

# JASON KEN ADHINARTA

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## EDUCATION

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### Boston College

B.S. in Computer Science, B.S. in Mathematics (Cum. GPA: 3.98/4.00)

Chestnut Hill, MA

Aug 2021 – May 2025

## RESEARCH EXPERIENCE

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### Boston College Computer Vision Lab

Research Assistant (advised by Prof. Donglai Wei)

Chestnut Hill, MA

Sep 2021 – Present

- Ongoing: Crafted object-centric constraints for **terabyte-scale superpixel agglomeration** methods for **PyTorch Connectomics** using the SegCLR (**segmentation-guided contrastive learning**) pretrained model, in an attempt to build an open source competitor to Google's Flood Filling Networks. In collaboration with Zengyu Yang
- Ongoing: 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 [A] [B]
- Ongoing: 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 [C]
- 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 [D]
- 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 [E]
- 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**. [F]
- Prototyped methods to correct deformed **spinal vertebrae mesh predictions** using Probreg **point-cloud registration** for Dr. Zongwei Zhou at JHU
- Maintained **Docker evaluation containers** for the ISBI 2013 SNEMI3D neuron segmentation challenge, MICCAI 2021 AxonEM axon segmentation challenge, and the ISBI 2023 RNR-EXM expansion microscopy image registration challenge on the **Grand Challenge** platform, to simplify benchmark evaluation for 320+ participants
- Developed the ChunkPipeline package to perform distributed volumetric computations on the **Boston College Linux Cluster**, contributed bugfixes to the Princeton Seung Lab's suite of tools for connectomics, onboarded research interns onto the PyTorch Connectomics ecosystem

### EPFL CVLab

Research Intern (advised by Dr. Jiancheng Yang and Prof. Pascal Fua)

Lausanne, Switzerland

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 [G]
- Evaluated **voxel/point-cloud segmentation** models (PointNet/PointNet++, DGCNN, PointCNN, nnU-Net) and **center-line extraction** techniques (Kimimaro, L1-Medial Skeletonization) on our proposed dataset of 660 **CT scans** and 15,466 individually annotated ribs. Implemented a Docker compatibility 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 [H]

- Studied the **temperature-dependent excitation** curves of  $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+}$ ,  $\text{Dy}^{3+}$  glow-in-the-dark crystals. Built vacuum-sealed optical probes operating at cryogenic temperatures. In collaboration with Dr. Muhandis Shiddiq from Indonesia's National Research and Innovation Agency and Prof. Henri Uranus from Universitas Pelita Harapan [I]
- Developed an **OpenCV-based contamination detection system** featuring perspective normalization, shadow removal, and blob detection, to control a CNC-sprayer for disinfection of fungal cultures. Delivered a proof-of-concept robot for MycoWorks, a California-based startup producing **plant-based synthetic leather** [J]
- Trained the YOLACT **instance segmentation** model to track Black Soldier Fly larvae. Wired an Arduino-controlled linear-slider system for recording larvae behavior in arrays of petri dishes. Set up CVAT data annotation pipelines. An effort to **optimize larvae feed and rearing conditions for waste-processing** in collaboration with Hermetia Bio Sciences
- Automated palm oil **fruit quality assurance** using OpenCV and XGBoost tree models. Deployed training pipelines on Google Cloud Platform. In collaboration with manufacturing company PT. Sawit Asahan Tetap Utuh
- Finetuned the YOLACT segmentation model on the TACO waste dataset, integrated with a 3-DOF robotic arm with a gradient-descent-based **inverse kinematics** solver. Presented at Indonesia Science Expo 2019
- Computationally modeled angle-dependent Ohmic resistance of stacked hexagonal lattices analogous to twisted bilayer graphene using **CUDA-accelerated sparse linear solvers**, attempting to understand magic angle superconductivity
- Co-designed a 23-week long **Arduino-based electronics programming curriculum** for Sekolah Pelangi Kasih's after-school program. Co-instructed the electronics portion of Sekolah Pelita Harapan's 2019 Summer Science Academy

## PUBLICATIONS (\* indicates equal contribution)

- [A] Jason K. Adhinarta\*, Yutian Fan\*, Michael Lin\*, Richard Ren\*, Micaela Roth\*, Ayal Yakobe\*, Shulin Zhang\*, Rafael Yuste, Donglai Wei. **VesicleEM: A Comprehensive Vesicle Analysis Toolbox for Volumetric Electron Microscopy**. Manuscript in preparation; planned submission to PLOS Computational Biology.
- [B] Shulin Zhang, Netanel Ofer, Wataru Yamamoto, Richard Schalek, Yuelong Wu, Christoph Dupre, Jason K. Adhinarta, Yutian Fan, Michael Lin, Micaela Roth, Ben Cox, Celina Juliano, Donglai Wei, Jeff Lichtman, Rafael Yuste. **Connectomic analysis of the *Hydra vulgaris* endoderm: cell types and vesicles**. Manuscript in preparation; planned submission to Current Biology.
- [C] 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. **WormND: A Benchmark for Extracting Whole-Brain Neural Dynamics of *C. elegans* at the Neuron Resolution**. Manuscript under revision.
- [D] 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**. Under review at IEEE Transactions on Medical Imaging. [arXiv:2404.14435](https://arxiv.org/abs/2404.14435)
- [E] 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**. Under review at IEEE Journal of Biomedical and Health Informatics. [arXiv:2401.13961v4](https://arxiv.org/abs/2401.13961)
- [F] 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](https://doi.org/10.1038/s41467-024-50411-z) PMID:39103318
- [G] 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](https://doi.org/10.1007/978-3-031-72378-0_25)
- [H] 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](https://doi.org/10.1109/TMI.2023.3313627) PMID:37695967
- [I] Jason K. Adhinarta, Eric Jobiliong, Muhandis Shiddiq, Henri P. Uranus and Eden Steven. **Light storage and thermal-assisted switching of  $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+}$ ,  $\text{Dy}^{3+}$** . Journal of Nonlinear Optical Physics & Materials 2019. [doi:10.1142/S0218863519500425](https://doi.org/10.1142/S0218863519500425)

