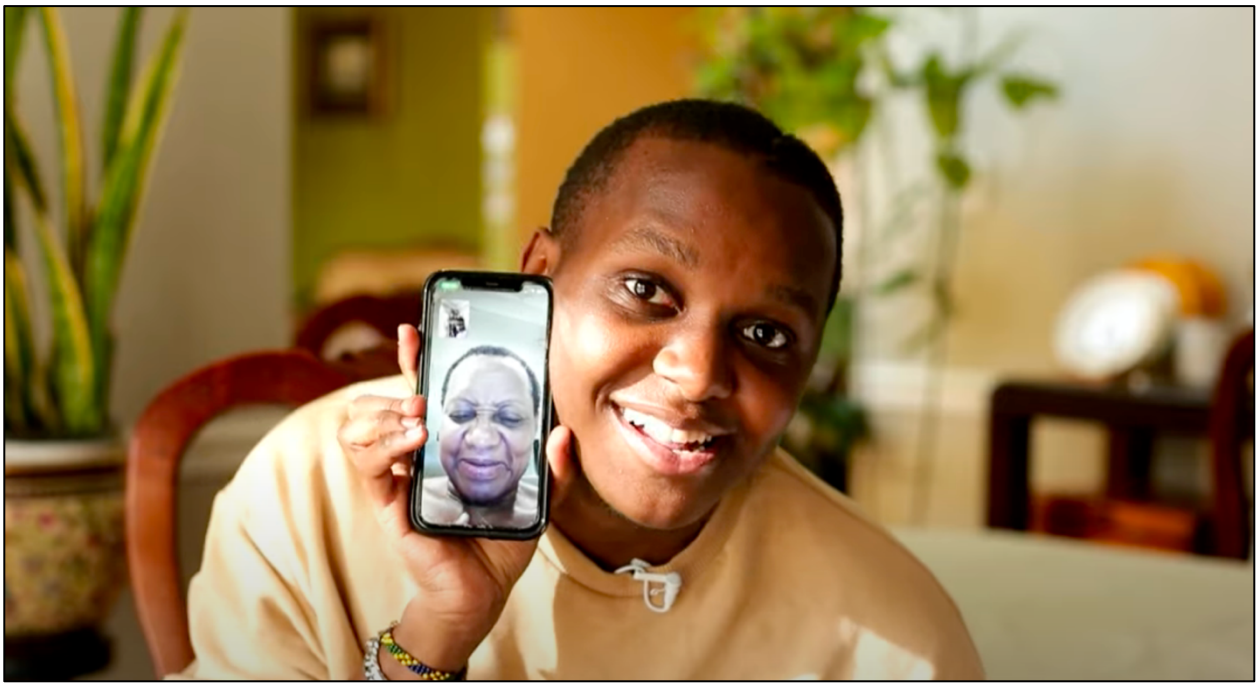
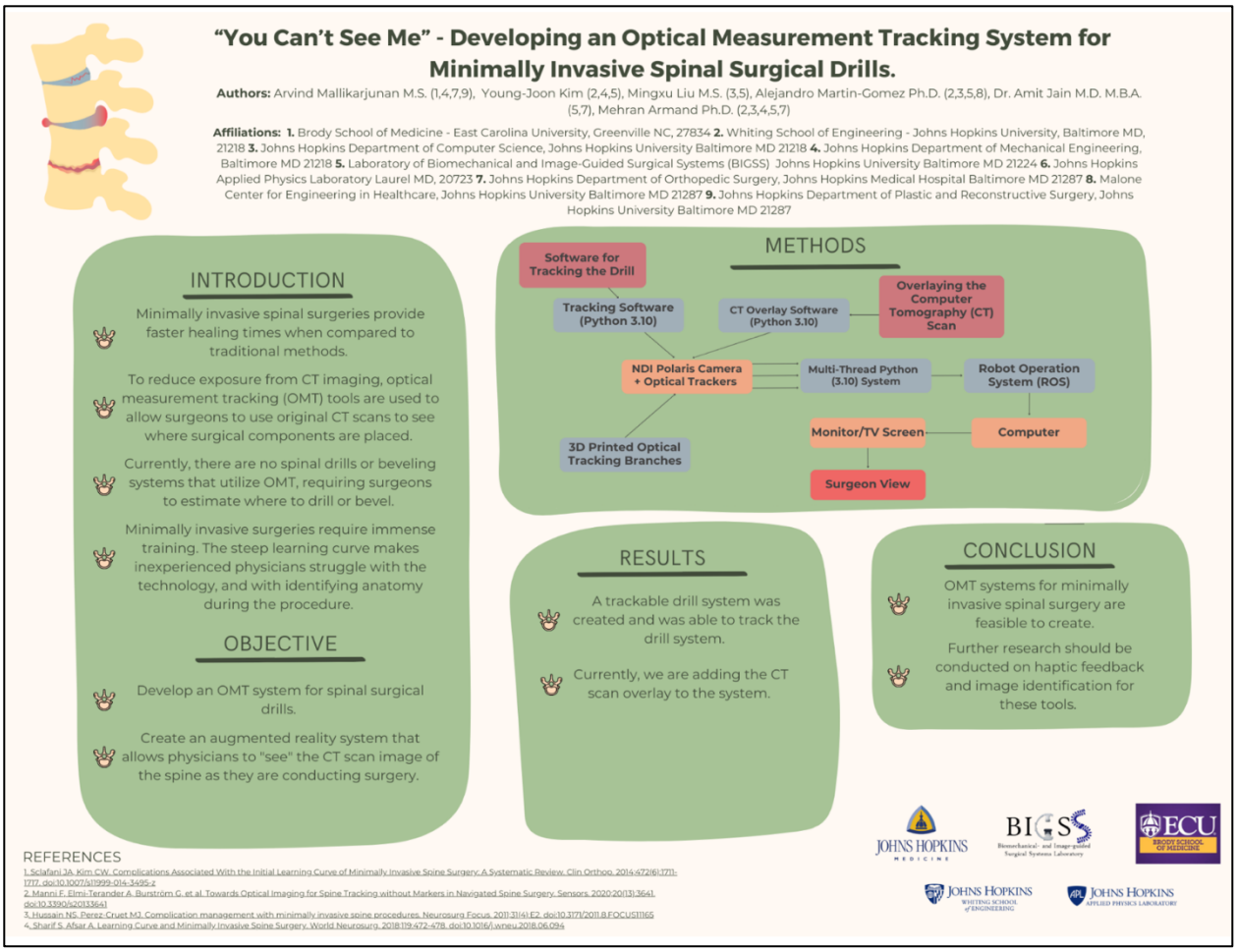
Arvind Mallikarjunan
Brody Summer Enrichment Program Summary



The Brody Summer Enrichment Program (SEP) allowed me to intern at Johns Hopkins Medical Hospital and the Johns Hopkins Applied Physics Laboratory in Baltimore, Maryland. The purpose of my visit was to work alongside engineers and physicians as we built robotic and implantable sensor technology for the future of medicine.

Over the summer I was tasked with working on two projects. A robotic drill that could aid laminectomies and other spinal surgeries by avoid damaging the spinal chord when conduction minimally invasive surgery, and helping further develop a 6-axis laser cutter for robotically cut cranial implants post cranial trauma. Both of these projects required immense communication between physicians and engineers, which is the role I primarily played, helping communicate between the two very distinct worlds.

For the robotic surgical drill, the impacts on spinal surgery were both for spinal surgeons and for patients. In minimally invasive surgery, small incisions make sight of the spinal cord difficult, resulting in these surgeries requiring years of experience to conduct. Spinal surgeons could use the drill to “see” where they were drilling in real time, using a CT scan and sensors that tracked the drill in space. Our tool also provided precise measurements on how close they were drilling towards the spinal cord. Alongside the surgeons, the drill benefited patients by not only ensuring higher accuracy and reducing potential risks, but to also help this surgery stay a minimally invasive surgery, as the lack of sightlines during a minimally invasive surgery were why this tool was devleoped. Minimally invasive surgeries reduce risk of infection and lower healing time to help people get back to everyday life.



