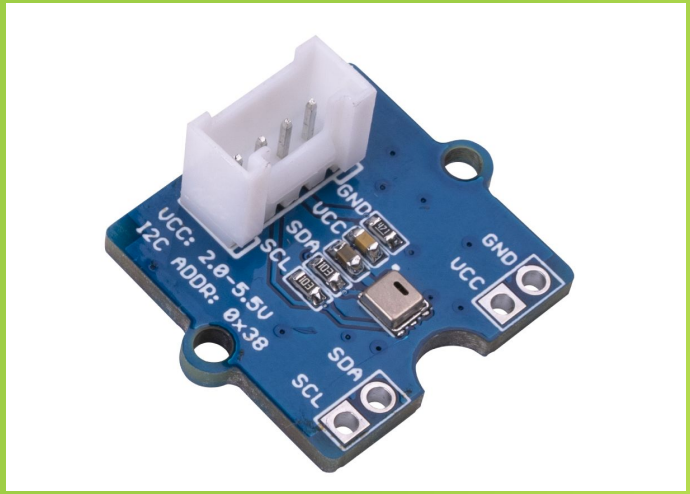
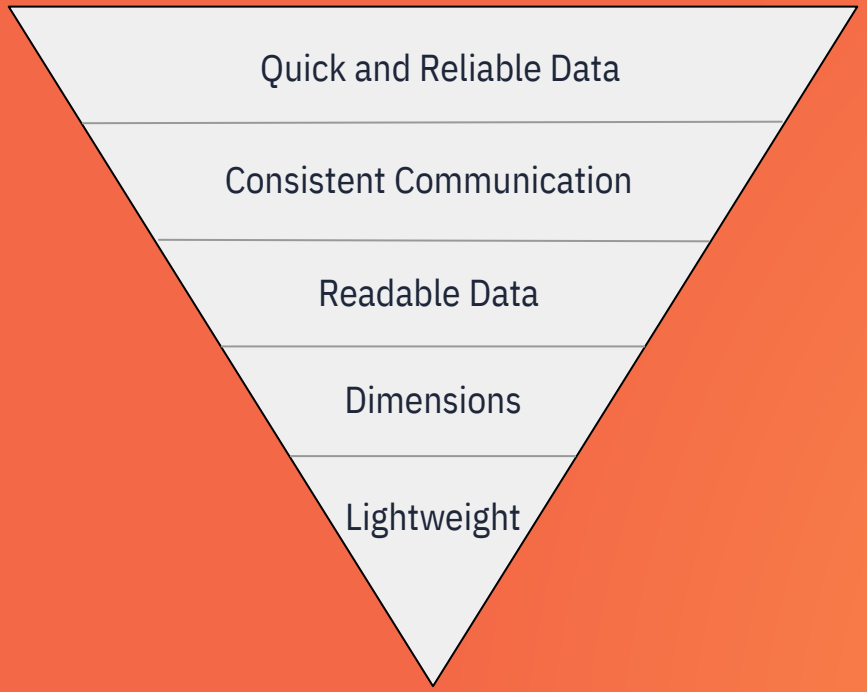
JAMZ CLIMATE SENSOR

