




**ECE 196: Fighting Algae Blooms**  
**Final Project Proposal**  
**FA 24**  
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**Problem Definition:**

Algae blooms can release toxins into the water and be deadly to the plant, animal, and human life that depends on that water supply. This can affect large bodies of water such as oceans and lakes. However, this issue also affects pools.

We aim to eventually solve this problem in oceans and lakes but will develop a smaller-scale model of the solution that will work in pools.

<p style="text-align: center;">Pool algae</p> 	<p style="text-align: center;">Lake algae</p> 
<p style="text-align: center;">Ocean algae</p> 	

CDC evidence of harmful algae blooms:

[Harmful Algal Blooms and Your HealthCenters for Disease Control and Prevention \(.gov\)https://www.cdc.gov > harmful-algal-blooms > about](https://www.cdc.gov/harmful-algal-blooms/about)

National Oceanic and Atmospheric administration causes and definition of algae blooms:

[What is a harmful algal bloom?National Oceanic and Atmospheric Administration \(.gov\)https://www.noaa.gov > what-is-harmful-algal-bloom](https://www.noaa.gov/what-is-harmful-algal-bloom)

### **Existing Solutions:**

#### **Preventive Solutions**

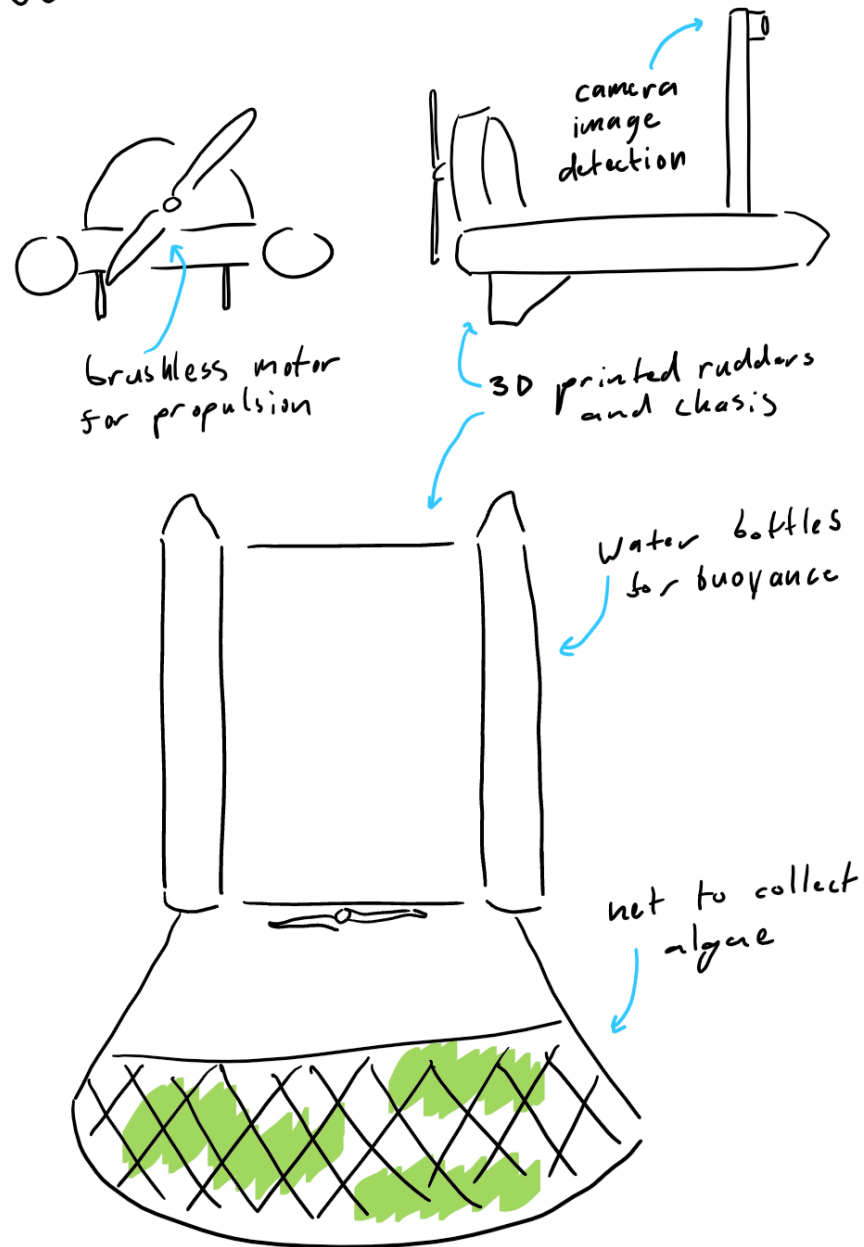
- Algae detection robots (Submersible) - These robots test the water for algae in locations routinely tested by scientists and researchers to save them time
- Fertilizer run off sensors at waterways with shut offs - This can prevent the algae from being “overfed” and can prevent the bloom from happening if the source of fertilizer runoff can be accurately determined
- Nutrient filtering systems - These systems filter out the nutrients in water-runoff instead of completely stopping it. This again requires that the runoff is traceable. In some instances, this runoff occurs due to rainfall and cannot be filtered or stopped.

