



# Gerry Chen

Robotics PhD Student, Georgia Tech  
(412) 956-3047

[gerry.chen2015@gmail.com](mailto:gerry.chen2015@gmail.com)  
<https://gerry-chen.com>

## OVERVIEW

---

Combined estimation and optimal control for robotic systems using factor graphs.

Georgia Tech Robotics PhD cohort of 2019.

*Keywords: robot art, human-robot collaboration, optimal control, computer vision, robotics*

**Primary Languages:** C++, Python, MATLAB

## EDUCATION

---

**Georgia Institute of Technology**

**08/2019 to Present**

*College of Computing*

PhD Robotics under Professors Frank Dellaert and Seth Hutchinson studying robot art

4.00/4.00 cumulative GPA

**Duke University**

**08/2015 to 05/2019**

*Pratt School of Engineering*

BSE Electrical & Computer Engineering, BSE Mechanical Engineering, CS (minor), Math (minor)

3.87/4.00 cumulative GPA, Magna Cum Laude

## PUBLICATIONS

---

10. [G. Chen](#), H. Muriki, C. Pradalier, Y. Chen, and F. Dellaert, “[A Hybrid Cable-Driven Robot for Non-Destructive Leafy Plant Monitoring and Mass Estimation using Structure from Motion](#)”, *IEEE International Conference on Robotics and Automation (ICRA)*. p (2023 - in press).
9. Y. Zhang, F. Jiang, [G. Chen](#), V. Agrawal, A. Rutkowski, and F. Dellaert, “[Constraint Manifolds for Robotic Inference and Planning](#)”, *IEEE International Conference on Robotics and Automation (ICRA)*. p (2023 - in press).
8. [G. Chen](#), S. Hutchinson, F. Dellaert, “[Locally Optimal Estimation and Control of Cable Driven Parallel Robots using Time Varying Linear Quadratic Gaussian \(LQG\) Control](#)”, *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. p (2022).
7. Y. Zhang, [G. Chen](#), A. Rutkowski, F. Dellaert, “[Efficient Range-Constrained Manifold Optimization with Application to Cooperative Navigation](#)”, *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. p (2022).
6. [G. Chen](#), S. Baek, J. Florez, W. Qian, S. Leigh, S. Hutchinson, and F. Dellaert, “[GTGraffiti: Spray Painting Graffiti Art from Human Painting Motions with a Cable Driven Parallel Robot](#)”, *IEEE International Conference on Robotics and Automation (ICRA)*. p 3-19 (2022 - in press).

5. A. Cohen, G. Chen, E. Berger, S. Warrier, G. Lan, E. Grubert, F. Dellaert, Y. Chen, “[Dynamically Controlled Environment Agriculture: Integrating Machine Learning and Mechanistic and Physiological Models for Sustainable Food Cultivation](#)”, *ACS ES&T Engineering*. p 3-19 (2022).
4. S. Yang, G. Chen, Y. Zhang, F. Dellaert, H. Choset, “[Equality Constrained Linear Optimal Control With Factor Graphs](#)”, *2021 International Conference on Robotics and Automation (ICRA)*. p 9717-9723 (2021).
3. Z. Li, A. Yang, G. Chen, Z. Zeng, A. Peterchev, S. Goetz, “[A High-Frequency Pulsating DC-Link for Electric Vehicle Drives with Reduced Losses](#)”, *47th Annual Conference of the IEEE Industrial Electronics Society (IECON)*. p 1-6 (2021).
2. P. Grady, G. Chen, S. Verma, A. Marellapudi, N. Hotz, “[A Study of Energy Losses in the World’s Most Fuel Efficient Vehicle](#)”, *IEEE Vehicle Power and Propulsion Conference (VPPC)*. p 1-6 (2019).
1. F. Wang\*, G. Chen\*, and K. Hauser, “[Robot Button Pressing in Human Environments](#)”, *2018 IEEE International Conference on Robotics and Automation (ICRA)*. p 7173-7180 (2018).

## HONORS AND AWARDS

---

<b>Sigma Xi Honor Society</b>	<b>08/2020 to Present</b>
<b>Tau Beta Pi Honor Society – NC Gamma Chapter</b>	<b>05/2019 to Present</b>
<b>IEEE Eta Kappa Nu Honor Society – Delta Lambda Chapter</b>	<b>01/2018 to Present</b>
<b>Pi Tau Sigma Honor Society – Pi Iota Chapter</b>	<b>01/2017 to Present</b>
<b>GVU Foley Scholar</b>	<b>10/2022</b>
<i>Finalist</i>	

[Foley Scholars](#) are the GVU Center’s highest recognition for student research contributions to computing.

