



Fleet Robotics @ Greentown Labs  
444 Somerville Ave,  
Somerville, MA 02143  
fleetrobotics.ai

## Autonomous Motion Planning and Control Lead

### Job Highlights

Fleet Robotics is a Harvard University and VC-incubated green-tech startup developing its first product, an underwater robot to inspect and maintain ship hulls. At Fleet, we are looking for an extraordinary roboticist to spearhead the development of novel path-planning algorithms that are robust to the dynamic and unpredictable environments present on ship hulls. Challenges include dealing with harsh and irregular environmental conditions, utilizing limited or varying sensor data, and lack of communication and near-zero visibility while underwater. The ideal candidate will be adept at developing organized software for autonomous path planning, systematically formulating and validating strategies for dealing with aforementioned challenges, and making key technical decisions with a high impact on product roadmaps. As one of the company's early employees, this role offers the ability to make significant contributions to a novel and meaningful environmental application working with a small, close-knit, and fast-paced team.

### Meaningful Work

We are tackling a thousand-year-old problem: the growth of biofouling on ships. Biofouling is the growth of microorganisms, algae, barnacles, and larger ocean organisms on the ship's hull. As the ship delivers our goods around the world, the growth of these organisms significantly increases the drag forces on the ship and in doing so, significantly increases fuel consumption. Ships are the world's largest consumers of carbon-heavy fuels (called bunker fuels). A covering of biofouling just half a millimeter thick can increase emissions up to 30%, which translates to multiple tons of bunker fuel per day, per ship<sup>1</sup>.

Conventionally, the commercial shipping industry handles biofouling in two ways: preventatively, by coating the ship's hull in a highly toxic paint that discourages growth, and reactively, by stopping operations every 6-months or so to have divers scrape off years of fouling that grows anyway (not to mention scraping off the toxic paint). We think this is akin to deciding never to brush your teeth because you go to the dentist every five years. There has to be a better way.

Our small autonomous swarm of robots lives on the side of the ship hull for years, gently removing the earliest stage of biofouling on a weekly basis. This early-stage biofouling is easy-to-remove slime. The technical challenge lies in having a robot that can withstand the harsh environments of adhering to the ship hull while the ship is underway, underwater, anywhere in the world - totally autonomously. By removing slime often and early, we prevent the growth of macrofouling, significantly reduce fuel consumption, and prevent the spread of invasive species from port to port. Eventually, we aim for our robots to eliminate the need for toxic anti-fouling paints entirely.

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<sup>1</sup> [http://www.glofouling.imo.org/\\_files/ugd/34a7be\\_02bd986766d44728b85228c3ec9b95ee.pdf](http://www.glofouling.imo.org/_files/ugd/34a7be_02bd986766d44728b85228c3ec9b95ee.pdf)



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## Your Role

You will spearhead the development of custom path-planning algorithms and robot control. Our swarm robots live on the side of ship hulls and must be able to accurately maneuver both above and below water in order to effectively fight biofouling. Our fleet of robots must use coordinated planning and real-time decision-making to combat the dynamic and uncontrolled environment that is present on ship hulls. Candidates must be able to develop path-planning algorithms and integrate data from many onboard, low-cost sensors using sensor fusion. Unlike many common path planning algorithms, the side of a ship provides unique challenges that require novel solutions. Some of these challenges include dealing with harsh and irregular environmental conditions, utilizing limited or varying sensor data, lack of communication while underwater, near-zero visibility, and many others. This challenging but rewarding environment creates an opportunity where creative problem-solving and critical thinking are crucial to success.

## Responsibilities

- Integrate and evaluate combinations of motion planning and prediction algorithms.
- Develop a variety of path-planning algorithms for autonomous motion, including but not limited to search-based methods, sampling-based methods, optimization-based methods, linear-temporal logic, and decision-making under uncertainty.
- Design and build a robust and scalable codebase that enables rapid exploration and evaluation of different motion planning approaches and algorithms.
- Interface with sensing and prediction components upstream as well as trajectory optimization and tracking & control components downstream.
- Develop organized software for motion planning and decision-making modules that sit at the core of autonomous path planning systems and interface with other key modules such as localization, control, sensing, and prediction.

## Required Skills

- Experience with robotics, robotic navigation, and techniques related to state estimation
- Good background in optimization, probability, signal processing, and linear algebra
- Experience with electronics and sensor integration
- Coding languages such as Python, C++, Matlab
- Excited to be developing a novel robotic platform
- Past experience taking projects from problem formulation through implementation and deployment

Everyone's background is different. We are committed to fostering an environment with diverse experiences, ideas, and backgrounds. Diversity includes not only race and gender identity, but also sexual orientation, religion, and disability status. We are deliberate and self-reflective about the kind of team culture that we are building, seeking engineers that are not only strong in their own aptitudes but who care deeply about supporting each other's growth. If you are excited by the ability to develop novel path planning and robot control algorithms, then we encourage you to apply.



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## Apply

Email resume to Michael Bell: [jobs@fleetrobotics.ai](mailto:jobs@fleetrobotics.ai)

## About Fleet Robotics

Fleet Robotics grew out of the Harvard Microrobotics lab, incubated by Material Impact<sup>2</sup> and Harvard University. We have a core team of roboticists who have designed robots for use in underwater inspection and navigation, and who were the world's first in deploying tracking tags to sperm whales with autonomous drones<sup>3</sup>. We are a passionate team who cares deeply about solving significant environmental and ocean-based problems with cutting-edge robotics.

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<sup>2</sup> <https://www.materialimpact.com>  
<sup>3</sup> <https://www.projectceti.org>