Cranial trauma that causes deformity of the skull is traumatic for the patient on not only a physical, but psychological level as well. Neuroplastics is a field of plastic surgery aimed at building custom implants from malleable premade components to reshape the skull after trauma. When inside of the surgical room, shaving and fitting of the implant usually only happens when the skull is open allowing for the surgeon to visualize and fit the piece. This process is long and requires repeat fittings. Dr. Chad Gordon, who led this initiative, had recognized that there was already a 3D scan made of the individuals head prior to surgery, and working alongside engineers developed a laser axis cutter that cuts sanitary skull implants with precision for a perfect fit prior to opening during surgery. The tool would enable surgeons to work faster and reduce risk of infection for the patient, while also ensuring patients get back to looking like themselves, and to both feel and see their healing journey.

Thank you to the Brody Family and Brody Foundation for this incredible experience, my hope is that with this knowledge we can continue to develop technological solutions that benefit rural healthcare. These tools help reduce waiting times, reduce risk of infection, and overall help patients feel better and get back to their lives post-traumatic events. By being at Johns Hopkins this summer, I was not only able to learn more about developing these technologies, but also learn how as a physician we can foster relationships and collaboration between engineers and the healthcare system, to develop a streamlined method for taking fantastic ideas and bringing them to reality, with the purpose of helping our patients.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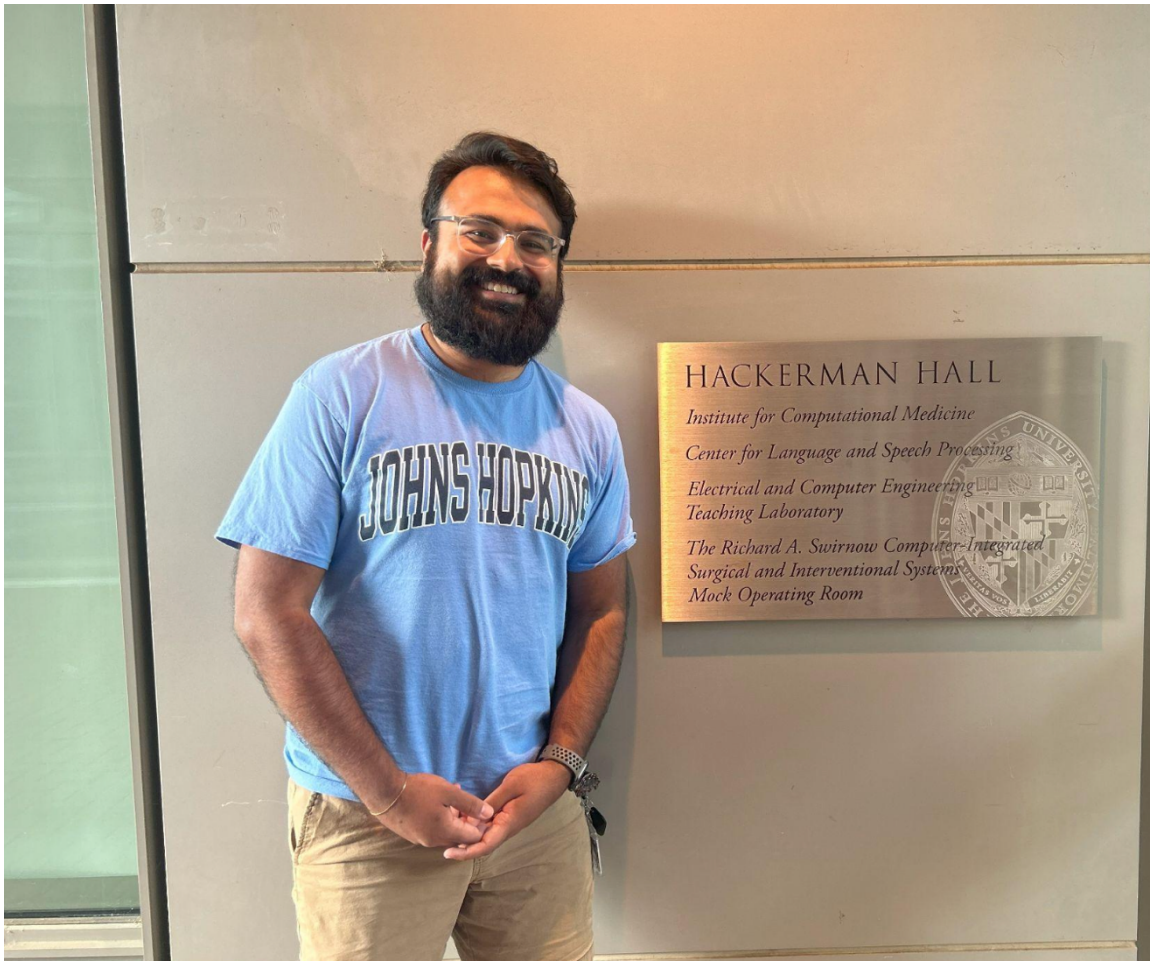
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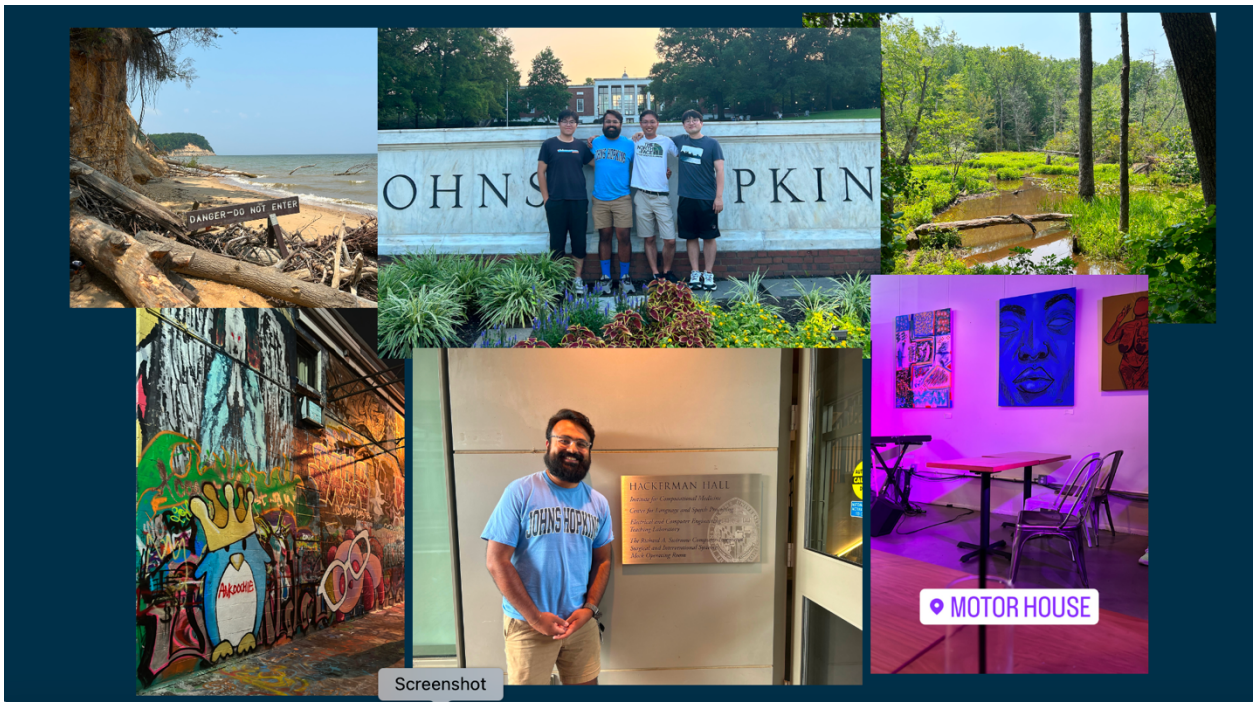
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