Jason Ken Adhinarta

jasonkena.github.io · adhinart@mit.edu · Cambridge, MA

Research Interests

My research focuses on developing **multimodal representation learning** and **geometric deep learning** methods to enable scalable analyses of **biomedical imaging** data, with particular applications in neuroscience and clinical diagnostic settings.

Education

Massachusetts Institute of Technology — Cambridge, MA
Ph.D. in Electrical Engineering and Computer Science — *Sep 2025 – May 2031*

Boston College — Chestnut Hill, MA
B.S. in Computer Science, B.S. in Mathematics | GPA: 3.98/4.00 — *Aug 2021 – May 2025*

Research Experience

Medical Vision Group — Cambridge, MA
Graduate Research Assistant (advised by Prof. Polina Golland) — *Sep 2025 – Present*

- Investigating multimodal contrastive learning methods for X-ray-report pairs, leveraging anatomical priors

Boston College Computer Vision Lab — Chestnut Hill, MA
Research Assistant (advised by Prof. Donglai Wei) — *Sep 2021 – Aug 2025*

- Developed segmentation and signal-processing pipelines based on **PyTorch Connectomics** and **Segment Anything for Microscopy** to study gene regulation dynamics; done with the Spatial Biodynamics Lab at University of Michigan [A]
- Clustered vesicles in *Hydra vulgaris* samples using PyroVED **translation/rotation equivariant autoencoders**, characterizing neurons using spatial distribution of vesicles. Part of larger work to build a toolbox for **vesicle analysis** for electron microscopy. In collaboration with Shulin Zhang from Prof. Rafael Yuste's lab at Columbia University [B] [C]
- Adapted **cell tracking models** (3DeeCellTracker and Ultrack) to extract **whole-brain neural dynamics** from **calcium imaging** of 118 NeuroPAL-strain roundworms across 5 labs. Work done in collaboration with Daniel Sprague from the UCSF Foundations of Cognition Lab, Prof. Erdem Varol at the NYU Neuroinformatics Lab, and Prof. Eviatar Yemini at UMass Chan Medical School [D]
- Benchmarked PointNet++, RandLA-Net, and PointTransformer **point-cloud segmentation architectures** on our dataset of 4,476 spines sourced from electron microscopy of 70 dendrites, demonstrating **zero-shot cross-species generalization** of our proposed Frenet-Serret **equivariant geometric transform** on the mouse visual cortex (94.1% Dice) and human frontal lobe (81.8% Dice). Also wrote extensive pipelines for morphology processing and mesh visualization. Part of a project to improve **segmentation on tree-like structures**; locating synapses in neurons and aneurysms in blood vessels. Collaborated with Shixuan Gu at the Harvard Visual Computing Group [E]
- Analyzed **blood vessel morphologies** in mouse, human, and macaque cortical samples using Kimimaro **centerline extraction**. Evaluated the performance of the U-Net3D baseline model on the largest electron microscopy blood vessel dataset to date. Part of a project to develop a **zero-shot 3D segmentation method** using **Segment Anything Model**. In collaboration with Prof. Jia Wan from Harbin Institute of Technology, China, the Harvard Visual Computing Group, and the Harvard Lichtman Lab [F]
- Finetuned Cellpose, a **foundation model for cell segmentation**, to automatically detect ∼5 million neuronal vesicles in 20 volumes. Work done with Dr. Xiaomeng Han from Prof. Jeff Lichtman's lab at Harvard to develop a novel microscopy technique incorporating fluorescent markers to facilitate **identification of cell types and functions**. [G]

EPFL CVLab — Lausanne, Switzerland
Research Intern (advised by Dr. Jiancheng Yang and Prof. Pascal Fua) — *May 2023 – Aug 2023*

- Orchestrated pipelines integrating the STU-Net **medical image segmentation foundation model** with our **geometrically-constrained neural implicit fields** to generate anatomically accurate heart structures from our aggregated dataset of 140 **MRI scans**. Contributed to the Heart Augmented Reality Training System, in collaboration with Swiss medical imaging company ADIS and the Cardiology Division of Lausanne University Hospital [H]
- Evaluated **voxel/point-cloud segmentation** models (PointNet/PointNet++, DGCNN, PointCNN, nnU-Net) and **centerline extraction** techniques (Kimimaro, L1-Medial Skeletonization) on our proposed dataset of 660 **CT scans** and 15,466 individually annotated ribs. Implemented a Docker compatability wrapper for the L1-Medial Skeletonization codebase from 2016. Ongoing work to incorporate the **mesh representations of ribcages** into the **MedShapeNet2.0** dataset. In collaboration with radiologists at Huadong Hospital, China and Shixuan Gu at Harvard Visual Computing Group [I]

PUBLICATIONS *(* indicates equal contribution)*

[A] Lirong Zheng*, Dongqing Shi*, Yixiao Yan*, Bingxin Zhou, Jormay Lim, Yongjie Hou, Bobae An, **Jason K. Adhinarta**, Michael Lin, BumJin Ko, William C. Joesten, Mehul Gautam, Emily G. Klyder, Boxuan Chang, Sethuramasundaram Pitchiaya, Denise J. Cai, Edward S. Boyden, Donglai Wei, Pietro Liò, Changyang Linghu. **Scalable and multiplexed continuous recording of gene regulation dynamics over 2 weeks**. Manuscript under review.