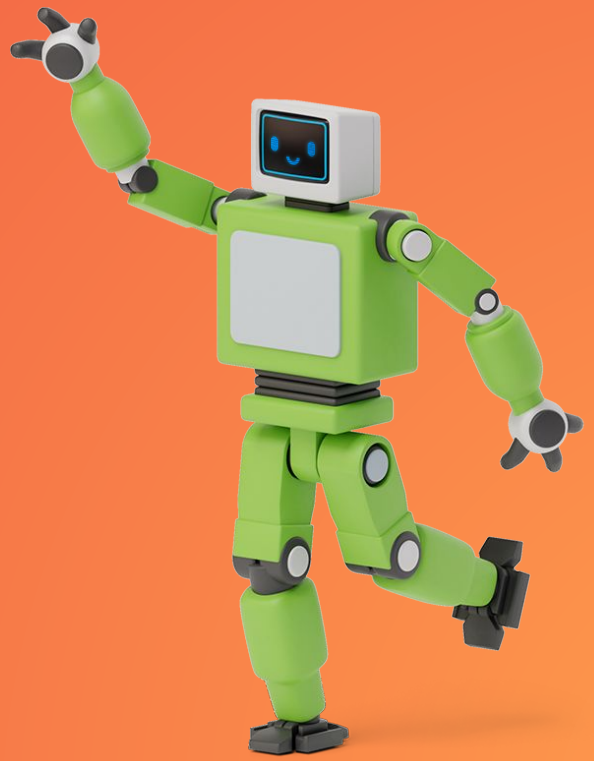
DESIGN ALGORITHM

CLIMATE SENSOR



CLIENT NEEDS



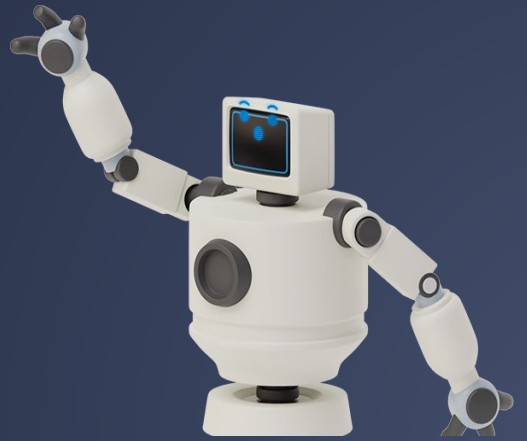


CLIENT NEEDS

Priority	Customer Statement	Interpreted Need
1	"If I see consistent data I'm going to be very happy"	Consistency of data collection
2	"That information between the drone and the operator needs to be conveyed at all times. Constant communication. So whatever information you can take from the drone and give it to the operator and vise versa is very essential"	Constant communication/data exchange between all parties
3	Visual feedback/info that operator can easily interpret.	Readable and understandable data
4	"As long as it is compact...So remember, drone weight is everything so make sure you are thinking about compactness"	Dimension and compactibility
5	"With drones, weight is everything"	Light weight

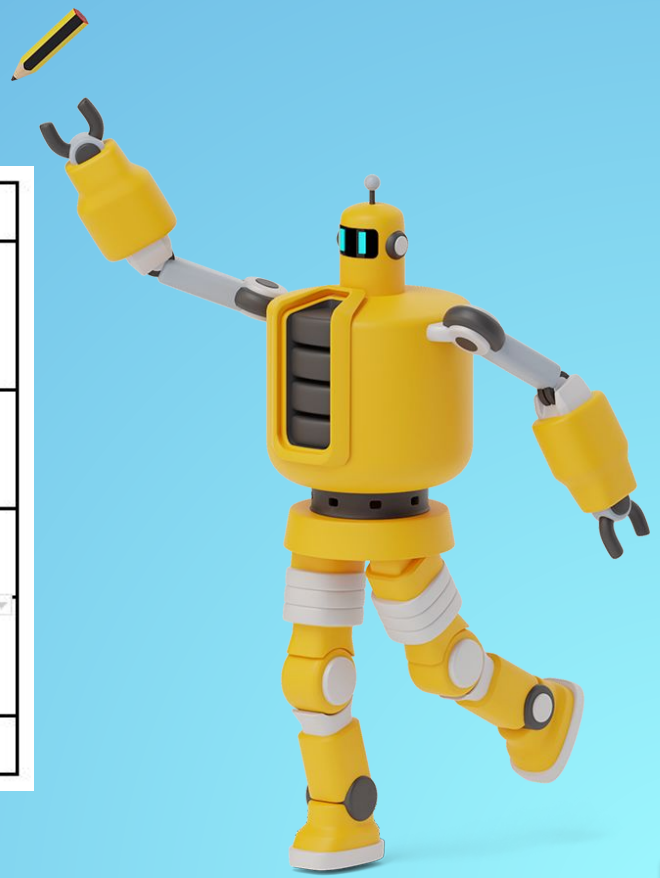
PROBLEM STATEMENT

JAMZ needs a climate sensor add-on system for a food delivery drone that provides consistent data for temperature and humidity values. Constant communication to the flight operator is also necessary so JAMZ can figure out when the temperature and humidity values go out of the optimal range.



DESIGN CRITERIA

Interpreted needs	Design Criteria
Consistency of data collection	Sensor needs to accurately read temperature. Reliability. Temperature reading needs to be consistently collected
Constant communication/data exchange between all parties	Temperature readings are constantly being sent to drone operator (and any other sources)
Data is readable and understandable	Data from sensor is easily interpretable to the operator
Dimension and compactibility	Size (small) Depth and length correspond to aerodynamics
Light weight	Weight (minimal)



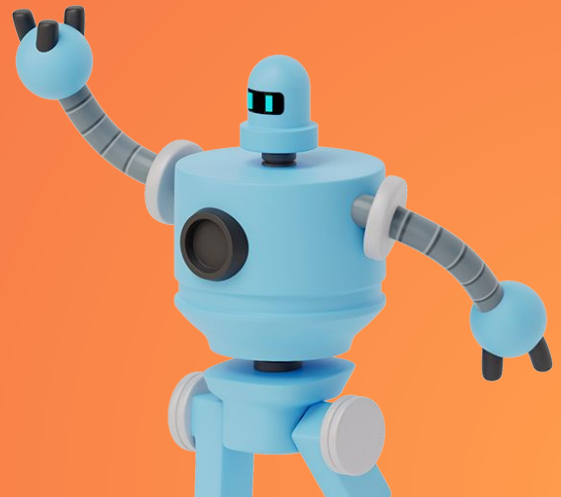
BENCHMARKING

Temperature Sensors:

