Algaeorithm

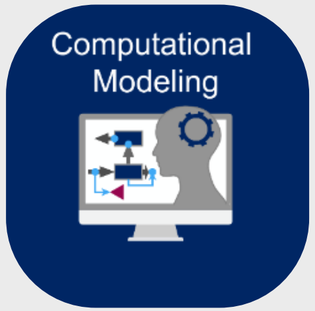
Ashwin Mukherjee, Los Altos High School

Rohan Chanani, The Paideia School

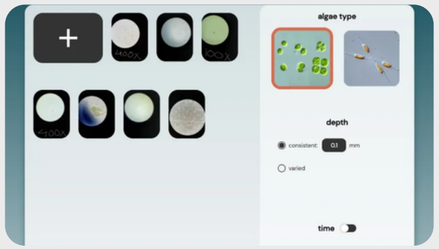
Jake Valenzuela (PhD), Institute for Systems Biology

PROJECT ORIGINS

July 2021



August 2021

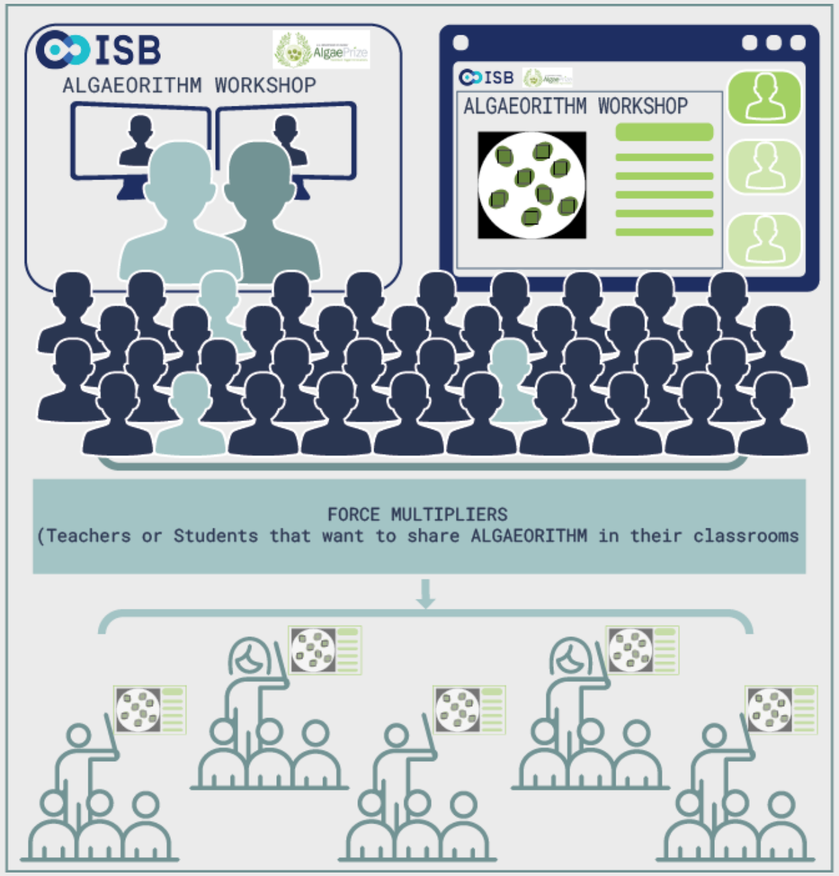


April 2022

THE NEED

A generational shift in student accessibility to bioenergy information and understanding of the potential of machine learning to unlock biological complexities

Increasing the number of high school students who can think critically about how to deal with tomorrow's problems today

