

PROJECT CATEGORY:

MedTech

STARTUP:

Rhaeos

CONTACT:

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RESEARCH AREA:

Rhaeos is a VC backed, clinical stage medical device company developing FlowSense, a patent protected platform technology and a noninvasive wireless, wearable skin patch that can assess and monitor fluid flow subdermally throughout the body. The company is initially targeting hydrocephalus, a life-threatening condition caused by an abnormal accumulation of cerebrospinal fluid (CSF). Implantable shunts, the gold standard treatment, often fail, leading to multiple trips to the emergency room and repeat surgeries. There is no technology available today that can easily assess CSF flow in shunts wirelessly, bedside, and without capital equipment until now.

PROJECT TITLE:

Sensor development for children in need of brain surgery.

PROJECT DESCRIPTION

Hydrocephalus is a common and costly condition caused by the accumulation of cerebrospinal fluid (CSF) in the brain, with symptoms that include headaches, lethargy, seizures, coma, or death. It particularly afflicts children (occurring in 1 out of every 770 births) but has no cure and will require treatment throughout the child's life. Hydrocephalus is most often treated with the surgical implantation of a catheter, known as a ventricular shunt, which diverts the excess CSF in the brain to a distal absorptive site, such as the abdomen. Shunt related surgeries are the most common neurosurgical procedures performed on pediatric patients. Unfortunately, shunts have extremely high failure rates due to a diverse set of factors including occlusion, mispositioning, or kinking. Non-specific symptoms like headaches and nausea make diagnosing shunt malfunction extremely challenging. An accurate tool for diagnosis would directly improve the lives of patients with implanted shunts as well as reduce the daily worry of their loved ones.

Rhaeos creates wearable medical devices that directly monitor the flow in surgically implanted CSF shunts using principles of convective heat transfer. In the research and development of flow monitoring devices, Rhaeos uses an in-lab benchtop setup to mimic an implanted shunt underneath skin with flowing fluid. This project would involve characterizing the performance of both existing and prototype flow monitors on a benchtop model under various conditions through data collection and analysis. The end goal of this project is to provide a complete understanding of the key benchtop data-based takeaways to the research and development of Rhaeos sensors.

JOB EXPECTATIONS:

The student will be responsible for the main data collection and analysis of next generation sensor prototypes. Additionally, the student will be expected to be a contributing member of the R&D engineering team. This will include: regular lab work on characterizing the benchtop flow model by taking and analyzing data, daily 15 minute standup meeting attendance, weekly 1 hour R&D planning meeting attendance, and weekly 1-on-1 supervisor meeting attendance. The student will also be expected to make a final report on their findings deliverable to their supervisor and a detailed presentation on their project presented to the R&D team.

DESIRED EXPERIENCE:

Necessary:

- Demonstrated Matlab or Python data analysis proficiency
- Lab and/or technical project experience
- Technical writing experience

Nice to have:

- Understanding of fluid mechanics; ME 241, BME 270, or equivalent
- Understanding of heat conduction and convection in fluid mechanics; BME 378 or eq.
- Understanding of electronic circuits; completion of ME 233, BME 308, or eq.

TIME COMMITMENT:

8 weeks

TRAINING MENTORING:

The student will be mentored by the company's Chief Technology Officer, Dr. R. Chad Webb, and one of the engineering team's Product Development Engineers, Blake Parsons. Dr. Webb will serve as a development and career mentor, while Blake will serve as the day-to-day mentor and engineering development and coordinator for the student. Blake is a biomedical engineering Northwestern graduate, with multiple years of full-time engineering project. The student will be mentored by the company's Chief Technology Officer, Dr. R. Chad Webb, and one of the engineering team's Product Development Engineers, Blake Parsons. Dr. Webb will serve as a development and career mentor, while Blake will serve as the day-to-day mentor and engineering

The student will also be receive development and training through regular team Lunch and Learn series focused on organization wide technical and strategical development.