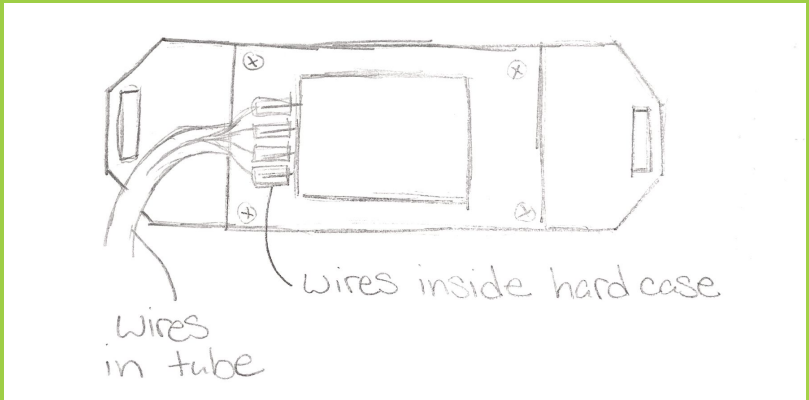
	DHT11	DHT22	AM2302	BME280	Grove AHT20
Price (CAD)	$5.2	$8.6	$15.3	$5.15	$5.73
Temperature Range	0-50°C	-40-80°C	-40-125°C	-40-85°C	-40-85°C
Temperature Accuracy	± 1°C	± 0.5°C	± 0.2°C	± 1°C	± 0.3°C
Data Transfer	Serial Data	Serial Data	Serial Data	Serial Data	Serial Data
Response Time	6-15s	2s	2s	1s	0.5s (with ease)

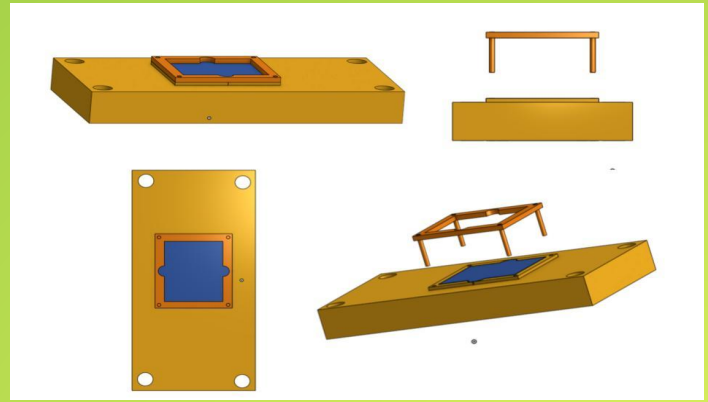
Microcontrollers:

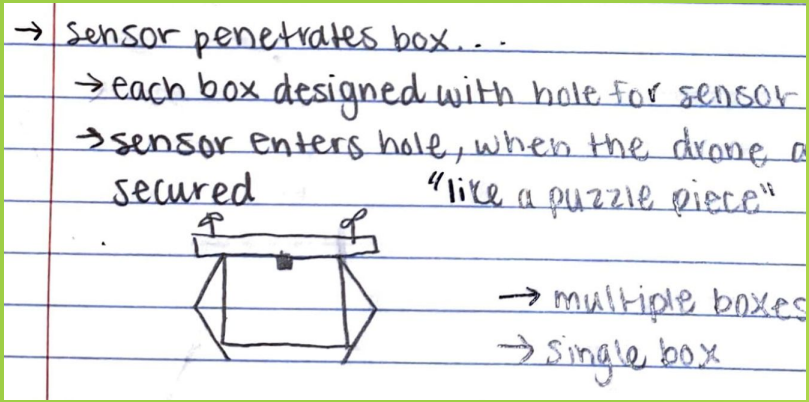
	Arduino Uno	Arduino Leonardo	Arduino Due	Teensy 4.0	Raspberry Pi 4
Price (CAD)	$29	$25.5	$51	$25	$44.6
Programming Language	C/C++	C++	C/C++	C++	Python
Size (cm)	6.86 x 5.34	6.86 x 5.33	10.2 x 5.33	3.56 x 1.78	8.56 x 5.65
Weight (g)	25	20	36	2.8	46
Input Voltage Limits	6-20v	6-20v	6-16v	3.3v	6v

