Eduardo Hirata Miyasaki

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PROFESSIONAL SUMMARY:

I am a research and development engineer specializing in the development of deep learning tools for virtual staining and segmentation of dynamic cell systems, dedicated to advancing the field of biomedical imaging. My expertise lies in integrating advanced computer vision models with imaging systems to enable smart microscopy, such as tools that facilitate the tracking and perturbation of dynamic organ systems in model organisms, such as zebrafish. With a Ph.D. in Electrical and Computer Engineering, I have a proven track record in creating innovative imaging technologies and computational pipelines for biomedical imaging. My work has been recognized through various publications and presentations, reflecting my commitment to advancing the field of biomedical imaging. I am adept at leading multidisciplinary teams and driving impactful research projects that contribute significantly to scientific knowledge and technological advancement in the biomedical domain.

EDUCATION:

University of California at Santa Cruz, Santa Cruz, CA, USA 09/2022

Ph.D. Electrical and Computer Engineering

- Thesis: "Deep and Fast High-Resolution 3D Imaging."
- Advisor: Dr. Sara Abrahamsson

University of California at Santa Cruz, Santa Cruz, CA, USA 06/2018

B.S Bioengineering & Minor in Electrical Engineering

- Capstone: Automation and Miniaturization of Surface Functionalization Process for Surface Acoustic Wave Devices
- Mentor: Xiangchao 'Jude' Zhu & Dr. Ali Yanik

TECHNICAL SKILLS:

Programming Languages:	C/C++, Python, MATLAB, Bash
Image Processing and Computing Tools:	Git, ImageJ, Sci-kit Learn, OpenCV, Pytorch, SLURM
Single Board Computing:	PSoC 5, Xilinx Pynq, Raspberry Pi, STM32
CAD and Optical Simulations:	SolidWorks/Fusion 360 and CodeV/Zemax
Nanofabrication:	AFM, SEM, Photolithography, Dry Etching, Fused Silica Processing
Languages:	Spanish (Native Speaker), English (Fluent), Japanese (Intermediate)

RESEARCH EXPERIENCE:

CZ Biohub SF LLC, *Research and Development Engineer II* 09/2022- Present

Project: Robust Virtual Staining of Landmark Cellular Organelles

- Co-developed a robust deep learning pipeline for virtual staining to translate from label-free to cellular landmarks for single cell detection and phenotyping using pytorch.

Project: High-throughput 4D correlative imaging and analysis of the molecular and physical architecture of cells

- Co-designed and built high throughput fluorescent and label-free imaging system for fast correlative measurements of cell dynamic states.
- Developed scalable image processing pipelines handling TB size datasets.

Project: Smart microscopy tools for tracking and perturbation of dynamic organ systems

- Designed and built tools for photomanipulation enabling experiments for organ formation and re-organization longitudinal studies.
- Implemented close-loop algorithms for cell tracking in longitudinal experiments.

University of California Santa Cruz, *Graduate Research Student* 09/2018- 09/2022

Project: Fast Live-3D microscopy with 25-Plane Multifocus Microscopy (M25)

Subproject: 25-Camera Array Automation and Synchronization

- Modeled and built a fast fluorescence microscopy imaging system based on Fourier diffractive optics for simultaneous multifocal plane imaging using a camera array.
- Developed an acquisition pipeline for a 25-camera array multifocus microscopy system operating at over 100 FPS.
- Wrote C/C++ and Python programs for real-time control of cameras, lasers, and optoelectronic equipment.
- Designed a PyQt5 GUI for automated pipeline control, making it accessible for 'non-engineers.'
- Developed a Python pipeline for image registration and analysis of 3D volumes, including C. elegans and lamprey neural circuits.

Subproject: Custom Diffractive Optical Element (DOE) Development

- Simulated and devised multifocus transmissive phase gratings with custom pattern allowing for simultaneous multiple plane imaging in a 5x5 array of sensors with >87% efficiency with MATLAB.
- Fabricated color-correcting gratings with ~85% transmission efficiency for aberration-free multifocus microscopy
- Designed CAD custom holders for DOEs and optical elements to troubleshoot and operate the tool.

