

# KERRY HE

## EDUCATION

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**Doctor of Philosophy** – *Electrical and Computer Systems Engineering* 2022 – Present  
Monash University, Clayton, Australia

- **Thesis title:** Convex optimization methods for quantum information theory
- **Advisors:** James Saunderson and Hamza Fawzi
- **Expected completion date:** Dec 2025

**Bachelor of Engineering (Honours)/Commerce** – *Mechatronics Engineering/Finance* 2017 – 2022  
Monash University, Clayton, Australia

- **WAM:** 93.348/100, **GPA:** 3.975/4
- Best performing student in the cohort for both degrees.

## RESEARCH EXPERIENCE

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**Doctor of Philosophy** – *Convex Optimization for Quantum Information* 2022 – Present

- Performed rigorous numerical analysis of gradient-based and interior-point methods for complex nonlinear optimization problems arising in quantum information theory.
- Devised new algorithmic techniques for solving optimization problems arising in quantum information theory which significantly outperform existing state-of-the-art methods.
- Developed an open-source conic programming solver in Python and integrated this into the existing optimization modelling interface PICOS.
- Presented research in 3 international conferences, and published 2 papers into Q1 journals.

**Summer Research Scholarships** – *Monash Robotics* 2020 – 2022

- Developed an optimal control algorithm for robots with arms to avoid obstructing their own vision, allowing for improved closed-loop control and success in grasping tasks (2022).
- Developed an algorithm to digitally stabilize video feeds of cameras mounted on crane hooks to provide crane operators with visual feedback to improve their safety and efficiency (2021).
- Designed and implemented a convolutional neural network to identify the upright orientation of common household objects, and deployed this on a real-world robotic arm to place objects down in a stable, upright position (2020).

**Engineering Honours Project** – *Monash Motorsport* 2021

- Designed a model predictive controller for an autonomous Formula-style racecar, to be used in international competitions against other university teams.
- Findings and insights are now being used by new team members to further understand and improve the autonomous racecar's controller.

## SKILLS

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**Coding:** Python, MATLAB, Julia, C++, Git, PyTorch, Linux.

**Technical:** Convex optimization, quantum information theory, robotics, optimal control.

## TEACHING/EXTRACURRICULAR EXPERIENCE

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**Deputy Unit Coordinator – ECE4132 Control System Design** Present

- Supports Chief Examiner with administrative tasks, assisting with student enquiries, and acting as the lead Teaching Assistant within the unit.

**Summer Research Project Supervisor** 2023

- Supervised two undergraduate students researching optimal control techniques for a robotic arm to grasp objects in complex, cluttered environments.
- Responsibilities included conceptualizing the project brief, chairing weekly meetings with the students, and providing expert advice and feedback throughout the project.

**Teaching Assistant** 2019 – Present

- ECE4132 Control System Design (2023 – Present).
- ECE3093 Optimisation and Numerical Methods for Engineers (2024 – Present).
- TRC2201 Mechanics and TRC3200 Dynamical Systems (2019 – 2023).

**Monash Motorsport** 2018 – 2021

- Autonomous Systems department member involved in developing perception, localisation, and planning algorithms for Australia's first autonomous Formula Student racecar.
- Held multiple leadership roles, including:
  - Head of Autonomous Systems (2020): Leading and mentoring the department, making high level technical decisions, facilitating communications with other departments.
  - Autonomous Systems Principal Engineer (2021): Involved with giving technical advice to department members and management.

## SELECT PUBLICATIONS & PREPRINTS

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K. He, J. Saunderson, H Fawzi, "Exploiting Structure in Quantum Relative Entropy Programs," *arXiv preprint arXiv:2407.00241*, 2024.

K. He, J. Saunderson, H Fawzi, "A Bregman Proximal Perspective on Classical and Quantum Blahut-Arimoto Algorithms," *IEEE Transactions on Information Theory*, vol. 70, no. 8, pp. 5710-5730, August 2024.

K. He, J. Saunderson, H Fawzi, "Efficient Computation of the Quantum Rate-Distortion Function," *Quantum*, vol. 8, pp. 1314, April 2024.

K. He, R. Newbury, T. Tran, J. Haviland, B. Burgess-Limerick, D. Kulić, P. Corke, and A. Cosgun, "Visibility Maximization Controller for Robotic Manipulation," in *IEEE Robotics and Automation Letters*, vol. 7, no. 3, pp. 8479-8486, July 2022

## AWARDS AND HONOURS

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Monash Graduate Excellence Scholarship (2022 – 2025)

University Medal for Undergraduate Academic Excellence in the Faculty of Engineering (2022)

Dean's Student Excellence Award for the top Undergraduate in Commerce (2022)

T.F. Berreen Prize for Excellence in Engineering Dynamics (2019)