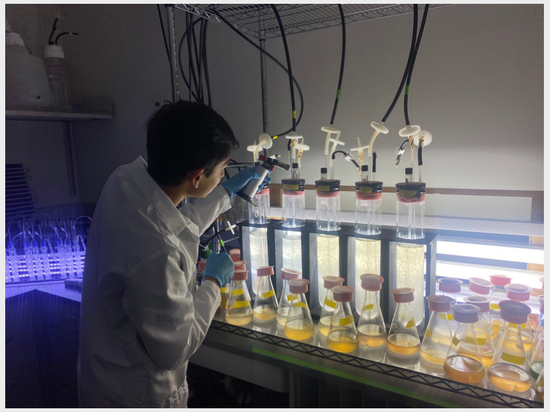


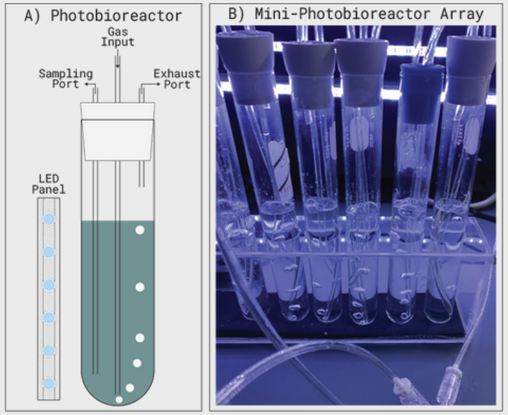
RESEARCH OBJECTIVES

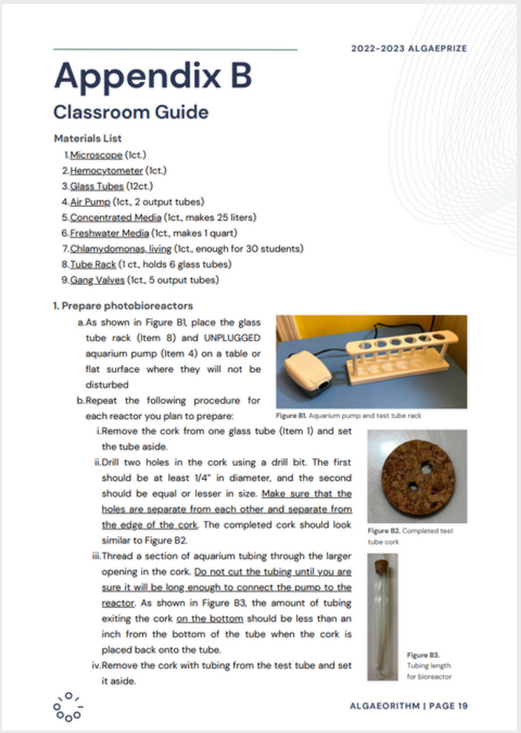
Engage future scientists, engineers, and entrepreneurs about the bioenergy industry while introducing students to the potential of machine learning in solving the world's energy problems

1. Increase the accessibility and effectiveness of algae cultivation in lab and classroom settings
2. Create original video content to engage students in the fields of bioenergy and machine learning
3. Develop an integrated web application to host software tools and educational materials

GOAL 1: ALGAE CULTIVATION







2022-2023 ALGAEPRIZE

Appendix B

Classroom Guide

Materials List

1. Microscope (1ct.)
2. Hemocytometer (1ct.)
3. Glass Tubes (12ct.)
4. Air Pump (1ct., 2 output tubes)
5. Concentrated Media (1ct., makes 25 liters)
6. Freshwater Media (1ct., makes 1 quart)
7. Chlamydomonas, living (1ct., enough for 30 students)
8. Tube Rack (1 ct., holds 6 glass tubes)
9. Gang Valves (1ct., 5 output tubes)

1. Prepare photobioreactors

a. As shown in Figure B1, place the glass tube rack (Item 8) and UNPLUGGED aquarium pump (Item 4) on a table or flat surface where they will not be disturbed

b. Repeat the following procedure for each reactor you plan to prepare:

Figure B1. Aquarium pump and test tube rack

i. Remove the cork from one glass tube (Item 1) and set the tube aside.

ii. Drill two holes in the cork using a drill bit. The first should be at least 1/4" in diameter, and the second should be equal or lesser in size. Make sure that the holes are separate from each other and separate from the edge of the cork. The completed cork should look similar to Figure B2.

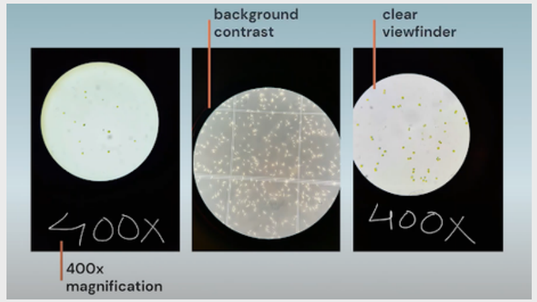
Figure B2. Completed test tube cork

iii. Thread a section of aquarium tubing through the larger opening in the cork. Do not cut the tubing until you are sure it will be long enough to connect the pump to the reactor. As shown in Figure B3, the amount of tubing exiting the cork on the bottom should be less than an inch from the bottom of the tube when the cork is placed back onto the tube.