Project: Multifocus Structured Illumination Microscopy (MF-SIM)

- Home-built and characterized home build 3D SIM system performs multiple plane super-resolution imaging.
- Nanofabricated custom DOEs enabling multiple plane SIM
- Reconstruction and processing of 3D SIM datasets

Chan Zuckerberg Biohub, *Computational Microscopy Intern*, May 2021 -September 2021 06/2021-08/2021

Project: Live- uniaxial Permittivity Tensor Imaging (PTI)

- Constructed multimodal imaging setup including label-free and fluorescence imaging paths.
- Automated and accelerated acquisition hardware enabling live imaging using Xilinx Pynq and Triggerscope
- Improved the sensitivity of Live-PTI prototype by measuring elliptical states.
- Designed CAD for cell-incubator enclosure around our custom optical setup for live-cell compatibility

Marine Biological Laboratory, *Whitman Associate*, June 2019 – August 2019 06/2019-08/2019

Project: 25-Plane Multifocus Microscopy (M25) Prototype

- Design and build large FOV multifocus microscopy 130x130x50um and fabricated DOEs for Zeiss microscopes
- Built and tested prototype allowing fast live-3D microscopy at 50HZ in multiple model organisms including *C.elegans*, zebrafish, lamprey, and hydra for neural circuit imaging

University of California Santa Cruz, *Undergraduate Research Assistant*, November 2017 – June 2018 11/2017-06/2018

Project: Miniaturize and Automation of Surface Acoustic Waves Surface Functionalization Process

- Automated the workflow process with state machines using STM32 microcontroller, TCP/Sockets, and i2C protocol to control the pumps and valves in the system.
- Characterized pumps to flow 1-1000[ul/min] without perturbations and achieved workflow to inject multiple fluids for the surface functionalization process.

TEACHING EXPERIENCE:

Deep Learning Course, Marine Biological Laboratory (MBL), 08/2024-09/2024

- Leading the image-to-image translation exercise and project section.
- Supervise the students' projects related to image-to-image translation.

ECE 103/L: Signals and Systems, University of California Santa Cruz, 04/2020-06/2020

- Taught and created MATLAB labs covering time-domain analysis with convolution, frequency domain Analysis with Fourier series, sampling, and examples of applications in communications and control systems.

Analytical and Quantitative Light Microscopy (AQLM) Course, Marine Biological Laboratory 05/2019

- Taught introductory geometric and physical optics, 4f systems, Fourier Optics, basic image processing algorithm, and fluorescence microscopy techniques (Widefield, TIRF, SIM, Confocal, Light Sheet).

ECE 101/L: Introduction to Electronic Circuits, University of California Santa Cruz 01/2019-03/2019

- Taught labs for introductory circuit design, testing fundamental theorems (Thevenin, Norton, Kirchhoff's Laws, Superposition), 1st and 2nd order circuits, Op-Amps and filtering.

EE 293: Optics and Microscopy Course, University of California Santa Cruz 01/2018-04/2018

- Demonstration on introduction to geometric optics, aberration, diffraction, 4f system, Kohler Illumination, and Fourier Optics.

EMPLOYMENT HISTORY:

Chan Zuckerberg Biohub San Francisco, San Francisco, California 09/2022-Present
Research and Development Engineer II

Chan Zuckerberg Biohub San Francisco, San Francisco, California 06/2021-08/2021
Research engineering intern

University of California Santa Cruz, Santa Cruz, California 07/2018-08/2022
Graduate student researcher

UC Santa Cruz S-Lab, Santa Cruz, California 07/2017-09/2017

Technical Assistant II
University of California Santa Cruz, Santa Cruz, California 09/2015-09/2016
Undergraduate student researcher

