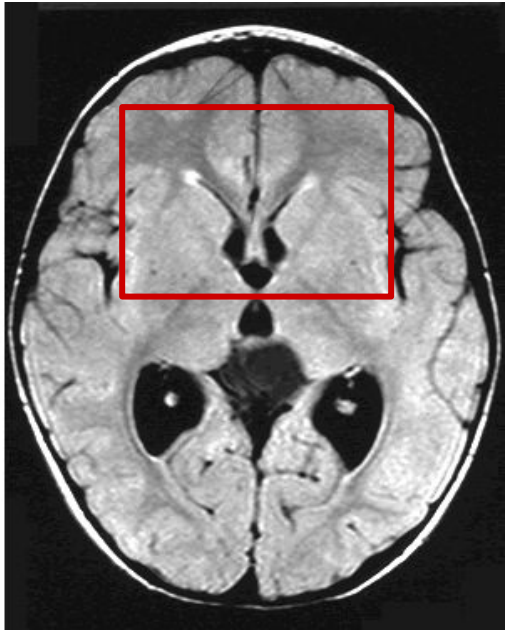
1 MILLION ADULTS IN THE U.S.

suffer from hydrocephalus

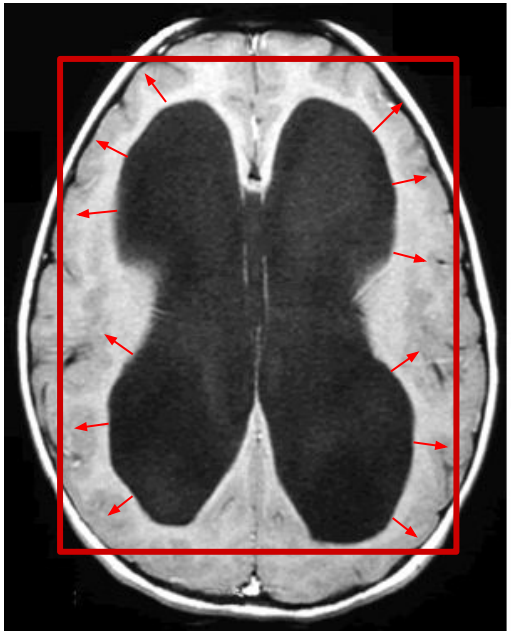
CephaloPump:

A Revolutionary New Treatment for Hydrocephalus

Team Brain Drain
Patrick Bi, Samuel Brehm, Haafiz Hashim,
Irene Kwon, Cooper Lueck, Bill Wang



Normal

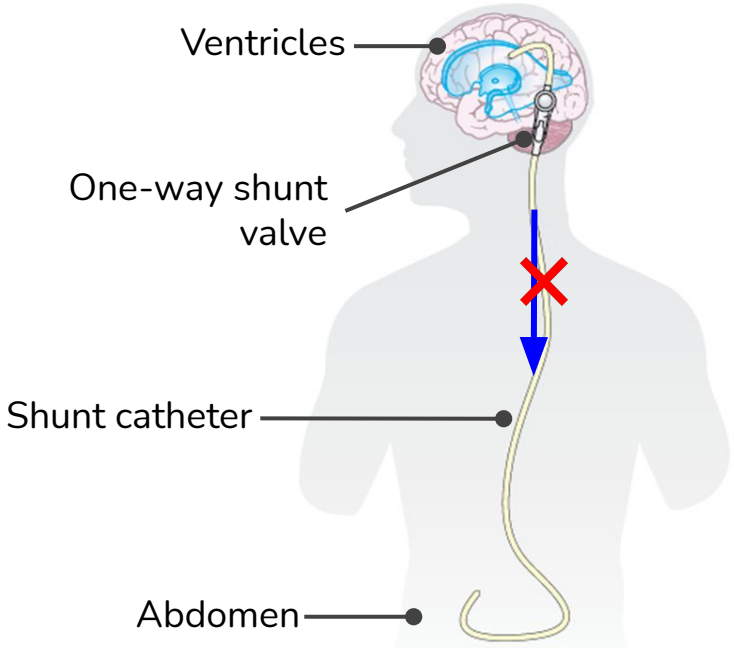


Hydrocephalus
(excess fluid buildup)