<b>National Science Foundation Graduate Research Fellows Program</b>	<b>03/2020</b>
<i>Honorable Mention</i>	

The NSF GRFP recognizes and supports outstanding graduate students in supported STEM disciplines.

<b>Guinness World Records</b>	<b>06/2019</b>
<i>Most Efficient Prototype Electric Vehicle</i>	

President of the Duke Electric Vehicles team that broke the record with 77.98Wh/100km.

<b>Duke University Electrical and Computer Engineering Department</b>	<b>05/2019</b>
<i>Graduation with Departmental Distinction</i>	

Presented for my distinguished research and academic record.

<b>Guinness World Records</b>	<b>07/2018</b>
<i>Most Fuel-Efficient Vehicle</i>	

Head of hydrogen fuel cell development for the record breaking fuel cell vehicle achieving 14,573MPGe.

## RESEARCH EXPERIENCE

---

<b>Robotics Estimation and Control</b>	<b>08/2019 to Present</b>
<i>Georgia Institute of Technology - Dr. Frank Dellaert</i>	

- Combined estimation and optimal control using factor graphs
- Cable driven parallel robot (CDPR) design and control

### **Power Electronics**

**08/2018 to 05/2019**

*Duke University - Dr. Stefan Goetz and Dr. Angel Peterchev*

- Implemented novel FOC motor controller using modular multilevel series-parallel converter to self-balance battery cells, reduce noise, increase voltage ratings, and minimize losses
- Thermal analysis of battery/converter modules for use in automotive setting
- Electrical losses analysis for MOSFET selection in converter modules
- Installation of novel motor controller in electric vehicle to test practical cell-balancing performance

### **Fuel Cell Hybrid Vehicle**

**08/2017 to 05/2018**

*Duke University - Dr. Josiah Knight and Dr. Nico Hotz*

- Optimization of fuel cell operating parameters for use in hybrid vehicle to achieve 58.9% in-system efficiency (increase from baseline efficiency of 40%)
- Design and optimization of voltage converter for active supercapacitor load power leveling system resulting in 22% higher vehicle efficiency
- See Publication 2 – fuel cell vehicle system level design

### **Robotics Motion Planning**

**01/2017 to 05/2018**

*Intelligent Motion Laboratory - Dr. Kris Hauser*

- Applied convolution-based image similarity metrics for database assisted vehicle path planning
- Fabricated silicon and polyurethane cornea models with <50um repeatability for use in surgical robot testing
- See Publication 1 – work funded by NSF Research Experiences for Undergraduates (REU) to implement a Precision Positioning Unit (PPU) on the Tele-Robotic Intelligent Nursing Assistant (TRINA)
- Redundancy resolution for minimum manipulability / maximum continuous range joint configurations
- Fabricated polyurethane “finger” tip with integrated tactile sensor and 95.7% actuation success rate

## **WORK HISTORY**

---

### **Instructor**

**05/2022 to 08/2022**

*Georgia Institute of Technology*

- **CS3630:** [Intro to Perception & Robotics](#)

### **Software Engineer Intern: Autonomous Vehicle Perception**

**05/2021 to 08/2021**

*Zoox - Dr. Subhasis Das*

- Developed smoothing-based tracker for improved object tracking using sensor fusion
- My code achieved improvements in all tracking metrics for use in offline labeling, with 2 patents pending

### **Integrated Control and Estimation Intern**

**06/2020 to 08/2020**

*Air Force Research Laboratory (Eglin AFB) - Dr. Adam Rutkowski*

- Refine collaborative vehicle control with imperfect multi-vehicle trajectory estimations
- Compute optimal sensor measurement timing and inter-vehicle communication
- Compute optimal collaborative trajectories to minimize navigation uncertainty using factor graphs

### **Controls Engineer Intern**

**05/2018 to 08/2018**

*Deka R&D - Dirk Van Der Merwe*

- Developed novel 2-wheel balancing control scheme with constrained wheel displacement (patent pending)
- Created multi-system integration over CAN, EtherCAT, RS232 to create hybrid wheeled/legged robot
- Developed stability control of robot w/ powered casters + differential steering to test high speed dynamics