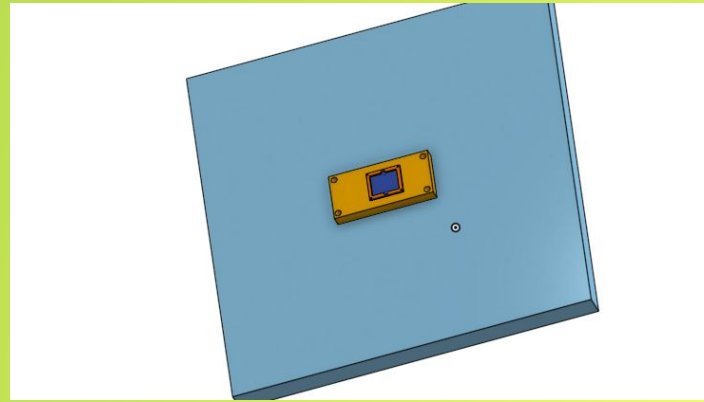


CONCEPTUAL DESIGN

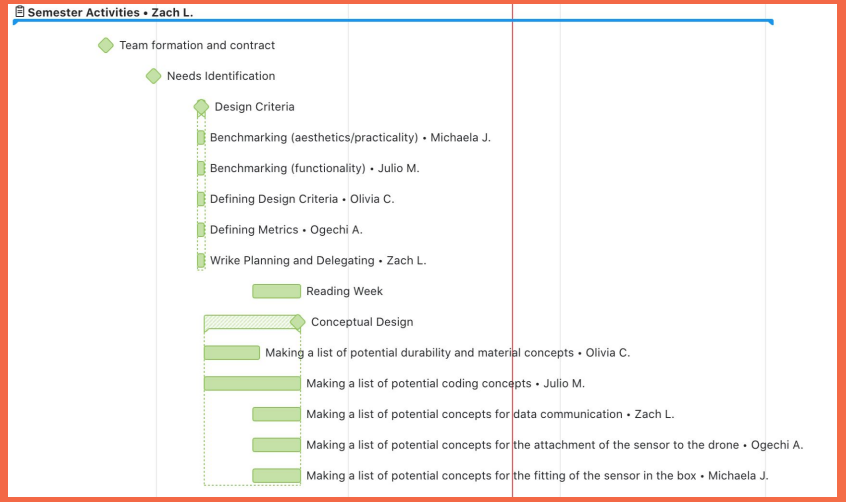


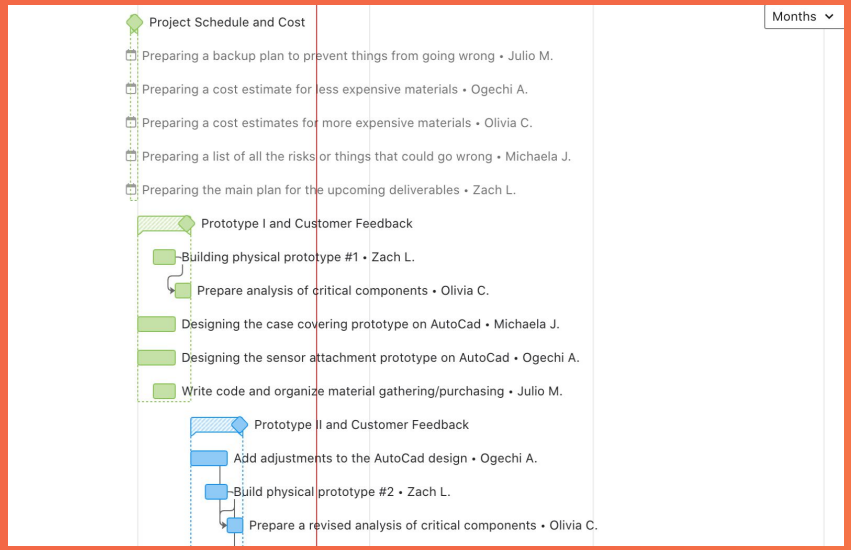


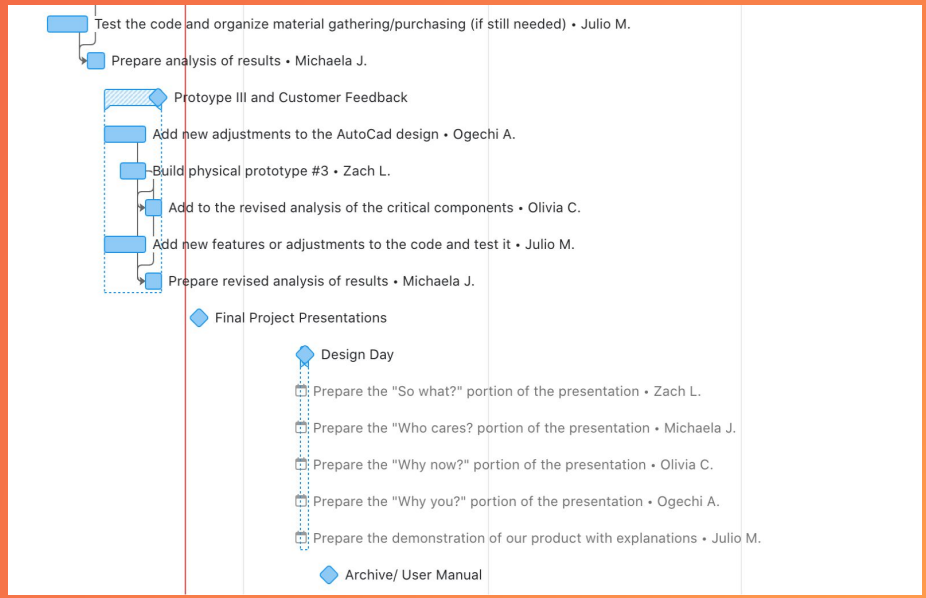




PROJECT PLAN (WRIKE)