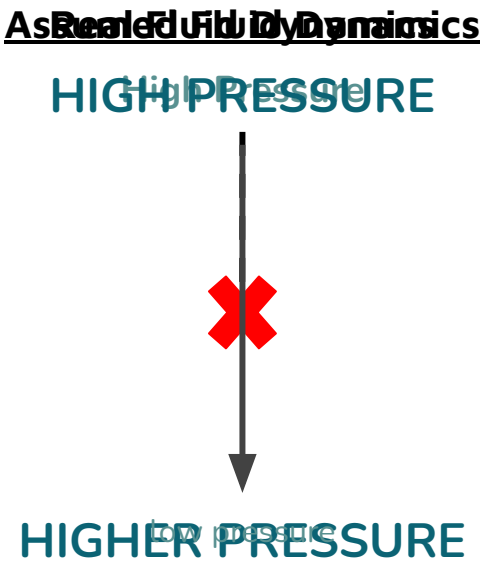
EFFECTS

- HEADACHE
- GAIT DISTURBANCE
- IMPAIRED COGNITION
- DEATH

Managing Hydrocephalus Today

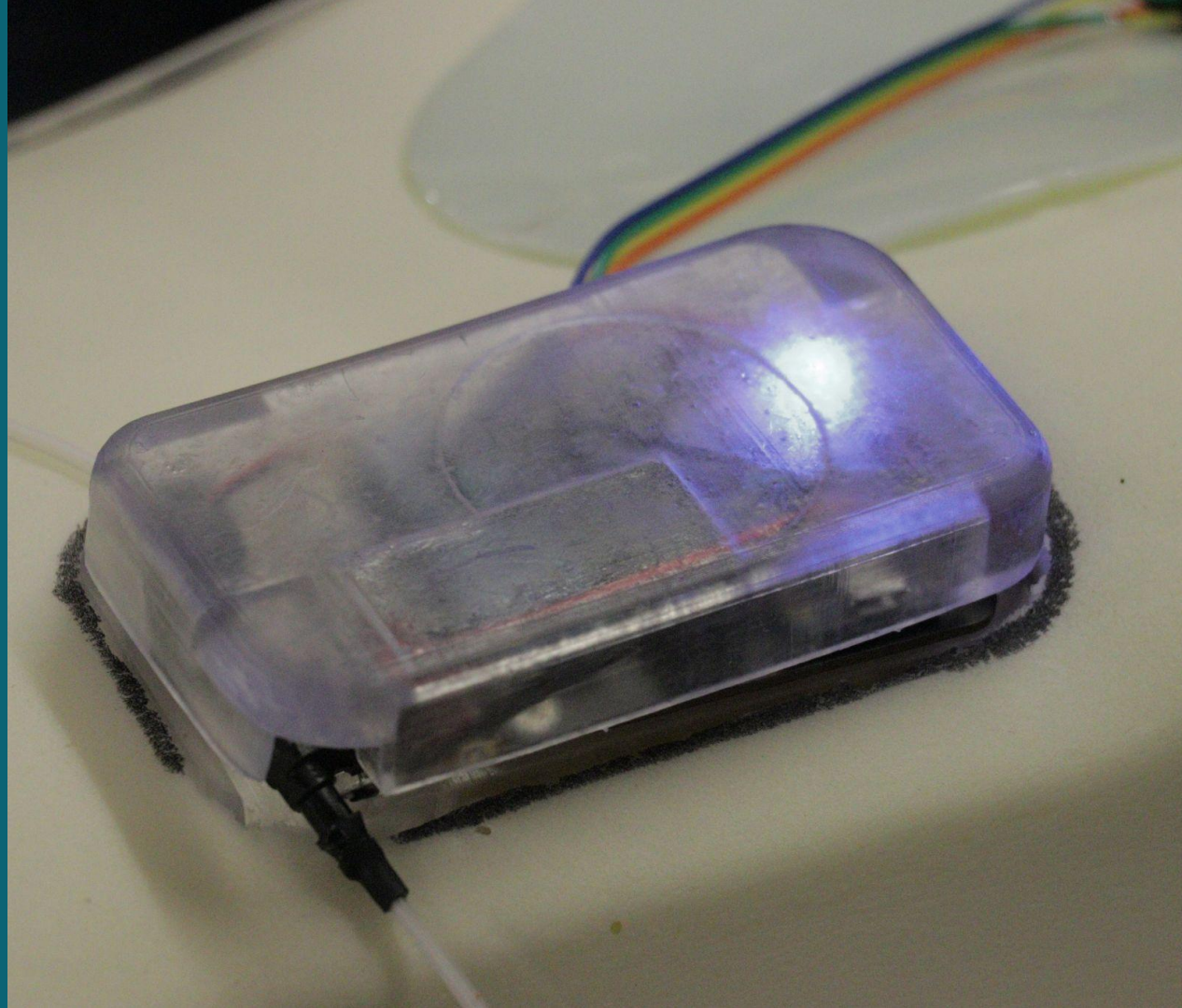


Shunt System



CephaloPump

Novel Hydrocephalus Treatment Device



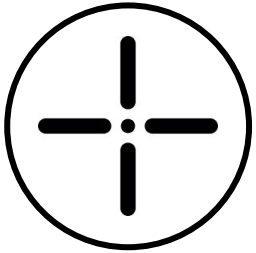
Design Specifications

Negative Pressure Gradient

0-25 cm H_2O

Monitoring Frequency

< once every 15 min.



Accuracy

< 10% measurement error

CephaloPump Components

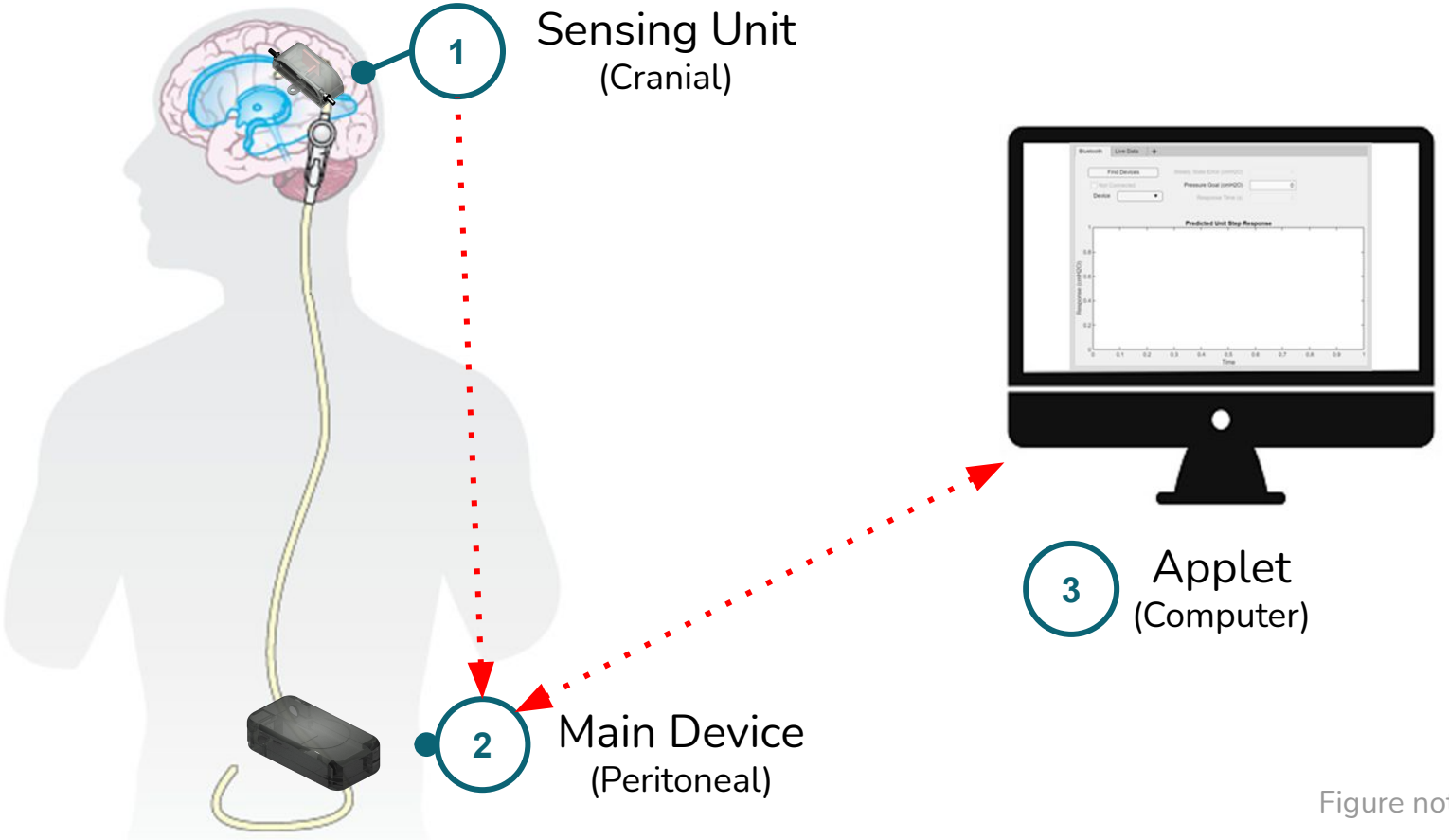
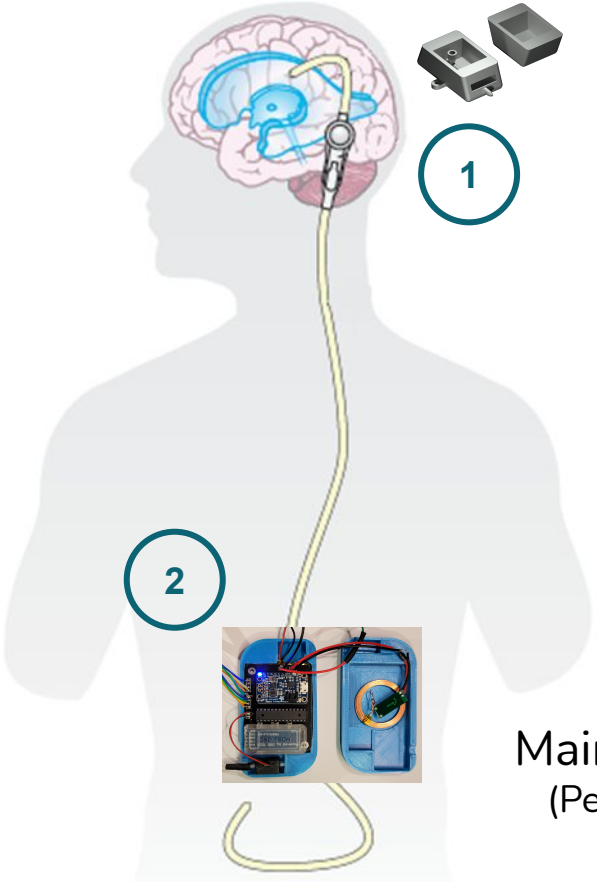


Figure not to scale.

