Created a machine learning pipeline based on the 3D-UNet architecture to study cell distribution in nervous systems of model organisms. Created instance segmentation maps of vesicles on large-scale electron microscopy volumes of *Hydra vulgaris* using tools from the PyTorch Connectomics library. Completed in collaboration with Prof. Rafael Yuste's NeuroTechnology Lab at Columbia University
- Implemented human-in-the-loop design principles during model training to expedite data annotation over three rounds of inference and annotation, increasing labeling throughput by over 10 times
- Automated model deployment (Slurm, sequential job management, bash scripting) on over 1TB of volumetric data on a HPC, producing 40000 instance segmentations with 98% precision

### **Real-time Microscopy Object Detection**

January 2023 – September 2023

- Developed a UNet model for object detection in STEM images using Pytorch to study electromagnetic spin in ferroelectric materials. Generated over 100 heatmaps of merons detections from greyscale EM imagery, achieving over 70% precision and recall during testing at a 1Hz rate. Completed in collaboration with the Shao Electron Microscopy Group at USC
- Published and presented a poster at the Microscopy and Microanalysis conference in 2024. Fielded questions over two hours during conference and made over 400 direct impressions by January 2026

### **Publications** (\* indicates shared first author)

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Lirong Zheng, ..., Michael Lin, et al (2025). *Scalable and multiplexed recorders of gene regulation dynamics across weeks*. Nature. doi.org/10.1038/s41586-026-10156-9.

Shulin Zhang, ..., Michael Lin, et al (2025). *Ultrastructural reconstruction of the endodermal nerve net of Hydra vulgaris*. Current Biology. doi.org/10.1016/j.cub.2025.10.001.

Michael Lin\*, et al. *VesicleEM: A Comprehensive Vesicle Analysis Toolbox for Volumetric Electron Microscopy*. In review for PLOS Computational Biology.

Michael Lin, et al (2024). *Real-Time Point of Interest Segmentation for Electron Microscopy Images via Machine Learning*. Microscopy and Microanalysis. doi.org/10.1093/mam/ozae044.215.

### **Technical Skills**

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*Languages*: English (native proficiency), Mandarin Chinese (conversational proficiency)

*Programming Languages*: Python, C, C++, Java, R

*Tools*: Pytorch, OpenCV, Numpy, PIL, Scikit, Matplotlib, Scipy, Git, Slurm, Github, Linux, Jupyter, Optuna