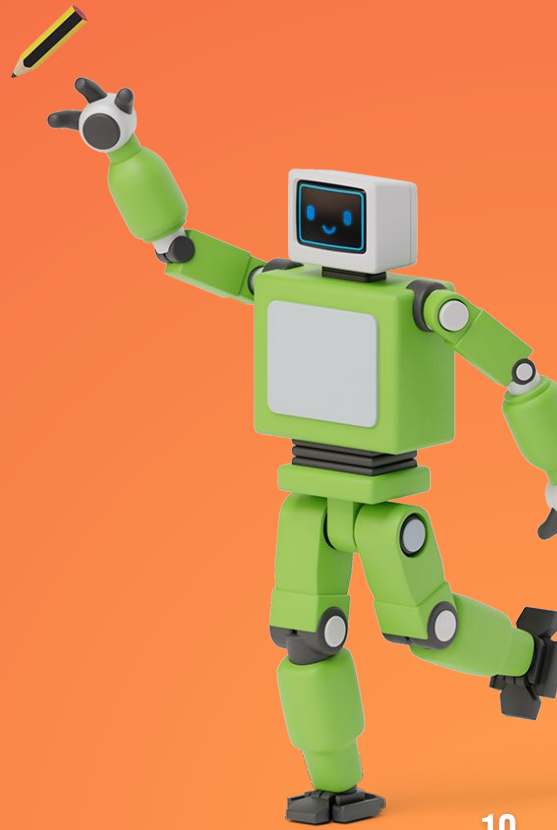






COSTS

Material	Estimated cost (for JAMZ)	Actual cost (for prototype)
Sensor and Arduino case printing	$5	$0
Temperature and Humidity Sensor (Grove - AHT20)	$6.24	$5.73
Arduino Uno	$29	$0
Wires	$10	$0
Screws/nuts and bolts	$4	$4
Styrofoam box	--	$9
Wire Wrapping	$5	$5 (estimated)
Power converter	$20	$0
Female connector	$2	$0



PROTOTYPE I: CODE

COM3

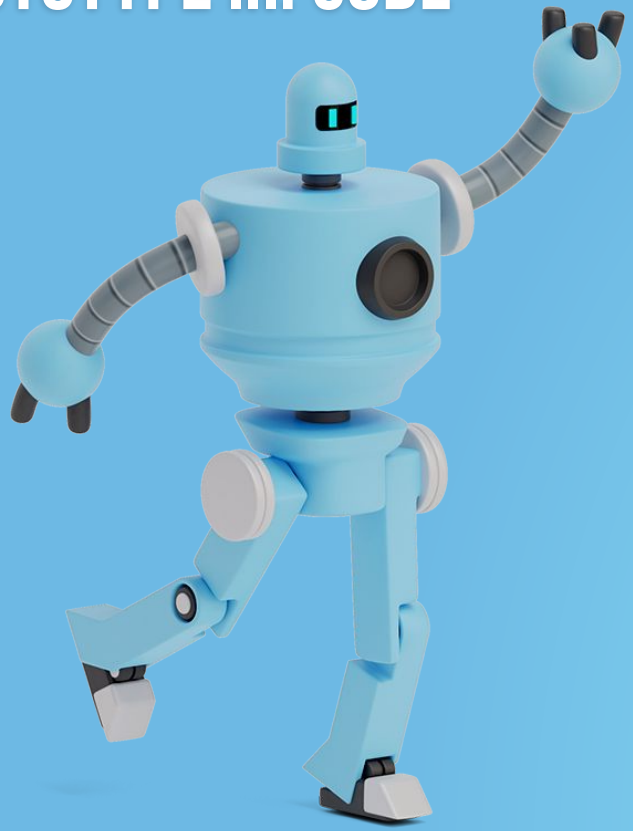
```
ʕcʕ----------------------------------------------------------------
|Time Stamp      |Temperature     |Humidity        |Warning
          36.84°C          25.28%
          36.85°C          25.28%
          37.07°C          25.30%
          37.42°C          25.31%
          37.72°C          25.30%
          37.80°C          25.31%
          37.70°C          25.29%
          37.59°C          25.30%
          37.55°C          25.30%
          37.44°C          25.30%
          37.49°C          25.30%
          37.70°C          25.30%
          37.98°C          25.30%
          38.24°C          25.30%
          38.38°C          25.30%
          38.57°C          25.29%
          38.86°C          25.31%
          39.09°C          25.32%
          39.23°C          25.31%
          39.41°C          25.32%
          39.63°C          25.32%
          39.69°C          25.32%
          39.69°C          25.31%
          39.64°C          25.31%
          39.82°C          25.32%
          39.94°C          25.32%
          40.13°C          25.31%
          40.20°C          25.30%
```