CephaloPump Components

1. SENSING UNIT

. PERITONEAL DEVICE



Sensing Unit
(Cranial)

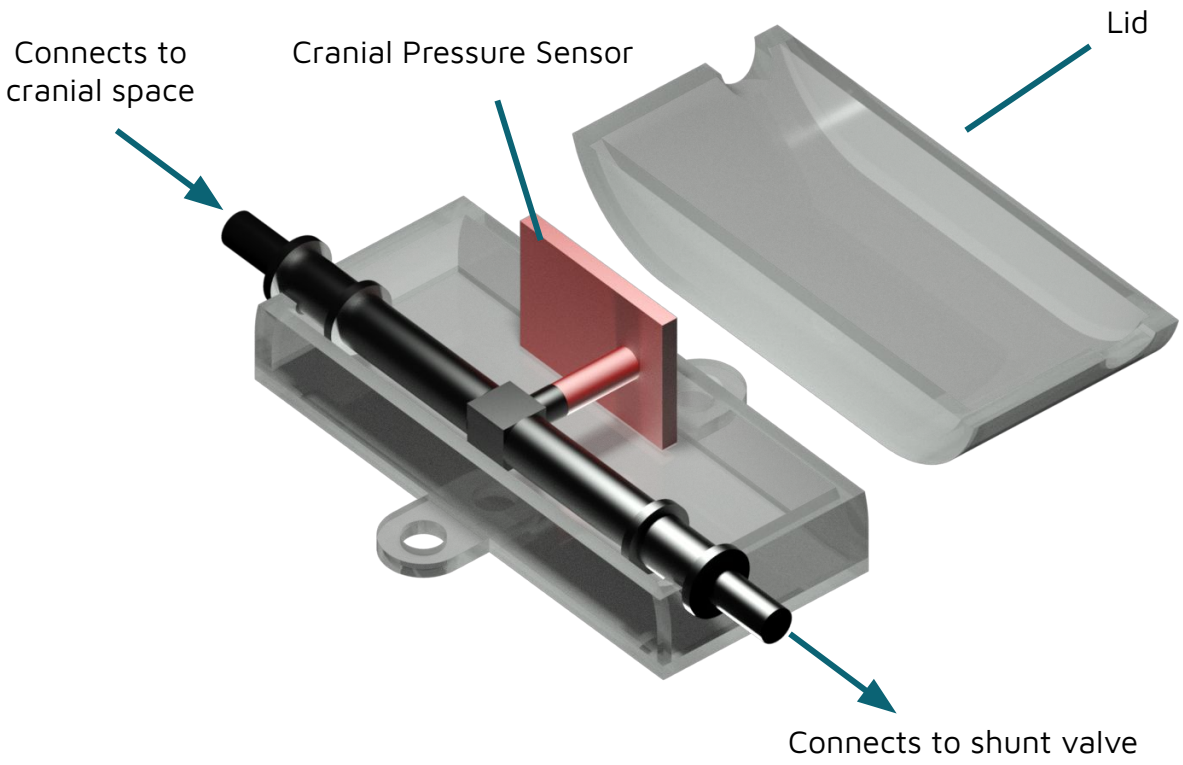
3

Applet
(Computer)

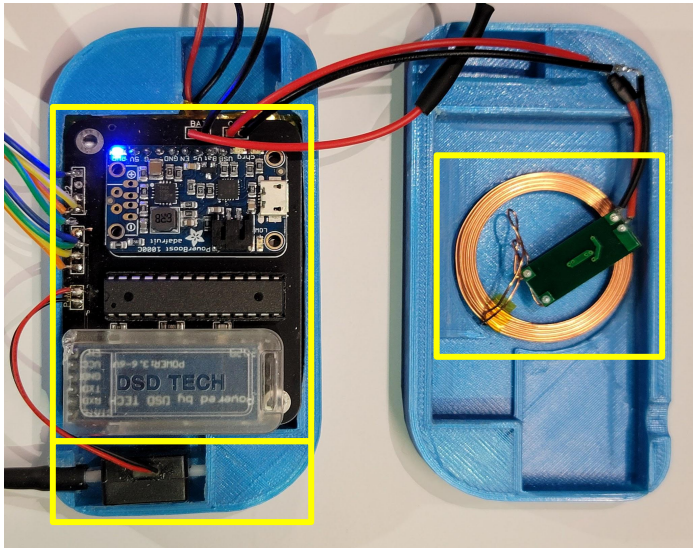
Main Device
(Peritoneal)

Figure not to scale.

1 SENSING UNIT



Printed
Circuit Board
(PCB)



