

# Charles J. Vorbach

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## Education

### Massachusetts Institute of Technology

Candidate for Bachelor of Science in Computer Science and Engineering; GPA 4.7/5.0

Cambridge, MA

Expected June 2021

## Experience

### MIT Space Systems Laboratory: International Space Station Astrobee

Cambridge, MA

Undergraduate Researcher

2019

- Building and debugging MIT's ground testbed copies of Astrobee's robotic astronaut assistants onboard the ISS.
- Leading embedded software and sensor integration for MIT Astrobee's ground test platform.
- 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.

### MIT Driverless: Controls Team

Cambridge, MA

Controls Engineer

2019

- Responsible for autonomous torque-vectoring controller using new kinematic vehicle models and EKF sensor fusion.
- Helping to integrate and accelerate Matlab Simulink models transpiled to C++ on an embedded platform.
- Solving optimal control problems with MPC using ACADO Toolkit.

### Ocado Technology: 10x Research and Development

London, United Kingdom

Mechatronics Engineering Intern

June – August 2018

- Developed a miniature, test version of Ocado's flagship robotic 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 Formula SAE Electric Racecar: Software Team

Cambridge, MA

Team Member

2018-2019

- Leading 2020 power limiting.
- Built 2019 vehicle's intelligent torque-vectoring controller using sensor fusion and vehicle tire models.
- Improved sensing with direct groundspeed measurement, real-time derivation 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.

### 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 requirements.

### 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:* 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; Full-Stack Development;

## Activities and Honors

**MIT Course Planner Development Team:** Full Stack Developer

September 2018

**MIT Student Information Processing Board Keyholder:** IAP Classes Coordinator

September 2017

**MIT Robotics Team:** Microtransat Autonomous Atlantic Crossing Competition

September 2017

**Eagle Scout, Boy Scouts of America**

October 2016

**Licensed Ham Radio Operator**

August 2016