Katherine Mao

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Education

University of Pennsylvania – Philadelphia, PA August 2021 - Present
PhD in Mechanical Engineering
Advisors: M Ani Hsieh, Vijay Kumar Dec 2023
GPA: 3.77

University of Pennsylvania – Philadelphia, PA
Masters of Science in Engineering in Robotics May 2020
GPA: 3.77

Purdue University - Honors College – West Lafayette, IN
Bachelor of Science in Mechanical Engineering
Minors: *Computer Science, Math*

Skills

Programming: C/C++, Python, MATLAB, Java, Arduino, OpenCV, Quartus Prime, Verilog, Linux
Mechanical Design/Manufacturing: SolidWorks, CATIA, Inventor, AutoCAD, KiCad, Standard Shop Tools, Soldering

Experience

Bolt Medical, Systems Team| *Systems Design Engineer* July 2020 – August 2021

- **Project details under NDA**
- Wrote OpenCV code to determine moving object location with micrometer accuracy
- Designed Python GUI for combined automation and control of components within prototype system
- Characterized and Isolated critical sensor feedback to determine breakage within prototype system
- Compiled and assembled wiring layout for the prototype system

Purdue University, Rhoads Group | *Research Assistant* January 2018 – May 2020

- Manufactured PCBs for lead detection with microelectromechanical system (MEMs) sensors
- Designed controller and GUI for instrumentation and data analysis of lead sensors in MATLAB
- Wrote jogging controller and GUI for laser printer within Arduino platform
- Designed testing chamber for chemical bed bug detection method
- Wrote FPGA frequency counter and UART transmission in Verilog and Quartus Prime
- Wrote data collection and visualizer tool for a (field-programmable gate array) FPGA frequency counter in Python

HP Inc, Writing Systems | *Product Design Intern* May 2019 – Aug 2019

- Designed diagnostics tool to analyze sub-millimeter deformation along printbar in global industrial printers
- Integrated Arduino microcontroller, IR sensors, Inertial Measurement Unit into 3D printed enclosure
- Developed tool code for data logging, calibration, and analysis in Arduino and Python
- Improved runtime and data acquisition of printbar deformation from existing techniques by an order of magnitude

Johns Hopkins University, Whitcomb Group | *Research Assistant* May 2017 - Aug 2017, May 2018 – Aug 2018

- Research Experience for Undergraduates in Computational Sensing and Medical Robotics (CSMR REU)
- Collaborated with graduate students on JHU ROV II (Remotely Operated underwater Vehicle) testbed design
- Designed waterproof connector adapter for titanium housing rated to 500m depth in SolidWorks
- Manufactured hardware for a 3' watertight enclosure with lathe, mill, and other shop tools
- Submitted project report to NSF and presented final research to all principal investigators

Purdue University, IEEE ROV Team | *Logic and Structures Project Lead* September 2016 – May 2019

- Designed the 2017 and 2018 competition ROV frame, thruster, and secondary camera mounts in SolidWorks
- Recipient of the Flying Fish Award for Ingenuity and Creativity in Design at the 2017 MATE International Competition
- Contributed to paper published in IEEE Computer Society Magazine (Vol 50, Issue 9, 2017)

Publications

K. Mao, H.Yu, R. Zhang, I. Spasojevic, M. A. Hsieh, S. Gao, and V. Kumar, "Sequence Modeling for Time-Optimal Quadrotor Trajectory Optimization with Sampling-based Robustness Analysis", in 2025 Conference on Robot Learning (CoRL). *Submitted*

K. Mao, I. Spasojevic, M. Hopkins, M. A. Hsieh, and V. Kumar, "Collision-free time-optimal path parameterization for multi-robot teams", in 2026 IEEE International Conference on Robotics and Automation (ICRA). *In Revision*

K. Mao, I. Spasojevic, M. A. Hsieh, and V. Kumar, "TOPPQuad: Dynamically-Feasible Time Optimal Path Parametrization for Quadrotors", in 2024 IEEE International Conference on Intelligent Robots and Systems (IROS). *Accepted*

K. Mao, J. Welde, M. A. Hsieh, and V. Kumar, "Trajectory planning for the bidirectional quadrotor as a differentially flat hybrid system" in 2023 IEEE International Conference on Robotics and Automation (ICRA), 2023, pp. 1242–1248.

N. Bajaj, N. Giampietro, **K. Mao**, et al. "Searching for Bed Bugs: The Design, Development, and Evaluation of an Oscillator-Based Trans-2-hexenal Sensor Array". Sensors & Actuators B. vol. 129161. 2020

Posters and Presentations

Poster, Lightning – Leveraging Implicit Methods for Aerial Autonomy Workshop @ Robotics: Science and System (RSS) 2025
"Sequence Modeling for Time-Optimal Quadrotor Trajectory Optimization with Sampling-based Robustness Analysis"
Invited Paper

Poster, Lightning – The Institute for Learning-enabled Optimization at Scale (TILOS) Industry Day 2025
"Sequence Modeling for Time-Optimal Quadrotor Trajectory Optimization with Sampling-based Robustness Analysis"

Oral – IEEE International Conference on Intelligent Robots and Systems (IROS) 2024
"TOPPQuad: Dynamically-Feasible Time Optimal Path Parametrization for Quadrotors"
Accepted as Oral Presentation

Poster, Lightning – The Institute for Learning-enabled Optimization at Scale (TILOS) Industry Day 2024
"TOPPQuad: Dynamically-Feasible Time Optimal Path Parametrization for Quadrotors"

Poster, Lightning – The Institute for Learning-enabled Optimization at Scale (TILOS) Industry Day 2023
"Trajectory planning for the bidirectional quadrotor as a differentially flat hybrid system"

Poster – IEEE International Conference on Robotics and Automation (ICRA) 2023
"Trajectory planning for the bidirectional quadrotor as a differentially flat hybrid system"

Leadership Experience

Purdue Fencing Club | Women's Sabre Captain August 2019 – May 2020
- Coached beginning fencers and managed team of four during tournaments

Purdue Fencing Club | Fundraising Officer May 2018 – May 2019
- Organized fundraising events to help lower dues for team members

IEEE ROV Team | *Logic and Structures Project Lead* September 2017 – May 2018
- Managed team of 10 members in design of ROV frame, internal structures, and electronic boards

Society of Women Engineers | *Office Assistant* September 2016 – May 2017
- Mentored by Chair of Membership Vitality on running large student-led organizations

Independent Projects

Smart Bat House, 3rd place winner – Purdue Ecomake Hackathon with team of 6
- Integrated Sparkfun PIR motion detection to trigger camera recording, temperature sensor to monitor internal climate
- Prototyped species detection via ultrasonic sound sensor

Academic Honors

Kaiser Aluminum Mechanical Engineering Scholarship 2018
Purdue Deans List Recipient 2016, 2017, 2018, 2019, 2020
Purdue Presidential Scholarship Recipient 2016
National Merit Finalist 2016

Affiliations: FIRST, IEEE, National Center for Women in Technology, SWE

Interests: Sketching/Digital Art, Fencing, Origami/Kusudama/Papercraft, Science Fiction/Fantasy Novels