The Malone Center for Center for Engineering and Johns Hopkins Hospital Internship

Position Summary: We are seeking an enthusiastic data science intern who is interested in the application of mathematical and computational techniques to solve real-world problems in healthcare. This internship is a collaboration between the Whiting School of Engineering, the School of Medicine, and a start-up (Rubicon Health LLC).

The intern will apply novel artificial intelligence and optimization techniques to help clinicians treat critically ill children. Sepsis is a syndrome, triggered by an infection, with life-threatening organ dysfunction caused by a dysregulated host immune response. Annually in the U.S., 1.7 million adults and 75,000 children have sepsis and about 20% of adults and 10% of children die. Antibiotic administration delays are common and associated with increased mortality. Once started, broad-spectrum antibiotic therapy for sepsis is often unnecessarily prolonged.

Current electronic health record (EHR) based CDS has not improved sepsis care. Current applications of AI to sepsis are myriad and have none impacted outcomes. We are leveraging the JHU Precision Medicine Analytics Platform to develop an innovative extensible comprehensive CDS software package to assist the workload-challenged, geographically dispersed, ad-hoc hospital-based clinical teams.

In the first phase of this work, we will move past prediction to solve the unmet need and create and analyze process models about how the workload-challenged, geographically dispersed, ad-hoc hospital-based clinical teams. We will develop an "expert consensus" process map for antibiotic administration after the team makes a diagnosis of presumed sepsis. The initial goals of this project include

- Process mine five years of Johns Hopkins Hospital Pediatric Intensive Care Unit retrospective EHR data to create a data-driven process map.
- Measure discordance between the expert map and the data-driven map.

The student can expect an experience similar to a lab rotation, as well as exposure to operational and clinical workflows relevant to translational medical research. The internship will start as soon as possible and is expected to last 16 weeks. There is a possibility of extension depending on the performance of the student.

Benefits for the Student: This internship is ideally suited to students with strong analytic skills and an interest in pursuing healthcare-oriented entrepreneurship or careers in industry or academia. Interns will acquire theoretical and practical training in advancing the practice of medicine and healthcare delivery using data science and systems engineering – with a particular focus on EHR data and optimization techniques. The intern will have access to faculty and staff in the Malone Center for Engineering in Healthcare, the Center for Systems Science and Engineering (CSSE), the department Critical Care Medicine, and Rubicon Health and work in interdisciplinary teams. The project is led by Dr. James Fackler (medicine) and Prof. Kimia

Ghobadi (engineering). Experiences gained will be highly informative and advantageous to students who plan to pursue further training (Masters, PhD or MD), expand their interdisciplinary skills and knowledge, or work in this arena after graduation. The project will prepare the student to showcase their skills in data analytics, analytical thinking, and operations research.

Compensation: Credit or $15/h up to $5,000, depending on student availability and project needs

Required Education: Undergraduate or master's students in systems engineering, computer science, applied mathematics and statistics, management sciences, biomedical engineering, or relevant fields. No previous research/industry experience is required.

Desired knowledge, skills, and abilities:

- High-level communication skills
- Strong critical thinking and analytical reasoning skills
- Proficiency with multiple programming languages (including R, Python and SQL)
- Ability to execute assigned project tasks within established schedule
- Sound documentation skills (writes and communicates clearly and concisely)
- Prior experience or knowledge in data analytics is desired
- Prior experience in healthcare-oriented research desired but not necessary

Application Process: Please send your resume, a one-page cover letter (describing relevant course work, research experience, and/or future plans about industry/research career) and one contact info for a letter of recommendation/professional reference. Email applications to Tracy Marshall at tmarshall@jhu.edu with the subject line "MCEH Internship application".

Application deadline: As soon as possible and no later than December 15, 2021

Anticipated start date: As soon as possible/negotiable (duration approx. 16 weeks). We prefer a start during the January intermission.