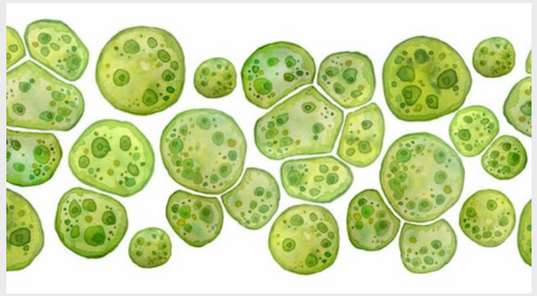
Figure B3. Tubing length for bioreactor

iv. Remove the cork with tubing from the test tube and set it aside.

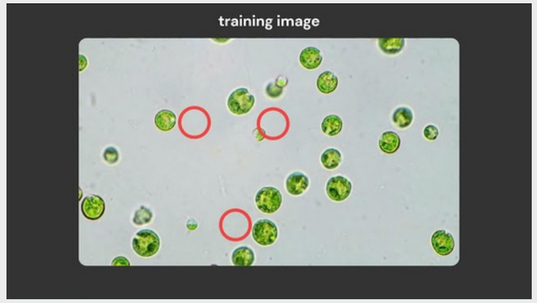
GOAL 2: EDUCATIONAL VIDEOS



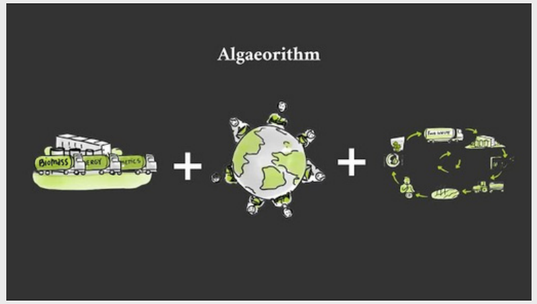
Algaeorithm Tutorial



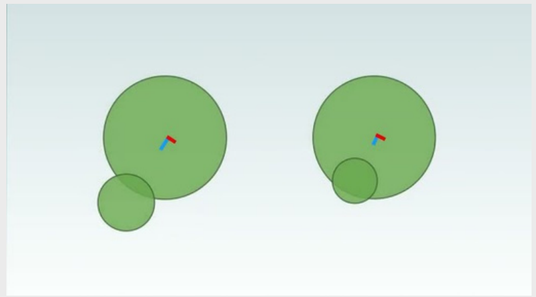
Algae for Manufacturing



What Is Machine Learning?



