KAO KITICHOTKUL

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EDUCATION

Boston University Ph.D. in Electrical Engineering — GPA 4.00/4, Expected December 2025
Advised by Vivek K Goyal.
Stanford University M.S. in Electrical Engineering — GPA 4.00/4.3, June 2022
Stanford University B.S. in Electrical Engineering, *distinction* — GPA 4.09/4.3, June 2022

RESEARCH INTERESTS

Computational Imaging, Statistical Signal Processing, Machine Learning, Lidar

EXPERIENCE

Mitsubishi Electric Research Laboratories — May 2024 - December 2024
Research Scientist Intern

· Develop a probabilistic model and estimation algorithms for Doppler single-photon lidar.

Boston University — September 2023 - May 2024
Graduate Student Teacher

· Contribute to instruction in "Probability, Statistics, and Data Science for Engineers," with 200+ students enrolled. Responsibilities include conducting a lecture, crafting examination materials, facilitating discussion sections, holding office hours, managing course announcements, and grading exams.

Stanford Computational Imaging Lab — June 2020 - June 2022
Undergraduate Researcher

· Develop model-based deep learning algorithms with uncertainty quantification using Stein's unbiased risk estimate for compressive MRI reconstruction, along with a self-supervised method for on-the-fly finetuning.

Agoda — June 2021 - August 2021
Data Scientist Intern

· Designed, prototyped, and tested an automatic content generation system based on large language models.

Spakowitz Research Group — June 2019 - September 2019
Undergraduate Researcher

· Investigate the effect of topological constraints on bacterial DNA using Monte Carlo simulation.

PUBLICATIONS

R. Kitichotkul, J. Rapp, Y. Ma, and H. Mansour, "Doppler Single-Photon Lidar," in *ICASSP* 2025.

- Develop the first measurement model for single-photon lidar that explicitly includes the target's velocity. Demonstrate joint range and velocity estimation via Fourier analysis through simulation and experiments.

R. Kitichotkul, J. Rapp, and V. K. Goyal, "The Role of Detection Times in Reflectivity Estimation With Single-Photon Lidar," *IEEE J. Sel. Topics Quantum Electron.*, 30(1):1-14, Jan-Feb 2024.

- Derive the maximum likelihood estimator and the Cramér-Rao bound for estimating depth and reflectivity using single-photon lidar. Show that fast time-censoring estimator is statistically efficient in simulation.

R. Kitichotkul, C. A. Metzler, F. Ong, and G. Wetzstein, "SUREMap: Predicting Uncertainty in CNN-Based Image Reconstructions Using Stein's Unbiased Risk Estimate" in *ICASSP* 2021.

- Develop a ground-truth-free per-pixel uncertainty quantification method for denoising approximate message passing, a signal recovery method that can leverage learned image denoisers.

S. Bharadwaj, R. Kitichotkul, A. Agarwal, V. K. Goyal, "Image Reconstruction from Readout-Multiplexed Single-Photon Detector Arrays," in *CVPR* 2025.

- Derive an image formation model for a single-photon detector array with coupled rows and columns. Propose image reconstruction methods and analyzed their statistical properties.

A. Agarwal, L. Kasaei, X. He, R. Kitichotkul, O. K. Hitit, M. Peng, J. A. Schultz, L. C Feldman, and V. K. Goyal, "Shot noise-mitigated secondary electron imaging with ion count-aided microscopy," *Proc. Nat. Acad. Sci.*, 121(31):e2401246121, 2024.

- Develop state-of-the-art per-pixel estimator for secondary electron imaging inspired by MLE by mitigating nonidealities in the image formation model, leading to 3x dose reduction while maintaining image quality.

M. Peng, R. Kitichotkul, S. W. Seidel, C. Yu, and V. K Goyal, "Denoising Particle Beam Micrographs With Plug-and-Play Methods," *IEEE Trans. Comput. Imaging*, 9:581-593, 2023.

- Propose algorithms for particle beam microscopy denoising by combining convex optimization algorithms with deep learning. Achieve 4x reduction in root-mean-square error compared to conventional methods.

TALKS

High-flux Free-running Single-Photon Lidar, *CISE Graduate Student Workshop, Boston University* 2025
Model-based Deep Learning for Imaging Inverse Problems, *Chulalongkorn University* 2025

CLASS PROJECTS

Training Input-Convex Neural Networks using Convex Optimization 2021
Signal Processing for Machine Learning Class Project *Individual project*

· Propose an approach to train two-layer input-convex ReLU networks using convex optimization. Our approach allows for training neural networks to global optimality in polynomial time. Input-convex neural networks can be optimized with respect to the input for applications such as model-based control and imaging.

Text-guided Image Generation using Score-based Model 2021
Deep Generative Models Class Project *Group of 2*

· Propose a method to generate images which capture the semantic meanings of text captions by using a loss from OpenAI CLIP model to guide the generative process of diffusion models.

Sparse + Low-rank Approximation of Matrix Inverse 2021
Convex Optimization Class Project *Group of 3*

· Propose and implement a scalable convex optimization approach to estimate a low-rank correction of a sparse approximate matrix inverse. Our approach can improve the preconditioning matrix in the Preconditioned Conjugate Gradient algorithm.

SKILLS

Technical Tools Python, Pytorch, MATLAB, C, C++
Languages Thai (native speaker), Japanese (JLPT N3)

AWARDS

IEEE Signal Processing Society Travel Grant for ICASSP 2025 2025
Distinguished Fellowship in Intelligent, Autonomous & Secure Systems, College of Engineering, Boston University 2022
Terman Scholastic Award, School of Engineering, Stanford University 2022
Awarded to top 5% of the graduating senior class
Project Design Award, Department of Electrical Engineering, Stanford University 2020
King's Scholarship, Thai Government 2017
Gold medal, International Chemistry Olympiad 2016

SERVICE AND ACTIVITIES

Reviewer for TPAMI, JSTQE, and Optics Express
Boston University RISE High School Program, Mentor 2023
Stanford Thai Student Association, Financial Officer 2019 - 2020
Stanford Splash, Teacher 2019