### **Robotics Motion Planning Intern**

**01/2017 to 05/2018**

*Intelligent Motion Laboratory - Dr. Kris Hauser*

- Work on PPU for TRINA (see entry in Research Experience)
- Coded (Python, C++) and tested max. continuous range / min. manipulatability arm configurations

### **Teaching Assistant**

**08/2019 to 12/2019**

*Georgia Institute of Technology*

- **CS3630:** Intro Perception & Robotics Fall 2019

### **Teaching Assistant**

**08/2016 to 05/2018**

*Duke University*

- **EGR201:** Mechanics of Statics Fall 2017
- **ECE230:** Microelectronics Fall 2017
- **ECE230:** Microelectronics Summer 2017
- **EGR103:** Computational Methods in engineering Fall 2016
- **CS201:** Data structures and Algorithms Fall 2016

### **Tutor**

**05/2014 to 05/2019**

*Multiple Employers*

- Duke Academic Resource Center - group instruction:
  - Multivariable Calculus 08/2016 to 05/2019
  - Linear Algebra 01/2017 to 01/2018
  - Differential Equations 01/2017 to 01/2018
- Duke Academic Resource Center - individual instruction:
  - Multivariable Calculus 08/2016 to 05/2017
  - Linear Algebra 08/2016 to 05/2017
  - Differential Equations 08/2016 to 05/2017
- America Reads America Counts at Duke 08/2015 to 06/2016
  - Durham Public Schools
  - Math + Reading
- Kumon Math and Reading Center of Fox Chapel 05/2014 to 08/2016
  - personalized curriculum generation for 40+ students
  - student performance evaluations

## **EXTRACURRICULAR ACTIVITIES**

---

### **Co-President**

**08/2015 to 08/2019**

*Duke Electric Vehicles Team*

- World Record (2019): World's most efficient electric vehicle - team president
- World Record (2018): World's most fuel efficient vehicle - head of hydrogen system

- Lead creation of a fully autonomous vehicle to allow the vehicle to follow a “total system energy” optimized path subject to physical control constraints
- Co-lead hydrogen fuel cell hybrid vehicle for 2018 to achieve 14,573 MPGe
- Design + Manufacture + Test the high power super-capacitor control board to increase vehicle efficiency by 22%
- Create an automated testing system resulting in fuel cell efficiency increase from 40% to 63%
- Design + Manufacture + Install the carbon fiber inserts to decrease weight and increase modularity
- 2018: 1st place H2, 1st place battery-electric (12,398 MPGe), Technical Innovation Award at the Shell Eco-Marathon Americas

## CTO

08/2018 to 05/2019

*Delta Band Inc. - [deltatrainer.fit](http://deltatrainer.fit)*

- Designed all electrical systems of the strength training workout tracker watch based on machine learning
- Currently on 7th generation electrical boards (Dec 2018)
- Initiating small-scale (100 devices) manufacturing for beta-testing devices to be shipped Jan 2019

## Project Lead

01/2016 to 01/2018

*Solar Benches*

- Lead technical, financial, and administrative aspects of augmenting existing campus benches with solar powered night-time task lighting and laptop/phone chargers to raise enthusiasm for clean energy
- Installed 2 test benches on campus after passing safety inspection on an off-site prototype bench

## RELEVANT COURSEWORK

---

*Georgia Institute of Technology*

- CS7643 - Deep Learning
- CS8803 - Probabilistic Graphical Models in Machine Learning
- CS7476 - Advanced Computer Vision
- CS8803 - Mobile Manipulation
- CS6601 - Artificial Intelligence
- ECE6553 - Optimal Control

*Duke University*

- CS520/MATH565 - Numerical Analysis
- MATH577 - Mathematical Modeling
- MATH216 - Linear Algebra and Diff. Equations
- MATH353 - Ordinary and Partial Diff. Equations
- ECE382/ME344 - Control Systems

## SKILLS

---

- Strong command of C++, Matlab, and Python
- Estimation, Sensor fusion, SLAM
- Path Planning + Classical Controls
- Embedded Software Development
- Eagle, SPICE, Solidworks, Autodesk Fusion
- Proficiency in ROS, Java, MATHEMATICA, L<sup>A</sup>T<sub>E</sub>X