PEER REVIEWED PUBLICATIONS:

1. E. Ivanov***, E. Hirata-Miyasaki****, T. Chandler*, R. Cheloor-Kovilakam*, Z. Liu, S. Pradeep, C. Liu, M. Bhave, S. Khadka, C. Arias, M. D. Leonetti, B. Huang, and S. B. Mehta, "Mantis: high-throughput 4D imaging and analysis of the molecular and physical architecture of cells," PNAS Nexus, (2024).
2. Z. Liu***, E. Hirata-Miyasaki****, S. Pradeep, J. Rahm, C. Foley, T. Chandler, I. Ivanov, H. Woosley, T. Lao, A. Balasubramanian, C. Liu, M. Leonetti, C. Arias, A. Jacobo, and S. B. Mehta, "Robust virtual staining of landmark organelles," bioRxiv preprint, 2024.
3. M.Senftleben, A.Bajor, **E.Hirata-Miyasaki**, S.Abrahamsson, H. Brismar, "Fast volumetric multifocus structured illumination microscopy of subcellular dynamics in living cells", Biomedical Optics Express (2024).
4. **E.Hirata Miyasaki**, A.Bajor, G.M. Petterson, K. Fouke, T. Graham, M. Senftleben, J. Morgan, G. Haspel, S. Abrahamsson. "High Speed 3D Imaging with an Aberration-corrected 25-plane Camera-Array Multifocus Microscope (M25), 2023. **(pending)**
5. **E.Hirata Miyasaki "Deep and Fast High-Resolution 3D Microscopy**" https://escholarship.org/uc/item/0r83j8zw (2022).
6. Y. Peng, **E. Hirata**, W. Pan, L. Chen, J.E. Lu, and S. Chen. *"Intraparticle Charge Delocalization through Conjugated Metal-Ligand Interfacial Bonds: Effects of Metal d Electrons"*, *Chinese Journal of Chemical Physics,* 31, 433 (2018)
7. Y. Peng, J.E. Luo, C.P. Deming, L. Chen, N. Wang, **E. Hirata**, and S. Chen, *"Photo-Gated Intervalence Charge Transfer of Ethynylferrocene Functionalized Titanium Dioxide Nanoparticles"*, *Electrochimica Acta,* 211, 704-710. (2016)

PEER REVIEWED PRESENTATIONS:

Invited Talks

1. S. Abrahamsson and **E. Hirata-Miyasaki**, "High-speed 3D imaging with Multifocus Microscopy", Imaging ONEWORLD, London, UK (Virtual) 09/2021
2. S. Abrahamsson and **E. Hirata-Miyasaki**, "25-camera Multifocus Microscope", LS2 Prestige Microscopy, EPFL Switzerland (Virtual) 08/2021
3. **E. Hirata-Miyasaki**, "High-speed 3D imaging with Multifocus Microscopy", MBL Imaging Lecture Series (Virtual), Woods Hole, MA 08/2020

Conference Papers and Presentations:

1. **E. Hirata-Miyasaki,** Z. Liu, S. Pradeep, J. Rahm, C. Foley, T. Chandler, I. Ivanov, H. Woosley, T. Lao, A. Balasubramania, C. Liu, M. Leonetti, C. Arias, A. Jacobo, S. B. Mehta. "Robust Virtual Staining of Landmark Organelles with Label-free imaging", UT Austin, USA. Poster. 06/2024
2. T. Chandler, I. Ivanov, **E. Hirata-Miyasaki**, S. Pradeep, Z. Liu, C. Foltz, S. B. Mehta, "Physics-informed computation of label-free and fluorescence microscopy data improves contrast, information content, and biophysical interpretation," ASCB Cell Biology, Boston, MA. Conference talk. Presented by T. Chandler. 12/2023
3. **E. Hirata-Miyasaki,** A. Bajor, G. Petterson, K. Fouke, D. D. John, B. Thibeault, G. Haspel, J. Morgan, and S. Abrahamsson, "Fast Live 3D imaging with 25-plane Camera Array Multifocus Microscopy", Methods and Applications in Fluorescence (MAF), Gothenburg, Sweden.(**Best Poster Award**) 09/2022
4. **E. Hirata-Miyasaki**, G. M. Pettersson, A. Bajor, K. Fouke, D. D. John, B. Thibeault, G. Haspel, J. Morgan, and S. Abrahamsson, "Ultrafast Live 3D Imaging with 25-plane Camera Array Multifocus Microscopy," in Imaging Systems and Applications. Conference paper and talk. 07/2022
5. **E. Hirata-Miyasaki**, G. M. Pettersson, K. Zaw, D. D. John, B. Thibeault, B. Lynch, J. Hernandez, and S. Abrahamsson, "Camera-Array 25-Plane Multifocus Microscope for Ultrafast Live 3D Imaging," in Conference on Lasers and Electro-Optics, OSA Technical Digest (Optica Publishing Group, 2020), JW3P.4. Conference Paper and talk. 05/2020
6. **E. Hirata-Miyasaki,** Gustav M. Pettersson, Khant Zaw, Demis D. John, Brian Thibeault, Brandon Lynch, Juliana Hernandez, and Sara Abrahamsson "25 plane multifocus microscopy for fast and live 3D imaging (Conference Presentation)", Proc. SPIE 11226, Neural Imaging and Sensing 2020, 1122602. Poster. 03/2020
7. **E. Hirata-Miyasaki**, G. M. Pettersson, K. Zaw, D. D. John, B. Thibeault, B. Lynch, J. Hernandez, and S. Abrahamsson, "25 Plane Multifocus Microscopy with Camera Array"*, Focus on Microscopy*, London, UK. Poster. 03/2019
8. ***E.Hirata-Miyasaki****,* G.Petterson, S.Abrahamsson, *"25 Plane Multifocus Microscopy for Live 3D Imaging Seeing is Believing"*, EMBL Heidelberg, Germany (October 2019). Poster. 09/2019
9. ***E.Hirata-Miyasaki,*** G.Petterson, S.Abrahamsson*, "Multifocus Microscopy with Camera Array" Sculpted Light in the Brain*, Royal Society, London. Poster 06/2019

10. **E.Hirata-Miyasaki**, G.Petterson, S.Abrahamsson, "Simultaneous 25 plane 3D Live Imaging System" *Biophysical Society Meeting,* Baltimore, MD. Poster. 03/2019

11. **E.Hirata Miyasaki***, A.Gumparthi*,A.Aljuraidan**, "Automatized Surface Functionalization for Point-of-Care Devices", Corporate Sponsor and Engineering Symposium,* UCSC, Santa Cruz, CA.. Poster. 06/2018

PROFESSIONAL ACTIVITIES:

5 total reviews

1. Reviewer for Optica Biomedical Express Journal 2022-Present
2. Reviewer for IEEE Transactions on Medical Imaging Journal 2024-Present
3. Reviewer for Nature Scientific Reports Journal 2022
4. Reviewer for napari Plugin Foundations Grants RFA 2022

PROFESSIONAL MEMBERSHIPS:

1. International society for optics and photonics (SPIE) 2021-Present
2. The Optical Society of America (OSA) 2021-2024
3. Biophysical Society 2018-2019
4. Society of Asian Scientist and Engineers 2014-2018

AWARDS:

Melina and Cliff's NSF's ENSEMBLE RCN Grant	$16K	2019
UC Santa Cruz, Baskin School of Engineering, Travel Award	$500	2019
UC Santa Cruz, Electrical and Computer Engineering Department Fellowship	$2k	2019
UC Santa Cruz, International Graduate Fellowship	$15k	2019
Engineering Dean’s Undergraduate Award	$500	2018
Sara Matthews Scholarship	$1k	2016
Undergraduate Dean’s Award	$20k	2014