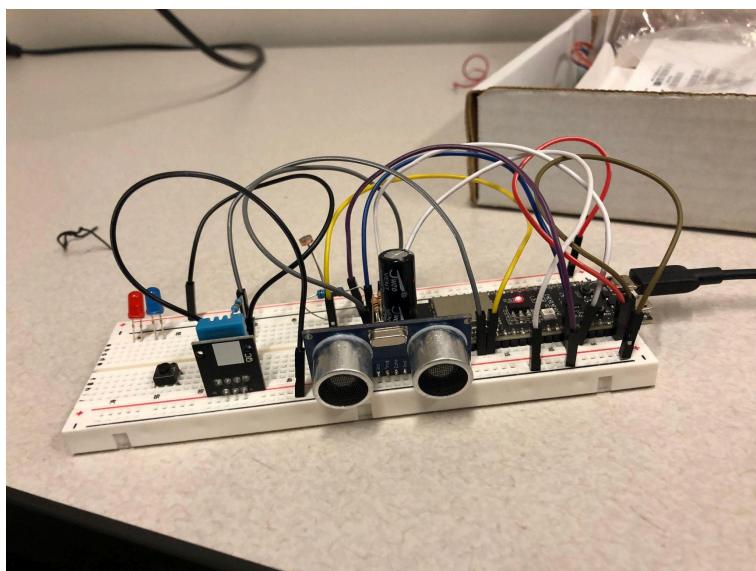


# Report Project Shield.

## Abstract

In this report we outline the current stage of development for project shield. Currently our system is capable of measuring light, and distance using an ESP32-S3 microcontroller. In our system we measure the variance and mean of the rolling buffer to estimate the accuracy of a given measurement.



## Design:

Our system uses an HC-SR04 ultrasonic distance sensor and a photoresistor to measure the light intensity at a given period of time. We chose to use a rolling buffer in order to calculate the mean and variance of an output over a given period of time. We use the variance to measure the accuracy of the measurements (by looking at how much they disagree with one another) and use the mean as our output measurement.

## Results:

We found a consistent pattern in the variance measurements which indicated a measurement was changing from one value to another, even when the measurements had wildly varying values. We also found that consistent patterns emerged for temporary interface with measurements.

## **Limitations:**

A number of significant challenges have been faced regarding power distribution and measurement using the modules for the ESP32-S3. One common issue was that sending signals to sensor modules caused shorts in the system resulting in mis-measurements from the ESP32-S3. This first problem was significantly reduced but not totally eliminated by the addition of resistors to the inputs of sensor modules and decoupling capacitors.. Additionally significant challenges were faced in getting accurate measurements from the HC-SR04 which often spat out extremely large values or failed to receive a signal for a significant amount of time, this issue was circumvented by a chunk of code which threw out values over a given threshold.

## **Future goals:**

Our short term goals are as follows: add more sensors (in particular we are actively working on adding an IMU and a temp/humidity module). We would also like to continue work on developing an algorithm which continuously writes out a confidence measurement and translates static and spiky measurements into continuous accurate measurements which we can see change values at discrete time intervals. In particular it seems that it would be useful to feed the mean and variance into a 1d-convolution neural network in order to test for signs of measurements changing, invalid reads/ interference, and a more accurate confidence estimation.