

# FENG-YI LIAO

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## EDUCATION

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<b>University of California, San Diego</b> Ph.D., Electrical and Computer Engineering (Intelligent Systems, Robotics & Control)	La Jolla, CA, U.S.A. Sep. 2023 – Present
<b>University of California, San Diego</b> M.S., Electrical and Computer Engineering (Intelligent Systems, Robotics & Control)	La Jolla, CA, U.S.A. Sep. 2021 – June. 2023
<b>National Chung Hsing University</b> B.S., Bio-Industrial Mechatronics Engineering	Taichung, Taiwan 2016 – 2020

## PUBLICATIONS

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### Preprint

1. **Feng-Yi, Liao**, Lijun Ding, and Yang Zheng. "An Overview and Comparison of Spectral Bundle Methods for Primal and Dual Semidefinite Programs." arXiv preprint arXiv:2307.07651, 2023. [PDF][CODE]

### 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]

### Conference papers

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)*, 2022. [PDF][CODE]

## RESEARCH EXPERIENCES

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<b>Scalable Optimization and Control (SOC) Lab, UCSD</b> <i>Advisor: Prof. Yang, Zheng</i>	Oct. 2021 – Present
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- 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

<b>Image and Signal Processing Lab, NCHU</b> <i>Advisor: Prof. Kuo-Yi Huang</i>	July 2020 – Feb. 2021
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- 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

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### 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-constrained 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

## TEACHING EXPERIENCE

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### Teaching Assistant at University of California, San Diego

- Winter 2023 ECE 285 - Semidefinite and Sum-of-squares Optimization
- Spring 2023 ECE 171A - Linear Control System Theory

### Teaching Assistant at National Chung Hsing University

- Artificial Intelligence of Things

## AWARDS

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| • 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 |