Inductive
Charging Coil

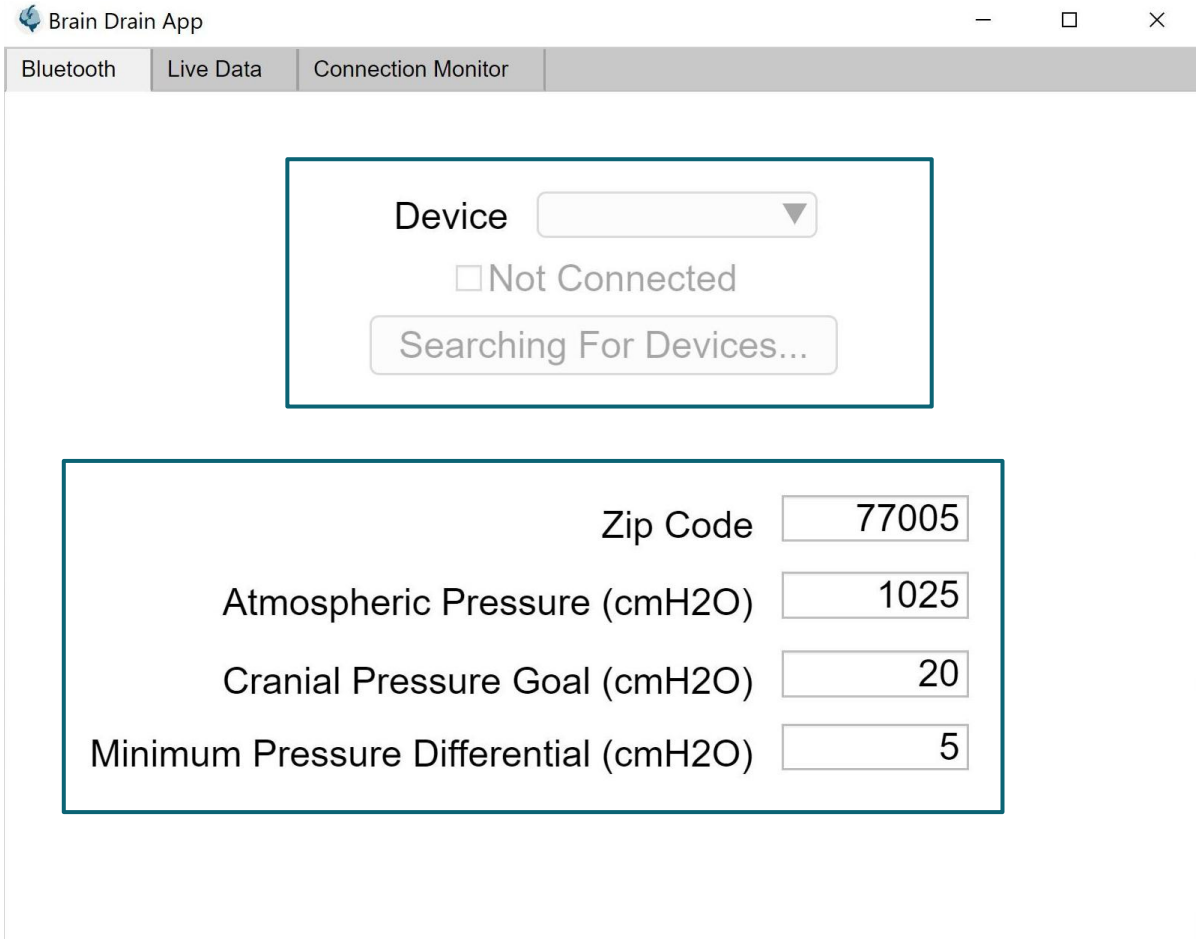
Pump and
Pressure Sensor

2 PERITONEAL DEVICE

3

APPLET: SETUP

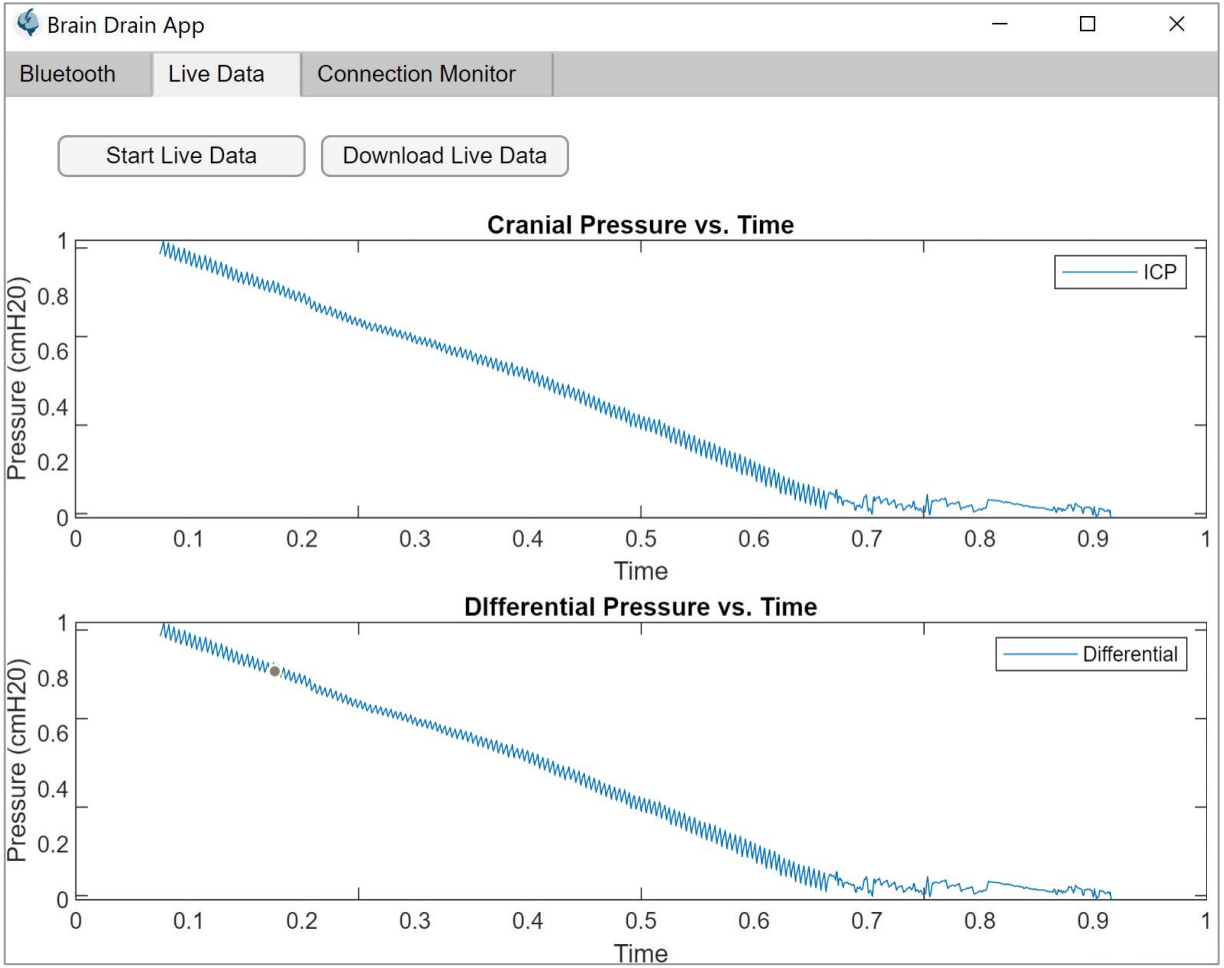
User Interface

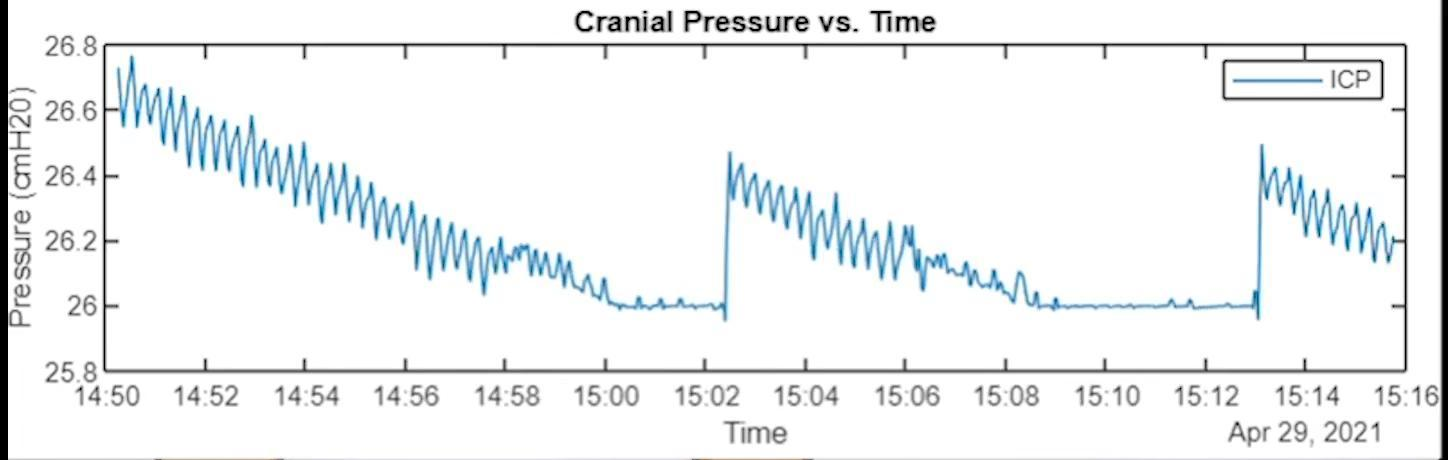


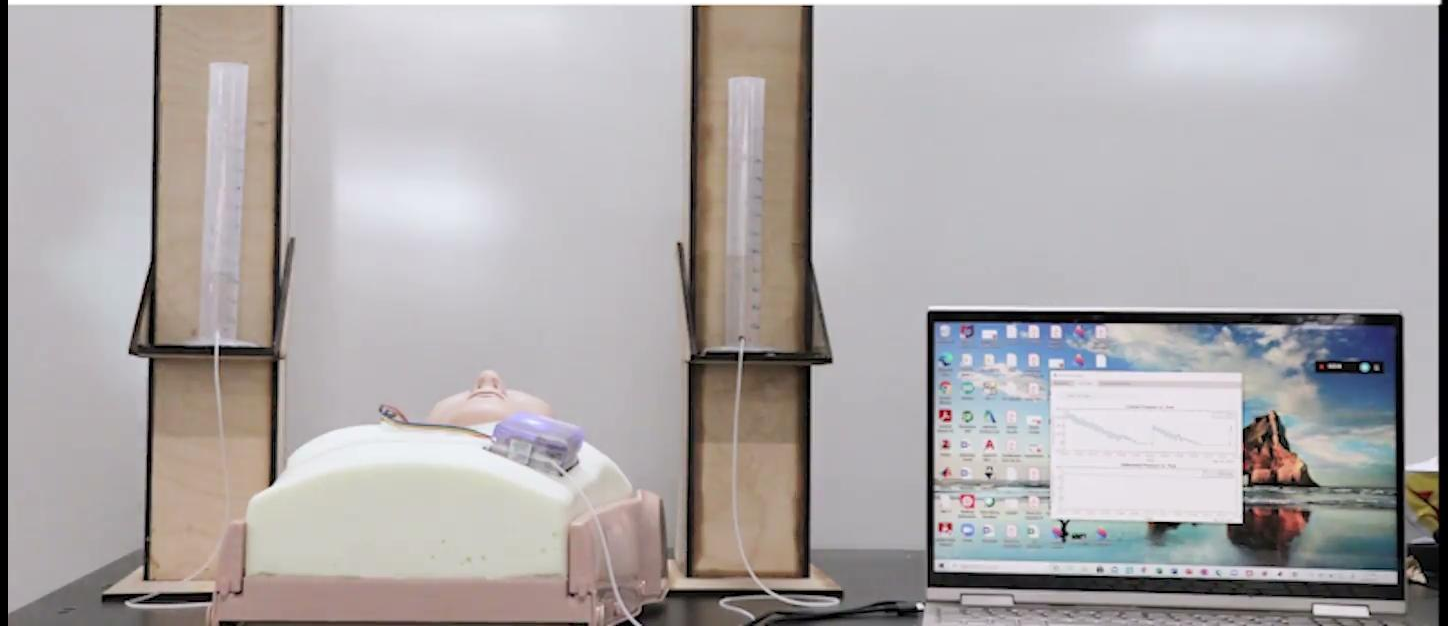
3

APPLET: DATA COLLECTION