[B] **Jason K. Adhinarta***, Yutian Fan*, Adam Gohain*, Michael Lin*, Paige Nurkin*, Richard Ren*, Micaela Roth*, Shulin Zhang*, Ayal Yakobe, Rafael Yuste, Donglai Wei. **VesiclePy: A Machine Learning Vesicle Analysis Toolbox for Volume Electron Microscopy**. Manuscript under review. bioRxiv:10.1101/2025.09.08.674799v1

[C] Shulin Zhang, Netanel Ofer, Christophe Dupre, Xueying Wang, Richard Schalek, Yuelong Wu, Michael Lin, Micaela Roth, **Jason K. Adhinarta**, Adam Gohain, Yutian Fan, Wenjie Yin, Donglai Wei, Jeff Lichtman, Rafael Yuste. **Ultrastructural reconstruction of the endodermal nerve net of *Hydra vulgaris***. Current Biology 2025. doi:10.1016/j.cub.2025.10.001

[D] **Jason K. Adhinarta***, Jizheng Dong*, Tianxiao He*, Junxiang Huang*, Daniel Sprague*, Jia Wan, Hyun Jee Lee, Zikai Yu, Hang Lu, Eviatar Yemini, Saul Kato, Erdem Varol, Donglai Wei. **WormID-Benchmark: Extracting Whole-Brain Neural Dynamics of *C. elegans* at the Neuron Resolution**. bioRxiv:10.1101/2025.01.06.631621v3

[E] Shixuan Gu, **Jason K. Adhinarta**, Mikhail Bessmeltsev, Jiancheng Yang, Jessica Zhang, Wenjie Yin, Daniel Berger, Jeff W. Lichtman, Hanspeter Pfister, Donglai Wei. **Frenet-Serret Frame-based Decomposition for Part Segmentation of 3D Curvilinear Structures**. IEEE Transactions on Medical Imaging 2025. doi:10.1109/TMI.2025.3589543

[F] Jia Wan, Wanhua Li, **Jason K. Adhinarta**, Atmadeep Banerjee, Evelina Sjostedt, Jingpeng Wu, Jeff Lichtman, Hanspeter Pfister, Donglai Wei. **TriSAM: Tri-Plane SAM for zero-shot cortical blood vessel segmentation in VEM images**. IEEE Journal of Biomedical and Health Informatics 2025. doi:10.1109/JBHI.2025.3577625 PMID:40489282

[G] Xiaomeng Han, Xiaotang Lu, Peter H. Li, Shuohong Wang, Richard Schalek, Yaron Meirovitch, Zudi Lin, **Jason K. Adhinarta**, Daniel Berger, Yuelong Wu, Tao Fang, Elif S. Meral, Shadnan Asraf, Hidde Ploegh, Hanspeter Pfister, Donglai Wei, Viren Jain, James S. Trimmer, Jeff W. Lichtman. **Multiplexed Volumetric CLEM enabled by antibody derivatives provides new insights into the cytology of the mouse cerebellar cortex**. Nature Communications 2024. doi:10.1038/s41467-024-50411-z PMID:39103318

[H] Jiancheng Yang, Ekaterina Sedykh, **Jason K. Adhinarta**, Hieu Le, Pascal Fua. **Generating Anatomically Accurate Heart Structures via Neural Implicit Fields**. Medical Image Computing and Computer-Assisted Intervention 2024. doi:10.1007/978-3-031-72378-0_25

[I] Liang Jin*, Shixuan Gu*, Donglai Wei, **Jason K. Adhinarta**, Kaiming Kuang, Yongjie J. Zhang, Hanspeter Pfister, Bingbing Ni, Jiancheng Yang, Ming Li. **RibSeg v2: A Large-scale Benchmark for Rib Labeling and Anatomical Centerline Extraction**. IEEE Transactions on Medical Imaging 2023. doi:10.1109/TMI.2023.3313627 PMID:37695967

TEACHING ASSISTANTSHIP

CSCI 3397: Biomedical Image Analysis, Boston College — Spring 2024

MATH 4480: Math and Machine Learning, Boston College — Spring 2023

AWARDS

NSF Graduate Research Fellowship — Fall 2025

David and Randi Fett Fellowship, MIT — Fall 2025

Matthew Copithorne Scholarship, Boston College — Spring 2025

John J. Neuhauser Award, Boston College — Spring 2025

Order of the Cross and Crown, Boston College — Spring 2025

Junior Inductee, Phi Beta Kappa — Spring 2024

Gabelli Presidential Scholarship, Boston College — Fall 2021