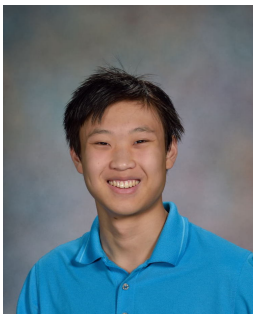

Gerry Chen

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OVERVIEW

Joint estimation and control for Cable-Driven Parallel Robots (CDPR).
Georgia Tech Robotics PhD cohort of 2019.
Secret Security Clearance (Inactive) – see Integrated Control and Estimation Intern

EDUCATION

Georgia Institute of Technology **08/2019 to Present**
College of Computing

PhD Robotics under Professor Frank Dellaert studying joint estimation and control using factor graphs
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

3. 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)*. (2021). **Pending Review**

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).

AWARDS

Sigma Xi Honor Society **08/2020 to Present**
Member

Sigma Xi, The Scientific Research Honor Society is a non-profit honor society for scientists and engineers.

Tau Beta Pi Honor Society **05/2019 to Present**
Member

Tau Beta Pi is the oldest engineering honor society in the United States.

National Science Foundation Graduate Research Fellows Program **03/2020**
Honorable Mention

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

Guinness World Records **06/2019**
Most Efficient Prototype Electric Vehicle

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

Duke University Electrical and Computer Engineering Department **05/2019**
Graduation with Departmental Distinction

Presented for my distinguished research and academic record.

Guinness World Records **07/2018**
Most Fuel-Efficient Vehicle

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

RESEARCH EXPERIENCE

Robotics Estimation and Control **08/2019 to Present**
Georgia Institute of Technology - Dr. Frank Dellaert

- 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 multilever 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

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 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 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

- 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 aspcts 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

- CS8803 - Probabilistic Graphical Models in Machine Learning
- CS8803 - Mobile Manipulation

Duke University

- 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

- 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, LaTeX