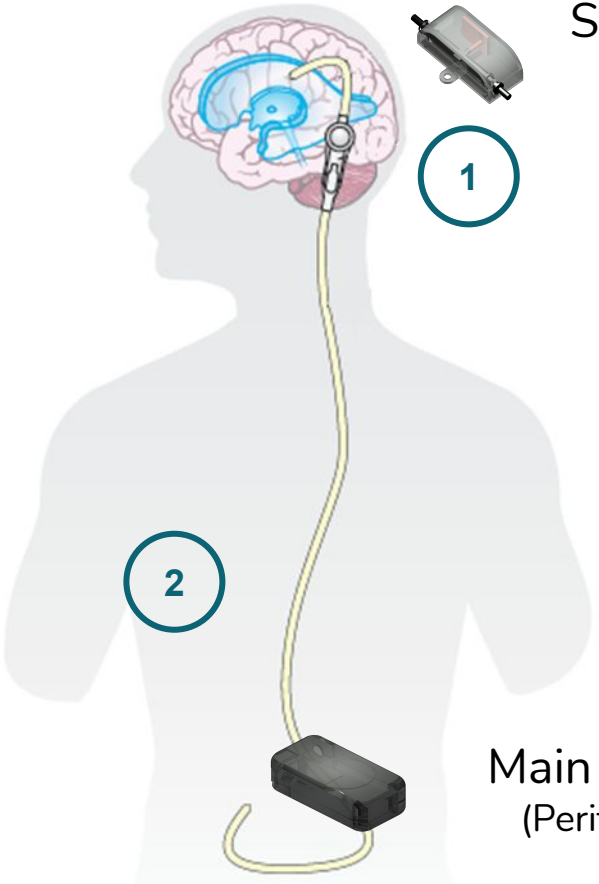
User Interface




Cranial Pressure vs. Time
ICP
Pressure (cmH20)
26.8
26.6
26.4
26.2
26
25.8
14:50
14:52
14:54
14:56
14:58
15:00
15:02
15:04
15:06
15:08
15:10
15:12
15:14
15:16
Time
Apr 29, 2021



CephaloPump



1

Sensing Unit
(Cranial)

2

Main Device
(Peritoneal)

3

Applet
(Computer)

