Pichaya Lertvilai, Ph.D.

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Profile

Senior Camera Hardware Engineer with specialized expertise in optical instrumentation, computational imaging, and test metrology. Proven track record of architecting hardware-software solutions for flagship consumer devices and managing complex international supply chain collaborations. Strong analytical and communication skills demonstrated through cross-functional engineering leadership and peer-reviewed scientific publications.

Skills

Engineering: Highly proficient in MATLAB, Python, KiCAD, Arduino, Raspberry Pi and Nvidia Jetson. Experienced in Tensorflow, Pytorch, LabVIEW, Fusion 360, C++, PHP, HTML.

Data Analysis: Image processing, computational imaging, image classification, object detection, statistical analysis, particle image velocimetry, hypothesis testing.

Research Experience

Senior Camera Module Test Engineer June 2022 – Present

Apple Inc., San Diego Office

- Architected computational imaging algorithms and bespoke test metrologies for flagship primary camera and depth-sensing modules.
- Pioneered a lean hardware testing approach for miniaturized optics, reducing physical components to save over $1.2M in capital expenditures.
- Optimized mass-production testers by significantly reducing takt times and enhancing measurement accuracy for high-volume manufacturing.
- Collaborated with global component vendors and module integrators to establish unified data streams and strict quality control standards.
- Directed factory-level quality assurance, executing rapid root-cause failure analyses and corrective actions to maximize production yields.

Graduate Student / Postdoctoral Researcher Summer 2016 – 2022

Jaffe Laboratory of Underwater Imaging, University of California San Diego

- **Holographic & Laser-Pulsed Microscopy:** Designed optics and C++/Python control software (via Nvidia Jetson) for a custom underwater microscope with a 1.0 μm detection limit. Utilized HoloPy, OpenCV, and MATLAB to reconstruct holograms, track 3D cellular localization, and analyze colonization statistics.
- **Stereoscopic Imaging & 3D Localization:** Engineered and deployed a deployable, Scheimpflug-based stereoscopic camera system. Conducted rigorous 3D calibration and MTF evaluation, and implemented triangulation algorithms to track and measure *in situ* aquatic invertebrates.
- **Novel Single-Sensor Velocimetry (PIV):** Designed a unique optical path that split a single image sensor into two stereoscopic views to measure 3D flow velocities. Formulated modified Particle Image Velocimetry algorithms utilizing OpenPIV/OpenCV and developed SNR-based data reliability metrics.
- **Machine Learning for Ecology:** Developed a PyTorch-based Convolutional Neural Network (CNN) to autonomously classify *in situ* microscopy images, extracting abundance and size metrics to correlate seasonal ecosystem dynamics with environmental databases.

Scientific Publications

1. **Lertvilai, P.** (2020). The in situ plankton assemblage eXplorer (IPAX): An inexpensive underwater imaging system for zooplankton study. *Methods in Ecology and Evolution*, 11(9), 1042–1048.
2. **Lertvilai, P.**, Roberts, P. L. D., & Jaffe, J. S. (2021). In situ underwater average flow velocity estimation using a low-cost video velocimeter. *Journal of Atmospheric and Oceanic Technology*, 38(6), 1143–1156.
3. **Lertvilai, P.**, & Jaffe, J. S. (2022). In situ size and motility measurement of zooplankton with an underwater stereoscopic camera system using tilted lenses. *Methods in Ecology and Evolution*, 13(6), 1192–1200.
4. Meewan, I., Panmanee, J., Petchyam, N., & **Lertvilai, P.** (2024). HBCVTr: An end-to-end transformer with a deep neural network hybrid model for anti-HBV and HCV activity predictor from SMILES. *Scientific Reports*, 14(1), 9262.
5. Ben-Zvi, O., Roberts, P., Ratelle, D., Snider, J., **Lertvilai, P.**, Wangpraseurt, D., ... & Jaffe, J. S. (2025). The Benthic Underwater Microscope imaging PAM (BUMP): A non-invasive tool for in situ assessment of microstructure and photosynthetic efficiency. *Methods in Ecology and Evolution*, 16(8), 1617–1624.
6. Wisessaowapak, C., Skorobogatko, Y., Kim, H., Feng, X., Son, S., Fu, H., Zhang, S., **Lertvilai, P.**, Chang, L., Hoang, A., & Chen, H. (2026). A nutrient-responsive AMPK/TBK1 circuit restricts adipocyte catabolism. *JCI Insight*, 11(9).

Education

Ph.D. in Oceanography, specialized in underwater optical instrumentation 2022
M.S. in Oceanography, Applied Ocean Science Program 2021
Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA

B.S. in Engineering, Emphasis in Environmental Analysis (GPA 3.85) 2016
Harvey Mudd College, Claremont, CA

Scientific Journal Reviewer

Springer Nature: *Sensing and Imaging* · Wiley: *Limnology and Oceanography Methods* · IEEE: *Journal of Oceanic Engineering* · BES: *Methods in Ecology and Evolution* · *PeerJ* · *Gigabyte*

Photography Awards & Press

Small World Photomicrography 2023, Nikon Small World 15th Place & Image of Distinction
Featured in Howard Hughes Medical Institute's Beautiful Biology online exhibition, Fall 2024.

Art of Science 2021, UC San Diego Library Judge's Award (Student Winner)
Featured in UCSD Explore magazine vol. 3 (Fall 2021); cover of SPIE Photonics Focus, Sep/Oct 2021.

Capturing Ecology 2020, British Ecological Society Overall Runner-Up
Featured in Amateur Photographer magazine, March 9, 2021.