COM3

Time Stamp	Temperature	Humidity	Warning
	25.13°C	37.22%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.15%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.12%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.04%	WARNING, HUMIDITY IS TOO LOW
	25.14°C	36.99%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.25%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.53%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.71%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.93%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	38.43%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	38.97%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	39.18%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	39.58%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	40.08%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	40.33%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	40.30%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	40.17%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	39.95%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	39.68%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	39.45%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	39.23%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	39.03%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	38.76%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	38.52%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	38.30%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	38.13%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	37.98%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.82%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.73%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.60%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.50%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.41%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.34%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.28%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.28%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	37.56%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.66%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.54%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.49%	WARNING, HUMIDITY IS TOO LOW
	25.16°C	37.37%	WARNING, HUMIDITY IS TOO LOW
	25.14°C	37.31%	WARNING, HUMIDITY IS TOO LOW
	25.15°C	37.16%	WARNING, HUMIDITY IS TOO LOW
	25.17°C	37.09%	WARNING, HUMIDITY IS TOO LOW

PROTOTYPE II: CODE

PROTOTYPE III: CODE



COM3

```
-------------------------------------------------------------
|Time Stamp      |Temperature     |Humidity        |Warning
0:0:0.50s          25.09°C          36.37%           WARNING, HUMIDITY IS TOO LOW
0:0:1.00s          25.11°C          36.33%           WARNING, HUMIDITY IS TOO LOW
0:0:1.50s          25.11°C          36.33%           WARNING, HUMIDITY IS TOO LOW
0:0:2.00s          25.10°C          36.29%           WARNING, HUMIDITY IS TOO LOW
0:0:2.50s          25.09°C          36.25%           WARNING, HUMIDITY IS TOO LOW
0:0:3.00s          25.12°C          36.24%           WARNING, HUMIDITY IS TOO LOW
0:0:3.50s          25.11°C          36.25%           WARNING, HUMIDITY IS TOO LOW
0:0:4.00s          25.10°C          36.24%           WARNING, HUMIDITY IS TOO LOW
0:0:4.50s          25.12°C          36.29%           WARNING, HUMIDITY IS TOO LOW
0:0:5.00s          25.11°C          36.26%           WARNING, HUMIDITY IS TOO LOW
0:0:5.50s          25.13°C          36.29%           WARNING, HUMIDITY IS TOO LOW
0:0:6.00s          25.12°C          36.27%           WARNING, HUMIDITY IS TOO LOW
0:0:6.50s          25.12°C          36.26%           WARNING, HUMIDITY IS TOO LOW
0:0:7.00s          25.11°C          36.27%           WARNING, HUMIDITY IS TOO LOW
0:0:7.50s          25.11°C          36.21%           WARNING, HUMIDITY IS TOO LOW
0:0:8.00s          25.11°C          36.26%           WARNING, HUMIDITY IS TOO LOW
