



# Gerry Chen

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## OVERVIEW

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Interested in robotics dynamics and control. Georgia Tech Robotics PhD cohort of 2019.

## EDUCATION

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### Georgia Institute of Technology

08/2019 to Present

*College of Computing*

PhD Robotics under Professor Frank Dellaert

### Duke University

08/2015 to 05/2019

*Pratt School of Engineering*

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

3.87/4.00 cumulative GPA, Dean's List every semester

## PUBLICATIONS

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3. 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)*. (2019).
2. Z. Li, A. Yang, G. Chen, Z. Zeng, A. Peterchev, S. Goetz, "[A Modular Multilevel Pulsating DC-Link Inverter for Electric Vehicle Drives with Increased Efficiency](#)", *IEEE Transactions on Transportation Electrification (TTE)*. **In Review** (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).

## RESEARCH EXPERIENCE

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### Robotic Kinodynamics

08/2019 to Present

*Georgia Institute of Technology - Dr. Frank Dellaert*

- Design and control of a cable driven parallel robot for painting graffiti
- Factor graphs (GTSAM) for MPC

**Power Electronics****08/2018 to 05/2019***Duke University - Dr. Stefan Goetz and Dr. Angel Peterchev*

- Implementing 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
- Writing papers for fuel cell optimization, hybrid system integration, and 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
- Submitted joint paper to IEEE International Conference on Robotics and Automation 2018 (Accepted 01/12/2018) - 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

**EXTRACURRICULAR ACTIVITIES**

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**Co-President****08/2015 to 08/2019***Duke Electric Vehicles Team*

- World Record (2018): World’s most fuel efficient vehicle - head of hydrogen system
- Leading creation of a fully autonomous vehicle to allow the vehicle to follow a “total system energy” optimized path subject to physical control constraints
- Leading effort towards World’s most efficient electric vehicle (2019)
- 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. - [delta-band.com](http://delta-band.com)*

- Design 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

## WORK HISTORY

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### 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. manipulability arm configurations

### Teaching Assistant

08/2019 to Present

*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 Present
  - 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

## RELEVANT COURSEWORK

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- CS520/MATH565 - Numerical Analysis
- ME524 - Finite Element Method
- MATH577 - Mathematical Modeling
- MATH216 - Linear Algebra and Diff. Equations
- MATH353 - Ordinary and Partial Diff. Equations
- ECE382/ME344 - Control Systems
- ECE350 - Digital Systems
- ECE280 - Intro to Signals and Systems

## SKILLS

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- Fluency in Matlab, Python, and C++
- Proficiency in ROS, Java, MATHEMATICA, L<sup>A</sup>T<sub>E</sub>X
- Embedded Development (MCU, FPGA, Jetson)
- Path Planning + Classical Controls
- Eagle, SPICE, Solidworks, Autodesk Fusion
- Experimental design and sensor data acquisition