#### **Restorative Solutions**

- Aeration of man- made bodies of water add oxygen back and inhibit growth of algal blooms - Aerating the water supports aerobic bacteria in the consumption of nitrogen and phosphorus which are the essential nutrients that cause algae to bloom. This essentially cuts off algae’s food supply.
- Ultrasonic waves higher than 22 KHz affect the density of water and inhibit algal growth- These waves vibrate the water and cause structural damage to the algae and results in it sink thus preventing it from getting sunlight and photosynthesizing causing it to die.
- Algae cleaning robots (Non-submersible) - These robots essentially pick up the algae and then dispose of it elsewhere.
- UV light to kill algal blooms - The UV light causes damage to the algae particles and causes them to die and fuse together making it easier to filter it out of the water

**Proposed Solution:** (Describe your proposed solution. Schematics or flowcharts can be especially helpful)

### Schematic



- Build an aquatic vehicle that can use machine learning to detect areas with algae on the surface of the water
- Can enable skimmer arms with a net or a ramp on the front of the vehicle to skim algae off the top of the water

**Testable Hypothesis:** (State your hypothesis. For example, describe what way your prototyped solution would solve this problem and what measurement would need to be taken to prove or disprove your hypothesis)

The algae cleaning robot will detect algae in a small pool and clean most of its algae and collect it autonomously.

**Milestones:** (What major milestones are needed (3-5 milestones) to successfully prototype your solution and test your hypothesis.)

1. Successful detection using a camera and a machine learning algorithm
2. Successful deployment of algae removing/cleaning solution
3. Successfully able to maneuver through the pool and algae
4. Ensuring the solution is waterproof

**Parts List:** (Add a google sheet link (share permissions) to a list of the parts needed to prototype and test. Include name, brief description, link, quantity/order, price/order, number of orders, and extended price. Please remember the total funds available to your team are \$200 (including shipping cost).)

[Part List](#)

<https://docs.google.com/spreadsheets/d/1TForluZNij0dq00UGnQPIwfkeNcgck7e8FcfkcQgj0/edit?gid=0#gid=0>

Part Name	Description	Link	Price	Quantity	Extended Price	Total	Date Added	Shipping Cost	
Logitech C270 Camera	This camera is needed for image detection	<a href="#">Camera</a>	\$11.83	1	\$11.83		10/17/24		
Raspberry Pi 4	Microcontroller, can be used with camera	<a href="#">Pi</a>	\$52.29	1	\$52.29		10/17/24		
Brushless/Servo Motor	Used for propulsion and steering	<a href="#">Motors</a>	\$25.75	1	\$25.75		10/17/24		
	^Includes ESC, servos, and propellers !								
Nylon Net	Used for cleaning algae	<a href="#">Net</a>	\$9.99	1	\$9.99		10/17/24		
						\$99.86	10/17/24	\$0	w/ Amazon prime