

# Yu-Hsiang Su

yuhsiang.drstu@gmail.com | (+44) 7365919870 | LinkedIn | Google Scholar

## EDUCATION

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**The University of Manchester**, Manchester, UK  
PhD in Electrical and Electronic Engineering

Sept. 2020 — June 2024

- Supervised by Prof. Alexander Lanzon
- Research Interests: Multi-Agent Systems, Multi-Robot Systems, Cooperative Control, Autonomous Vehicles, Robust Control Theory, Negative Imaginary (NI) Systems Theory

**The University of Manchester**, Manchester, UK  
MSc with Distinction in Advanced Control and Systems Engineering

Sept. 2018 — Sept. 2019

- Supervised by Prof. William Heath
- Overall GPA: 83.83/100

**National Chiao Tung University**, Hsinchu, Taiwan  
BSc in Mechanical Engineering

Sept. 2013 — June 2017

- Overall GPA: 82.09/100

**Shanghai Jiao Tong University**, Shanghai, China

Feb. 2017 — June 2017

Exchange Student in the School of Mechanical and Power Engineering

## AWARDS

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### Scholarships

- *Full PhD Scholarship*, Department of Electrical and Electronic Engineering, The University of Manchester
- *ICRA Travel Grant*, IEEE Robotics and Automation Society, 2023, 2022

### Fellowships

- *Associate Fellow of the Higher Education Academy (AFHEA)*, Advance HE

### Academic Awards

- *Rosenbrock Prize Award* (the best overall performance in the taught element of the MSc course), Department of Electrical and Electronic Engineering, The University of Manchester, 2019
- Nominated for the *Faculty's Distinguished Achievement Award (PGT Student of the Year)*, Faculty of Science and Engineering, The University of Manchester, 2019
- *Academic Excellence Award*, Department of Mechanical Engineering, National Chiao Tung University, 2017

### Competition Awards

- *Second place in the Autonomous Buggy Control*, Department of Electrical and Electronic Engineering, The University of Manchester, 2019
- *First place in the Final Project Presentation Competition*, Corning Display Technologies, 2018

### Course Certificates

- *IEEE RAS Summer School on Multi-Robot Systems*, Czech Technical University in Prague, 2023
- *Supervised Machine Learning: Regression and Classification*, Stanford (Coursera), 2024
- *Robotics: Aerial Robotics*, University of Pennsylvania (Coursera), 2021

## PUBLICATIONS

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### Journal Publications

- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, "A fixed-time formation-containment control scheme for multi-agent systems with motion planning: Applications to quadcopter UAVs", *IEEE Transactions on Vehicular Technology*, vol. 73, no. 7, pp. 9495–9507, July 2024. (Paper | Video)
- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, "A robust adaptive formation control methodology for networked multi-UAV systems with applications to cooperative payload transportation", *Control Engineering Practice*, vol. 138, p. 105608, Sept. 2023. (Paper | Video)
- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, "Properties of interconnected negative imaginary systems and extension to formation-containment control of networked multi-UAV systems with experimental validation results", *Asian Journal of Control*, vol. 27, no. 1, pp. 99–116, Jan. 2025. (Paper | Video)

### Conference Publications

- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, "Output-feedback-based affine formation manoeuvre control of multi-agent systems applying negative imaginary systems theory", in *Proceedings of the 63rd IEEE Conference on Decision and Control (CDC)*, Milan, Italy, Dec. 2024, pp. 6939–6944. (Paper)

- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, “A negative imaginary solution to an aircraft platooning problem”, in *Proceedings of the 22nd European Control Conference (ECC)*, Stockholm, Sweden, June 2024, pp. 2580–2585. (Paper)
- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, “A negative imaginary theory-based time-varying group formation tracking scheme for multi-robot systems: Applications to quadcopters”, in *Proceedings of the 40th IEEE International Conference on Robotics and Automation (ICRA)*, London, UK, May 2023, pp. 1435–1441. (Paper | Video)
- **Y.-H. Su**, P. Bhowmick, and A. Lanzon, “Cooperative control of multi-agent negative imaginary systems with applications to UAVs, including hardware implementation results”, in *Proceedings of the 21st European Control Conference (ECC)*, Bucharest, Romania, June 2023. (Paper | Video)
- **Y.-H. Su**, and A. Lanzon, “Formation-containment tracking and scaling for multiple quadcopters with an application to choke-point navigation”, in *Proceedings of the 39th IEEE International Conference on Robotics and Automation (ICRA)*, Philadelphia, USA, May 2022, pp. 4908–4914. (Paper | Video)
- **Y.-H. Su**, D. F. Morales Aldana, and W. P. Heath, “System Identification and Control Design for a Tip Tilt Nanopositioning System”, in *Proceedings of the 21st IFAC World Congress*, Berlin, Germany, July 2020, pp. 8577–8584. (Paper)