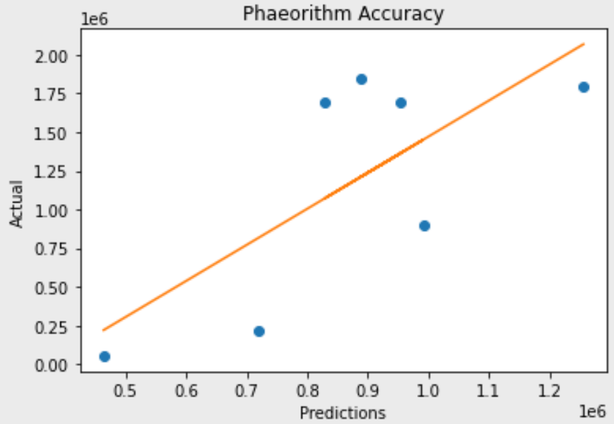
2022 Explainer

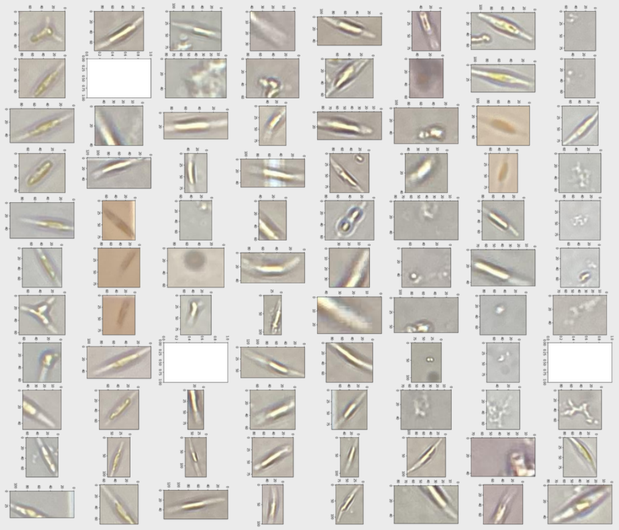


2021 Explainer

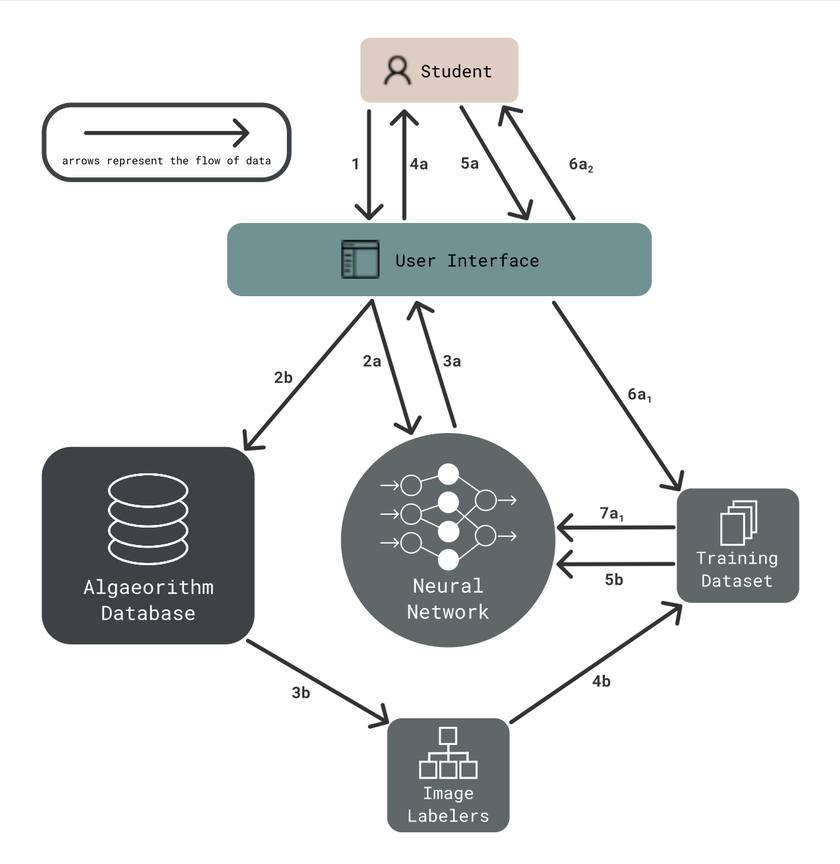
YouTube Channel

GOAL 3: APPLICATION DEVELOPMENT

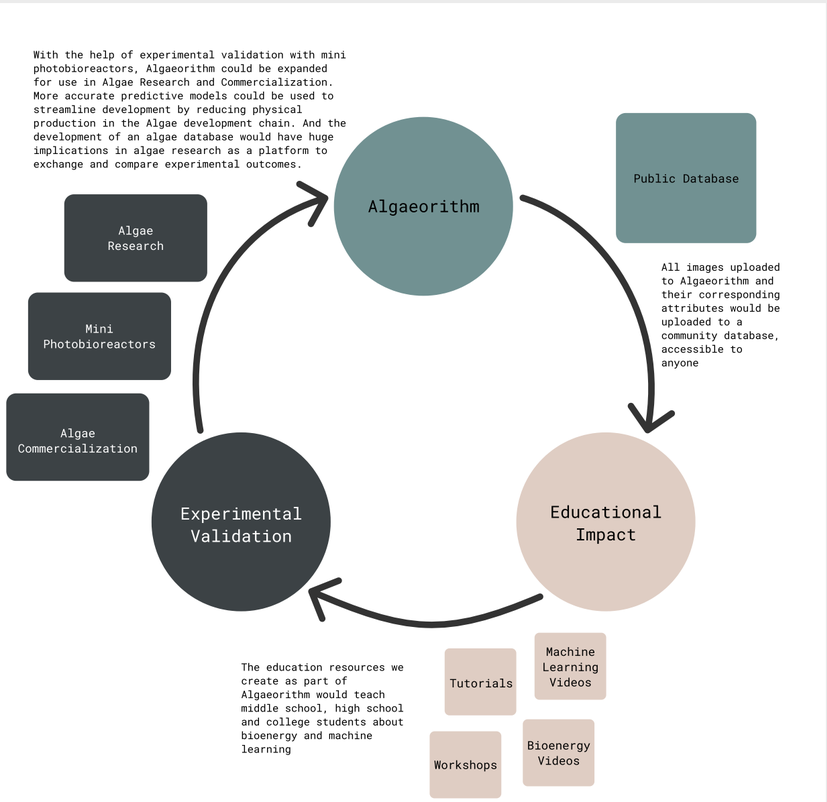




NEXT STEPS

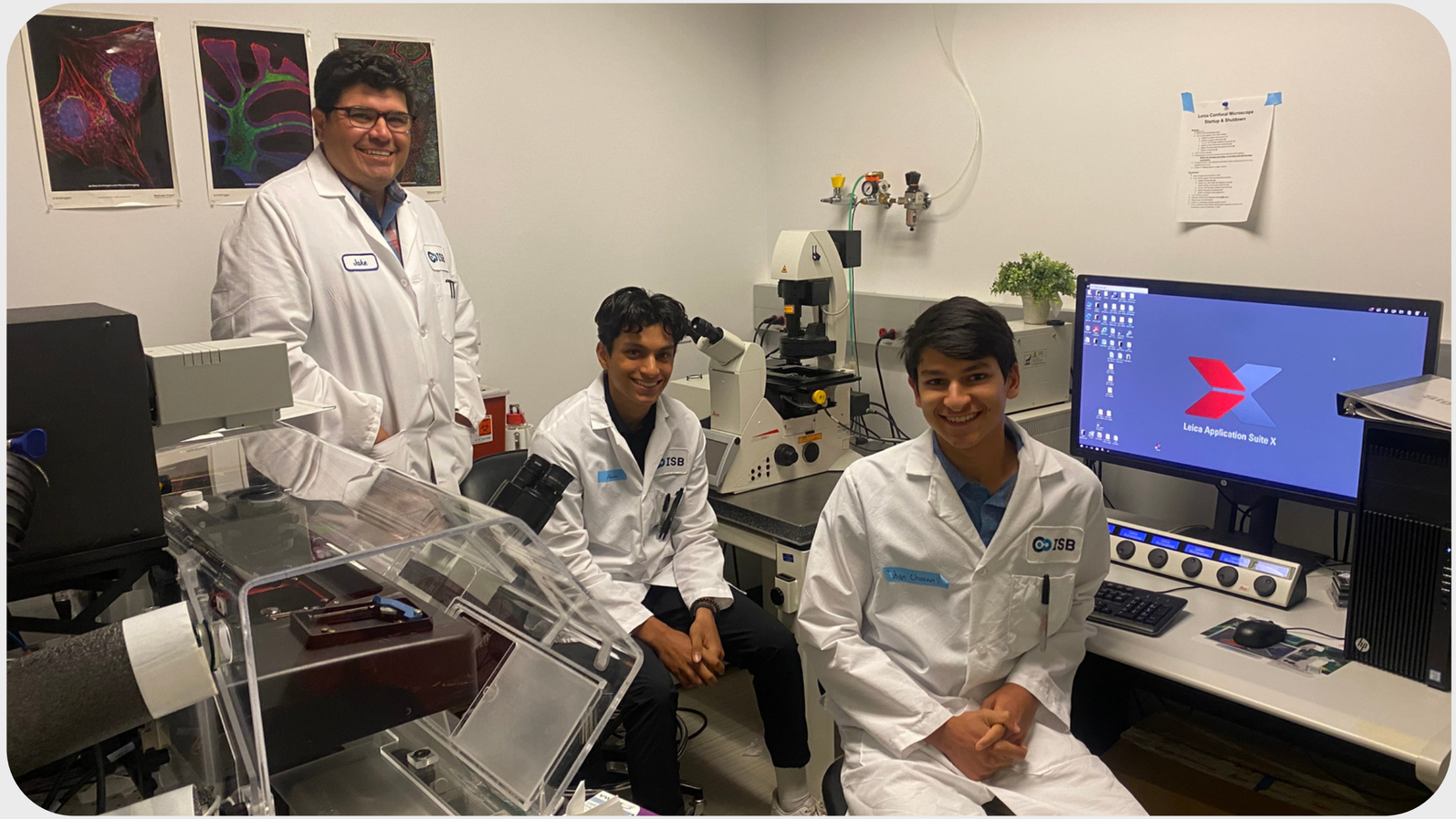


With the help of experimental validation with mini photobioreactors, Algaeorithm could be expanded for use in Algae Research and Commercialization. More accurate predictive models could be used to streamline development by reducing physical production in the Algae development chain. And the development of an algae database would have huge implications in algae research as a platform to exchange and compare experimental outcomes.



The education resources we create as part of Algaeorithm would teach middle school, high school and college students about bioenergy and machine learning

DISCUSSION



ACKNOWLEDGEMENTS

QUESTIONS?