FENG-YI LIAO

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EDUCATION

University of California, San Diego — La Jolla, CA, U.S.A.
Ph.D., Electrical and Computer Engineering (Intelligent Systems, Robotics & Control) — Sep. 2023 – Present

University of California, San Diego — La Jolla, CA, U.S.A.
M.S., Electrical and Computer Engineering (Intelligent Systems, Robotics & Control) — Sep. 2021 – June. 2023

National Chung Hsing University — Taichung, Taiwan
B.S., Bio-Industrial Mechatronics Engineering — 2016 – 2020

PUBLICATIONS

Conference

1. **F. Y., Liao** and Y. Zheng, "Iterative inner/outer approximations for scalable semidefinite programs using block factor-width-two matrices," *IEEE 61th Annual Conference on Decision and Control (CDC)*, accepted, 2022. [PDF][CODE]
2. **F. Y., Liao**, K. Y. Huang and M. T. Yan, "Auto-measurement of geometric features for micro tools," *International Society of Mechatronic Engineering, the 5th conference, (ISME)*, 2020.

Journal

1. A. Q. Xu, S. J. Luo, **F. Y., Liao**, I. C. Chen, M. C. Chien, and K. Y. Huang. "Development of a Novel Autoinspection System for Paddy Seed Early-germination Performance," *Sensors and Materials,* vol. 32, no. 11, pp. 3647-3657, 2020. [PDF]

RESEARCH EXPERIENCES

Scalable Optimization and Control (SOC) Lab, UCSD — Oct. 2021 – Present
Advisor: Prof. Yang, Zheng

- Designing efficient algorithms that leverage the problem **structures** and **data sparsity** in conic programs
- Developing a **primal-constrained version of the spectral bundle method** for semidefinite programs with low computational complexity and linear convergence rate
- Developed scalable algorithms that utilizes **basis pursuit** and **column generation** techniques to achieve tolerable accuracy with low computational complexity for large-scale semidefinite programs based on **Block factor-width-two matrices**
- Surveyed and developed algorithms based on sub-gradient, cutting plane, and bundle methods using MATLAB to evaluate the performance gain of our purposed algorithms

Image and Signal Processing Lab, NCHU — July 2020 – Feb. 2021
Advisor: Prof. Kuo-Yi Huang

- Developed a software program on a coffee bean picking machine that detects defects in collected coffee beans and controls the air pump to classify coffee beans into different levels using C++/C#
- Developed a software that controls motors to achieve auto-focusing and gauges the width and depth of cut objects from camera images on a micro-cutting machine using C#

SELECTED PROJECTS

Semidefinite and Sum-of-squares Optimization

- Evaluated efficiency, complexity, and convergence rate of **first-order** algorithms for semidefinite programs
- Implemented **alternating direction method of multipliers (ADMM)** for **large-scale semidefinite programs** using MATLAB

Convex Optimization

- Designed and implemented a set of programs to verify the equivalent relationship among **Dykstra's projection algorithm**, **block coordinate descent** and **ADMM** in **best approximation** problem and **regularized regression problem** to allow more efficient solutions for various input datasets using MATLAB.
- Designed and implemented a set of programs to verify the equivalent relationship between **coordinate descent** and **Dykstra's projection algorithm** on **dual of Lasso problem and Box-constrainted quadratic programs** using MATLAB

Sensing and Estimation in Robotics

- Applied **Gaussian Discriminant Analysis** to detect garbage bins in collected images using Python
- Implemented **Particle Filter and Visual-Inertial SLAM** to estimate the environment and self-location of autonomous vehicles using Python

AWARDS

- NCHU Golden Key award (top 5% of class) 2020
- Second place award, smart agricultural robotic competition 2019
- NCHU Ching-O award, NCHU (top 5% of class) 2019
- NCHU Academic Excellence award (top 10% of class) 2018

TEACHING EXPERIENCE

Teaching Assistant at National Chung Hsing University

- **Artificial Intelligence of Things**, *Prof. Tshen-Chan Lin*