## SERVICE

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### Seminar Organiser

- Organised the Control Seminar, Department of Electrical and Electronic Engineering, The University of Manchester

### Student Representative

- Represented the MSc course in Advanced Control and Systems Engineering, The University of Manchester

### Peer Reviewer

- *IEEE Transactions on Automatic Control*
- *IEEE Control Systems Letters*
- *IEEE Transactions on Network Science and Engineering*
- *International Journal of Robust and Nonlinear Control*
- *Nonlinear Dynamics*
- *IEEE Robotics and Automation Letters*
- The 22nd European Control Conference, 2024
- The 14th United Kingdom Automatic Control Council International Conference on Control, 2024

## TEACHING EXPERIENCE

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### Graduate Teaching Assistant, The University of Manchester

Manchester, UK

*EEEN60109 State-Space and Multivariable Control*

2020 — 2024

- Lead Graduate Teaching Assistant responsible for delegating work to five graduate teaching assistants, including lab material preparation, lab training organisation, lab report grading, and grade release
- Created questions for formative quizzes using Blackboard
- Drafted questions and solutions for coursework and final exams
- Assisted over 80 postgraduate students during lab sessions
- Tutored students on concepts of state-space control, full-state feedback control design and observer design

*EEEN30232 Control Systems II*

2023 — 2024

- Prepared lecture materials for digital control and created questions for formative quizzes and final exams
- Assisted over 200 undergraduate students during lab sessions
- Provided tutoring on state-space control, optimal control, discrete-time systems, and digital control concepts

*EEEN30002 Numerical Analysis*

2021 — 2022

- Prepared solutions for tutorial questions and delivered them to a small group of undergraduate students during tutorial sessions

*EEEN20131 Signals and Systems*

2022 — 2023

- Taught students the fundamentals of MATLAB and its usage in signals and systems during lab sessions

*EEEN20030 Control Systems I*

2020 — 2023

- Lead Graduate Teaching Assistant responsible for delegating work to ten graduate teaching assistants
- Created questions for formative quizzes using Blackboard and crafted both questions and solutions for coursework and final exams
- Assisted over 200 undergraduate students during lab sessions
- Tutored students on fundamental concepts of control theory, covering topics such as transfer functions, root locus, Nyquist plots, and PID control design

## WORK EXPERIENCE

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### Corning Display Technologies

Summer Intern

Taichung, Taiwan

July 2018 — Aug. 2018

- Applied Big Data knowledge to the Finishing process and developed a machine learning model in Python to predict the quality of the manufacturing process
- Learned to access data from Microsoft SQL and MySQL using SQL language
- Gained an understanding of the display glass manufacturing process and the system structure of SCADA

## SELECTED PROJECTS

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### Cooperative control of multi-agent systems: Theory and applications to multi-UAV systems

PhD Thesis

Sept. 2020 — June 2024

- Developed a robust adaptive formation controller for multi-UAV systems subjected to disturbances and demonstrated cooperative payload transportation missions using multi-UAV systems with cable-suspended payloads
- Developed a hierarchical cooperative control scheme that incorporates motion planning objectives and fixed-time formation-containment control for multi-agent systems
- Established the closed-loop stability for the interconnection of networked double integrator NI systems and distributed Strictly Negative Imaginary (SNI) controllers
- Developed an output dynamic feedback distributed SNI control law for achieving cooperative control objectives
- Established the closed-loop stability for the interconnection of networked double integrator NI systems and distributed 'mixed' SNI plus Strictly Passive controllers
- Developed an output dynamic feedback distributed SNI + Strictly Passive control law for achieving formation tracking and containment control
- Developed an aircraft platoon control scheme employing NI systems theory to provide an effective flight guidance and control system for managing aircraft landings
- Developed an output feedback based-affine formation manoeuvre control scheme employing NI systems theory for multi-agent systems

### System identification and control design for a tip tilt nanopositioning system

MSc Dissertation

May 2019 — Sept. 2019

- Developed MIMO linear position and force models for the tip tilt nanopositioning stage with 2 DOF for inclined motion
- Designed a SISO integral controller, a MIMO robust H-infinity controller with loop shaping design, and a SISO position/force feedback controller for the tip tilt nanopositioning stage
- Validated the feedback control systems through simulations in MATLAB/Simulink and hardware experiments conducted with LabVIEW

## TECHNICAL SKILLS

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|------------|-----------|-------------------|
| • C/C++    | • LabVIEW | • Crazyflie drone |
| • MATLAB   | • SQL     | • SolidWorks      |
| • Simulink | • LaTeX   | • AutoCAD         |
| • Python   | • Arduino |                   |