0:0:8.50s          25.12°C          36.27%           WARNING, HUMIDITY IS TOO LOW
0:0:9.00s          25.11°C          36.24%           WARNING, HUMIDITY IS TOO LOW
0:0:9.50s          25.10°C          36.25%           WARNING, HUMIDITY IS TOO LOW
0:0:10.00s         25.11°C          36.27%           WARNING, HUMIDITY IS TOO LOW
0:0:10.50s         25.09°C          36.21%           WARNING, HUMIDITY IS TOO LOW
0:0:11.00s         25.11°C          36.21%           WARNING, HUMIDITY IS TOO LOW
0:0:11.50s         25.11°C          36.20%           WARNING, HUMIDITY IS TOO LOW
0:0:12.00s         25.11°C          36.23%           WARNING, HUMIDITY IS TOO LOW
0:0:12.50s         25.10°C          36.19%           WARNING, HUMIDITY IS TOO LOW
0:0:13.00s         25.11°C          36.22%           WARNING, HUMIDITY IS TOO LOW
0:0:13.50s         25.11°C          36.26%           WARNING, HUMIDITY IS TOO LOW
0:0:14.00s         25.10°C          36.25%           WARNING, HUMIDITY IS TOO LOW
0:0:14.50s         25.11°C          36.25%           WARNING, HUMIDITY IS TOO LOW
0:0:15.00s         25.11°C          36.33%           WARNING, HUMIDITY IS TOO LOW
0:0:15.50s         25.11°C          36.38%           WARNING, HUMIDITY IS TOO LOW
0:0:16.00s         25.08°C          36.50%           WARNING, HUMIDITY IS TOO LOW
0:0:16.50s         25.10°C          36.58%           WARNING, HUMIDITY IS TOO LOW
0:0:17.00s         25.09°C          36.69%           WARNING, HUMIDITY IS TOO LOW
0:0:17.50s         25.10°C          36.79%           WARNING, HUMIDITY IS TOO LOW
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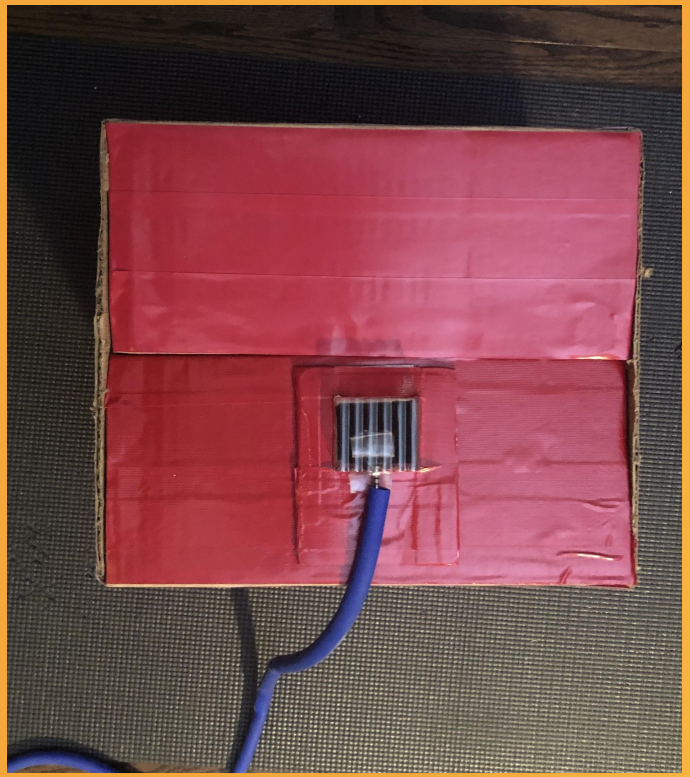
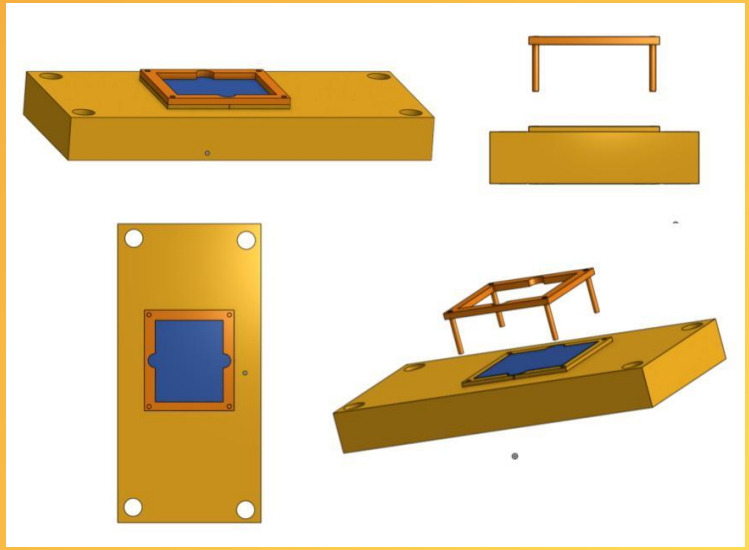
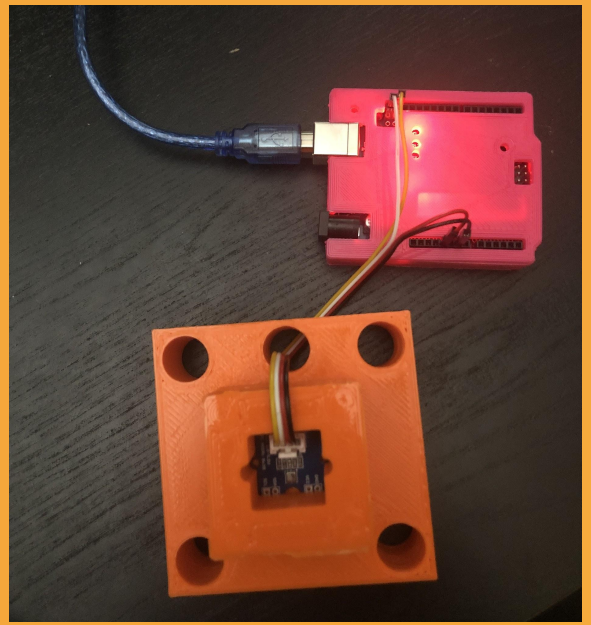
PROTOTYPE I: CAD & PHYSICAL





PROTOTYPE II: CAD & PHYSICAL



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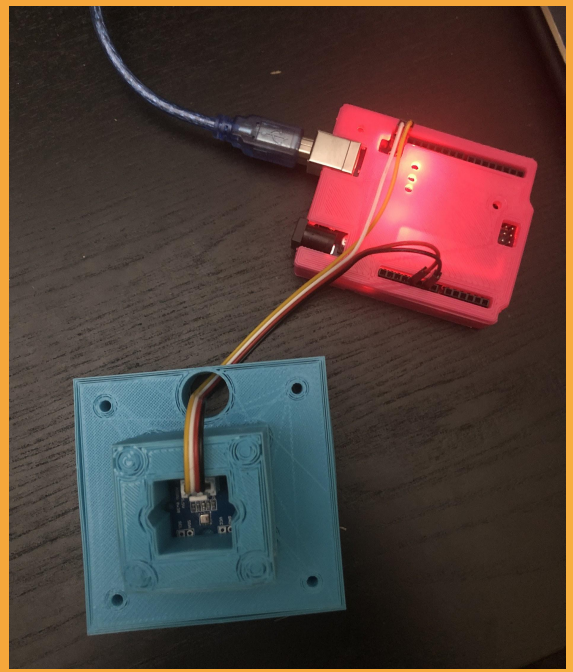
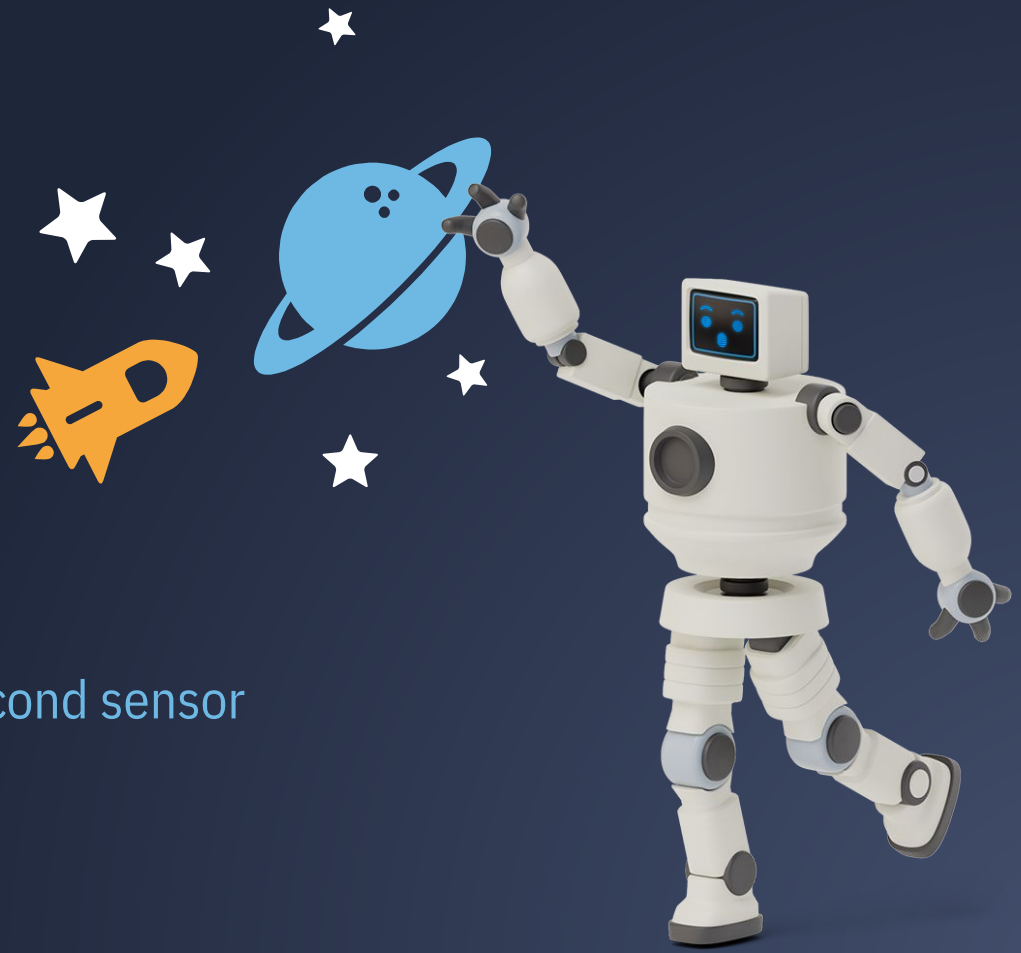


NEXT STEPS

- Waterproofing
- Potential addition of second sensor
- Attachment



ANY QUESTIONS?