ACKNOWLEDGEMENTS

RICE ENGINEERING
Bioengineering

Texas Children's Hospital®

Faculty Mentor: Dr. Sabia Abidi

Design Mentor: Patricia Thai

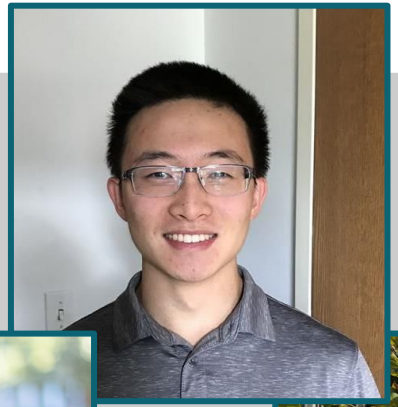
Sponsor: Dr. Daniel Curry

Sponsor: Angela Addison

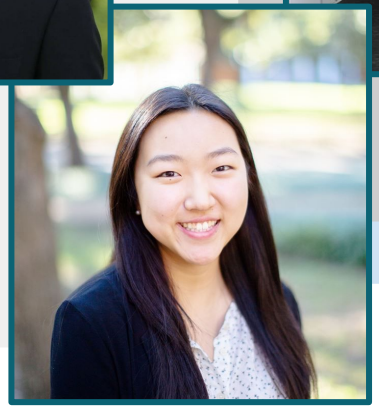
Bill Wang

Haafiz Hashim

Patrick Bi



Cooper Lueck

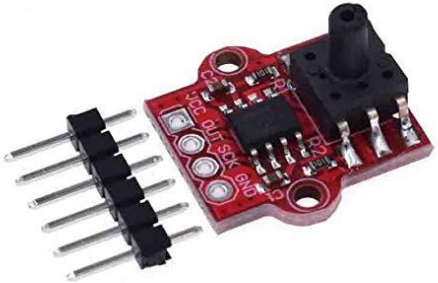


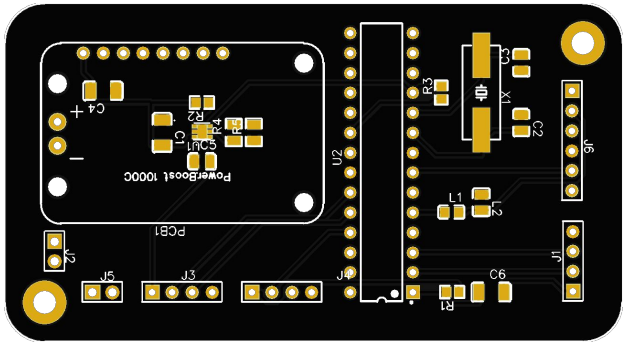
Irene Kwon

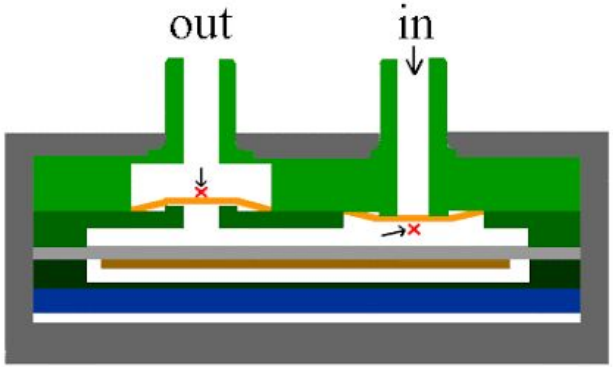
Samuel Brehm

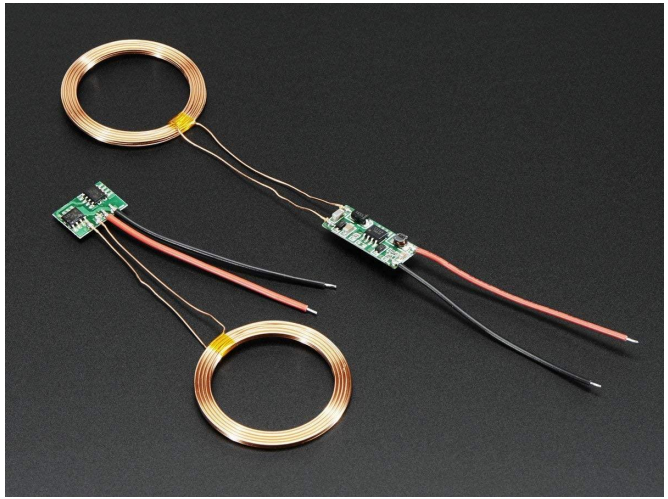
APPENDIX

