# Charles Vorbach

https://charliea0.github.io

Email : cvorbach@mit.edu
Mobile : +1 (914) 525-8764


## Education

- **Massachusetts Institute of Technology** — Cambridge, MA
  *Candidate for Bachelor of Science in Computer Science and Engineering; GPA 4.7/5.0* — *Expected June 2021*

## Experience

- **MIT Driverless** — Cambridge, MA
  *Controls Lead* — *Sept 2019 – Present*
  - Responsible for all controllers (LQR, Stanley, MPCC) and models (kinematic, dynamic) used on the race car.
  - Helped develop path planning strategies including lane detection and racing line generation.
  - Maintained embedded systems including vehicle CAN network, code-generated Matlab, and electrical integration.
- **MIT Formula SAE Electric Racecar: Software Team** — Cambridge, MA
  *Controls Team Member* — *Sept 2018 – Present*
  - Leading 2020 power limiting.
  - Built 2019 vehicle's torque-vectoring controller using vehicle model with normal forces and nonlinear Pacejka tires.
  - Improved sensing with direct groundspeed measurement, real-time derivative filtering, and higher wheel-speed resolution.
  - Wrote low voltage system power manager monitoring the cooling pumps, fans, and regenerative brakes.
  - Helped translate codebase to STM32 chip family and reimplement vehicle control unit using real-time operating system.
- **Ocado Technology: 10x Research and Development** — London, United Kingdom
  *Mechatronics Engineering Intern* — *June – August 2018*
  - Developed a testbed version of Ocado's flagship warehousing system for 10x research team.
  - Experimented with low-energy electropermanent magnetic gripping, contact sensing, and optical distance tracking.
  - Implemented robot operating system, centralized movement planner, and Wi-Fi communication in C and C++ on low-cost ESP32 and ESP8266 microcontrollers.
- **MIT Space Systems Laboratory: International Space Station Astrobees** — Cambridge, MA
  *Undergraduate Researcher* — *Fall 2019*
  - Performed embedded software and sensor integration for MIT's ground test copies of the Astrobee robotic astronaut assistants onboard the ISS.
  - Helping to clear research projects before their deployment onboard the ISS.
  - Working with ROS, Gazebo, Matlab code-generated C++, force allocation models, estimators, and PID control.
- **PepsiCo Demand Xccelerator: Shopper Insights and Capabilities** — White Plains, NY
  *Data and Software Engineering Intern* — *June – August 2017*
  - Developed web API and online dashboard for predicting new product performance using PepsiCo's existing household- and store-level shopper databases.
  - Worked in Python, Typescript, and SQL. Extensively employed Angular 2, Flask, and SQLAlchemy.
  - Coordinated project's development with other PepsiCo teams to accommodate legal, security, and maintenance needs.
- **MIT Robotics Team MicroTransat: Autonomous Atlantic Crossing** — Cambridge, MA
  *Electronics and Programming Subteam* — *2017 – 2018*
  - Lead software development for GPS navigation, sensor reading, motor control, and power management in C and C++.
  - Helped design vehicle's electronics package including microcontrollers, batteries, motors, solar panels, and sensors.
  - Implemented global coordinate navigation minimizing distance along preselected transatlantic route.

## Skills and Interests

**Relevant Coursework**: Underactuated Robotics; Design and Analysis Algorithms; Software Construction; Artificial Intelligence; Advances in Computer Vision; Computational Structures; Fundamentals of Programming; Differential Equations; Linear Algebra;
**Proficient With**: Embedded C and C++; Python;
**Interested In**: Robotics Control and Sensing; Computer Vision; Data Science and Visualization;

## Activities and Honors

**MIT Course Planner Team**: Full Stack Developer — *2018 – 2019*
**MIT Student Information Processing Board Keyholder**: January Term Classes Coordinator — *2017 - Present*
**Eagle Scout**: Boy Scouts of America — *October 2016*
**Licensed Ham Radio Operator** — *August 2016*