## PATENTS

- [J] Eden Steven, Ray A. O. Sinurat, Alvius Tinambunan, Edmund F. Anderson, Calvin, Andrew D. Widjaja, Josavan Ezekhiel, Jason K. Adhinarta. **A Robotic Method of Monitoring, Hydrating, Training, and Treating Bacterial or Fungal Infections of New-growth Fungal Cultures to Produce Densified Sheet-like Lateral Networks of Fungal Materials**. PDKI:P00202009416. Patent pending, submitted to Indonesian patent registry in 2020

## TEACHING ASSISTANTSHIP

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**CSCI 3397: Biomedical Image Analysis** (Prof. Donglai Wei)

Spring 2024

**MATH 4480: Math and Machine Learning** (Prof. Elisenda Grigsby)

Spring 2023

## ACTIVITIES

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### **Boston College Machine Intelligence Group**

Chestnut Hill, MA

*President*

*Sep 2022 – Present*

- **Organized weekly seminars** for an undergraduate audience, hosting industry experts from Meta, Google, Red Hat
- Equipped members with concrete engineering skills, connecting students with CS/math labs on campus
- Developed workshops on landmark ML methods in collaboration with Boston College Computer Science Society

### **Boston College Experimental Math and Machine Learning Lab**

Chestnut Hill, MA

*Member*

*Mar 2023 – Present*

- Engaged with faculty and graduate students to explore the intersection of mathematics and machine learning
- Gave a talk titled “**A Whirlwind Tour of Deep Learning**” Summer 2023, covering universal function approximation, loss landscape visualization, Sharpness Aware Minimization, Rich Sutton’s Bitter Lesson, and everything in between
- Held a **tutorial on CLI tools** for the lab’s biweekly seminar series Fall 2024, illustrated using a toy project minimizing repulsion forces for electrons on a sphere, received funding from a **Teaching-Advising-Mentoring grant** Summer 2024

### **Applied Science Academy at Sekolah Pelita Harapan Lippo Village**

Tangerang, Indonesia

*Mentor*

*Aug 2023 – Present*

- **Remotely mentored** and **designed lesson plans** for 3 high school students with varying experience levels with the Python deep learning ecosystem, to broaden their skillsets and **diversify educational and career opportunities**
- *Ongoing*: Guiding a sophomore in building a **remote-controlled car** using a Raspberry Pi and a camera module, feeding images into **Nerfstudio** to generate novel views for navigation, with a Flask server for remote control
- *Ongoing*: Assisting a junior in using a **U-Net architecture** to demonstrate how audio recordings can be used to reconstruct typing inputs, in a project to raise awareness on **audio-based keystroke sniffing attacks**
- Helped a junior develop a CNN to **classify mosquito species using audio recordings** from the HumBugDB dataset

### **Citylife Presbyterian Church**

Boston, MA

*Community Group Co-leader*

*Aug 2024 – Present*

- Facilitated weekly student-led meetings involving praise, prayer, and sermon discussions at Boston College

### **Brighton High School, Haley House, The City**

Boston, MA

*Volunteer*

*May 2022 – May 2023*

- Summer 2022: Served as a **teaching assistant** at Brighton High School for math classes; aided in **sorting and distribution of clothing donations** at Haley House; interviewed families of COVID victims for The City, a NYC-based news organization, **wrote an obituary** for publication
- Fall 2022 – Spring 2023: Co-ran the Threads campaign at Boston College, organizing a **clothing drive** and panel discussion with activists from St. Francis House, Cradles to Crayons, and Haley House to raise awareness on **clothing insecurity**

### **Boston College Competitive Programming Team**

Chestnut Hill, MA

*Competitor*

*Sep 2022 – Dec 2023*

- Represented Boston College at the 2022 and 2023 ICPC Northeast North America Regional Contests

## AWARDS

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### **Phi Beta Kappa**

Spring 2024

*Nominated as a junior, based on academic engagement, intellectual curiosity, and leadership capacity*

### **Boston College Dean’s Scholar Award**

Spring 2024

*Granted to the top 5% of the junior class based on academic performance and co-curricular leadership*

### **Boston College Eagle Intern Fellowship**

Summer 2023

*\$4,800 stipend awarded for a full-time research internship at EPFL CVLab in Lausanne, Switzerland*

### **Boston College Sophomore Scholar Award**

Spring 2023

*Granted to the top 5% of the sophomore class based on academic excellence*

### **Boston College Gabelli Presidential Scholarship**

Fall 2021

*Competitive four-year full-tuition scholarship awarded to ~15 students annually*

### **ISMOA Best Poster Presentation**

Summer 2019

*Awarded at the 12<sup>th</sup> International Symposium on Modern Optics and its Applications*