Design Process

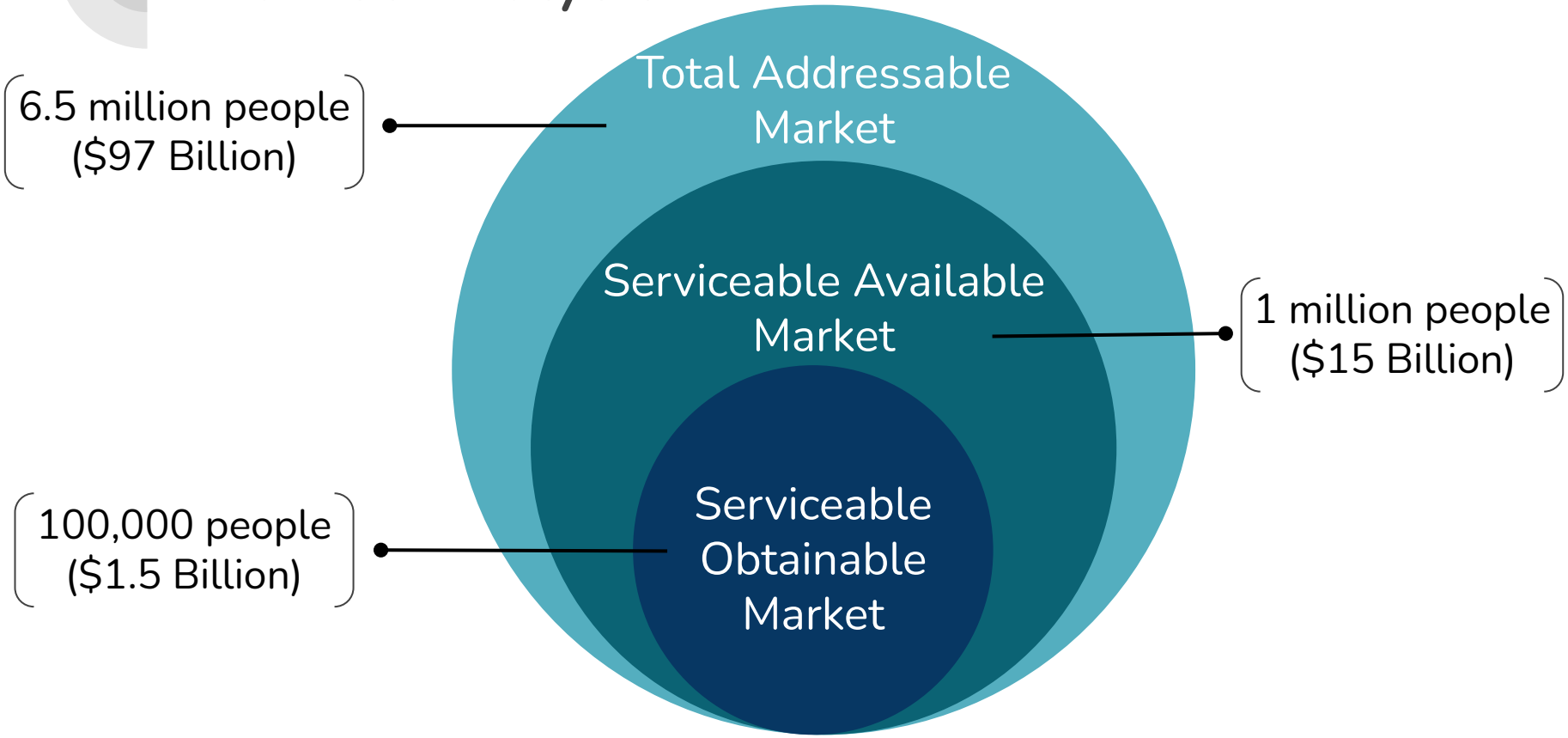




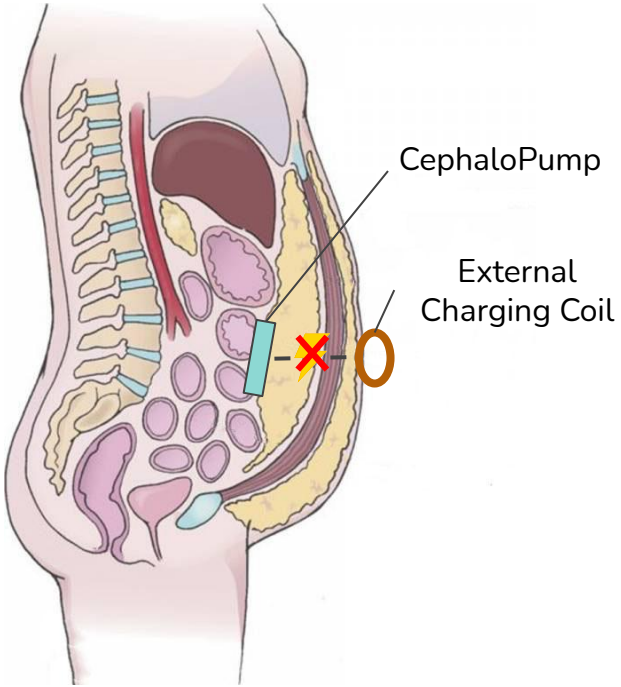


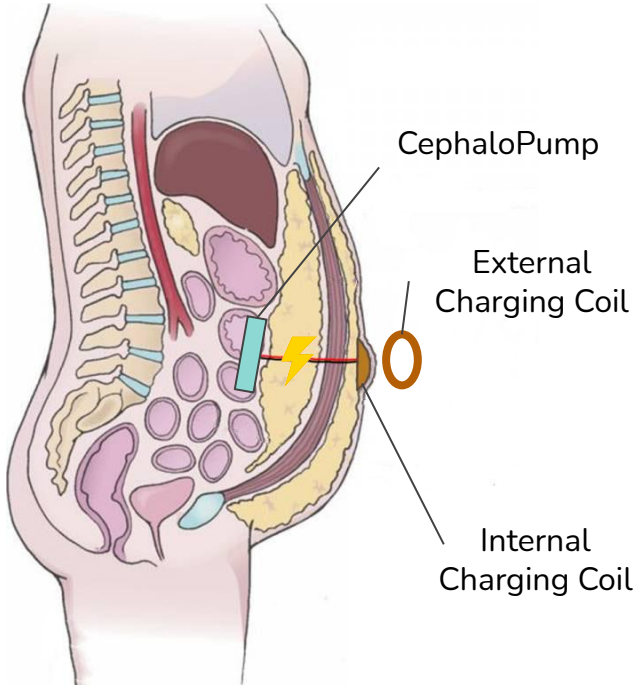


Market Analysis

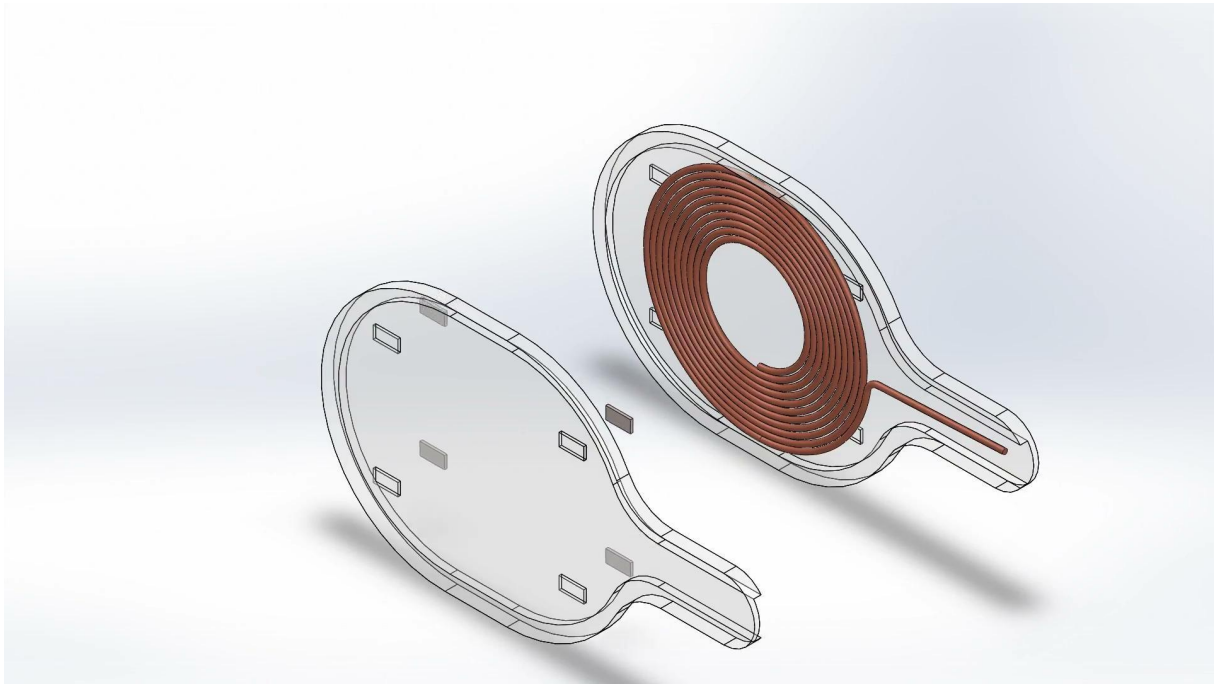


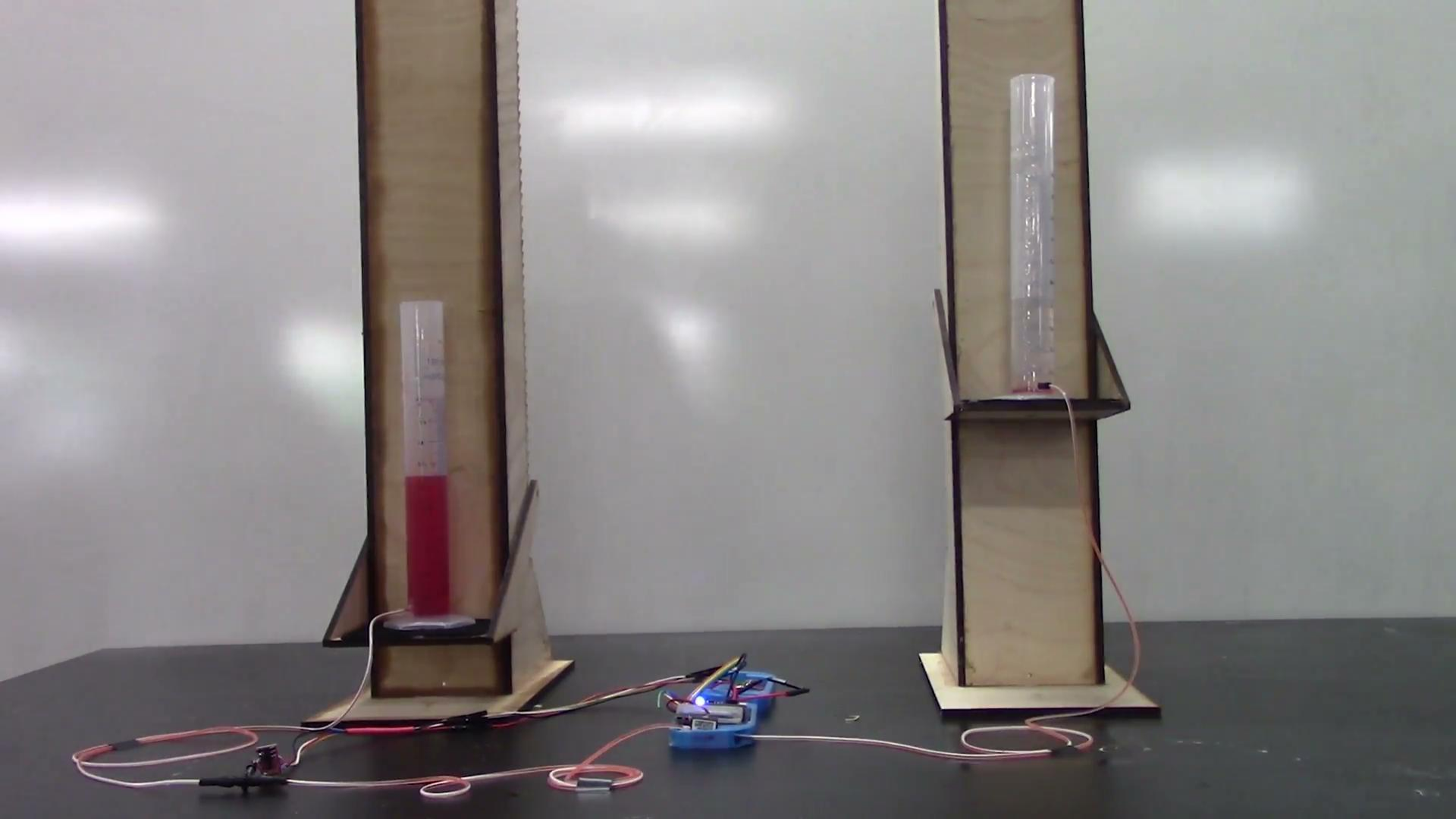
External Charging Component



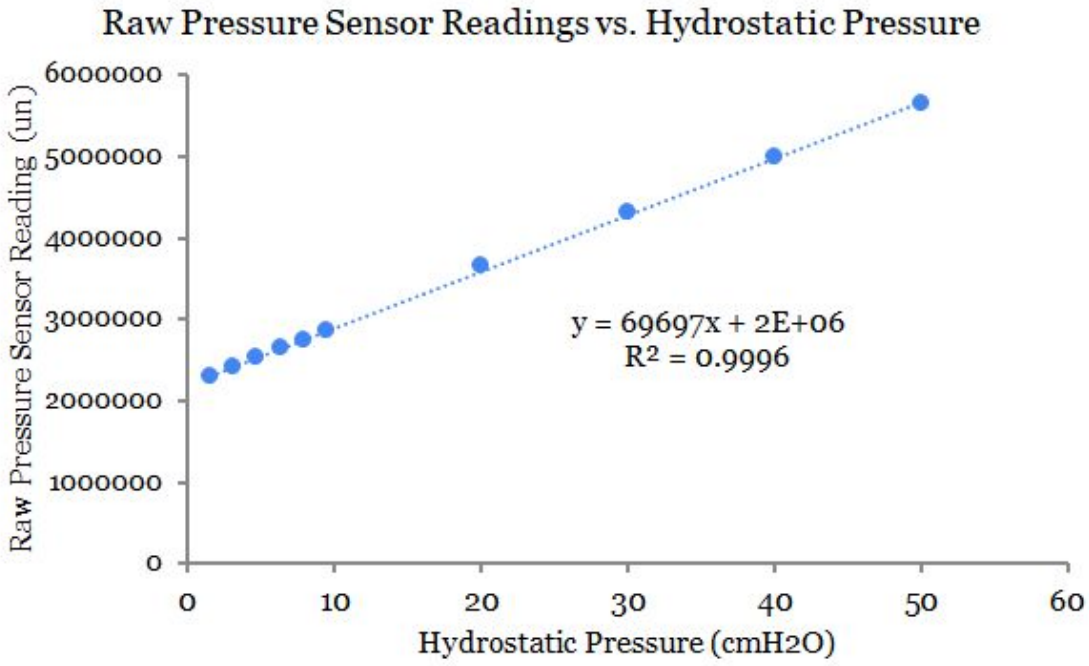


External Charging Render





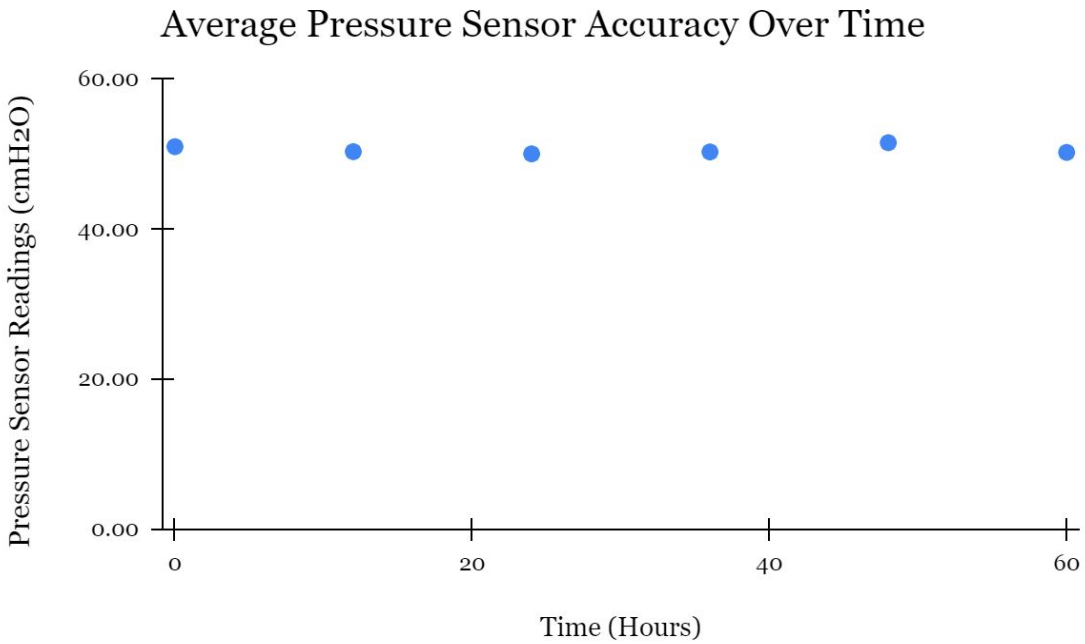
Sensor Calibration Test



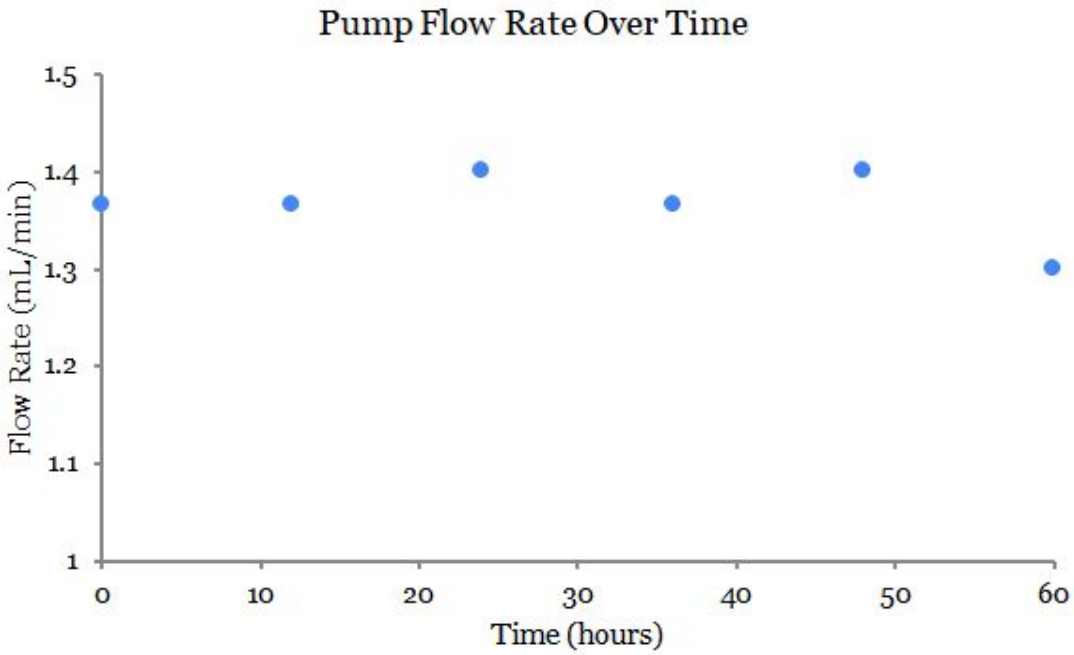
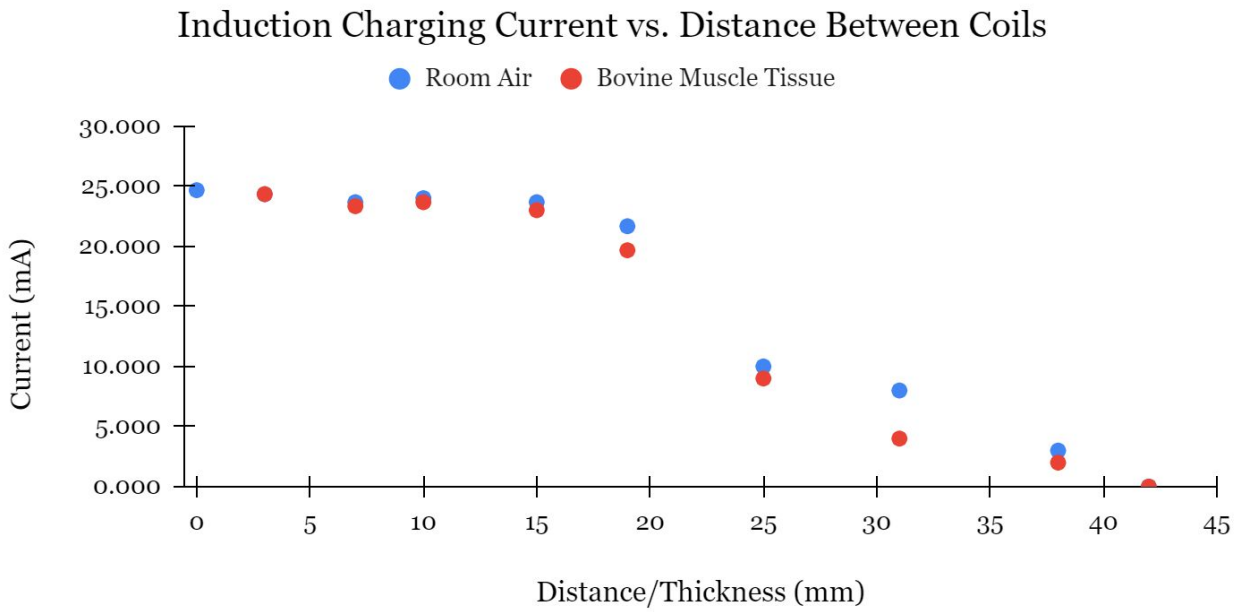
Sensor Accuracy Test

Pressure Sensor Accuracy Trials					
	Sensor Readings				
Water level (cm)	Trial 1 (cmH2O)	Trial 2 (cmH2O)	Trial 3 (cmH2O)	Avg (cmH2O)	Error
0	-0.30	-0.24	-0.14	-0.23	N/A
1.6	1.50	1.45	1.45	1.47	8.33%
9.6	8.85	8.83	8.78	8.82	8.09%
11.2	10.29	10.29	10.29	10.29	8.13%
12.8	11.78	11.78	11.80	11.79	7.92%
14.4	13.24	13.26	13.27	13.26	7.94%
16	14.93	14.96	14.95	14.95	6.57%
29.6	29.19	28.94	29.00	29.05	1.87%
43.2	42.13	42.07	42.15	42.11	2.51%
50	49.52	48.76	49.60	49.29	1.41%

Sensor Drift Test



Pump Drift Test



Inductive Charging Test