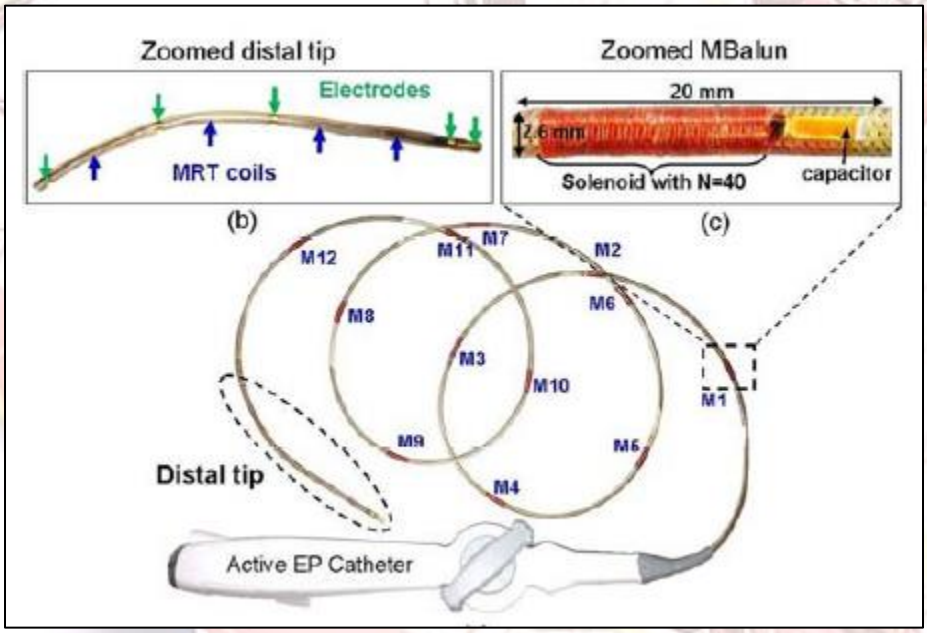
Cardiology Bioengineering Lab

Role: Research Assistant

Heart disease remains the leading cause of death since the last ten decades. It would be cliché to claim that this is my inspiration for developing a fervent interest in cardiovascular technology. But I have always admired the intrinsic complexity, yet the perspicuous predictability of the Heart. Although there have been numerous discoveries and developments all the way from finding out the first case of atherosclerosis in Egyptian Pharaohs in 1203 BC to solving the mystery of Angina in the late 18th century to the development of dynamic holographic imaging of the beating human heart in the last five years, cardiovascular disease still claims the lives of millions of people every year. This motivation, along with my background in medical instrumentation and imaging technologies led me to pursue related opportunities during my second-year Master's degree.

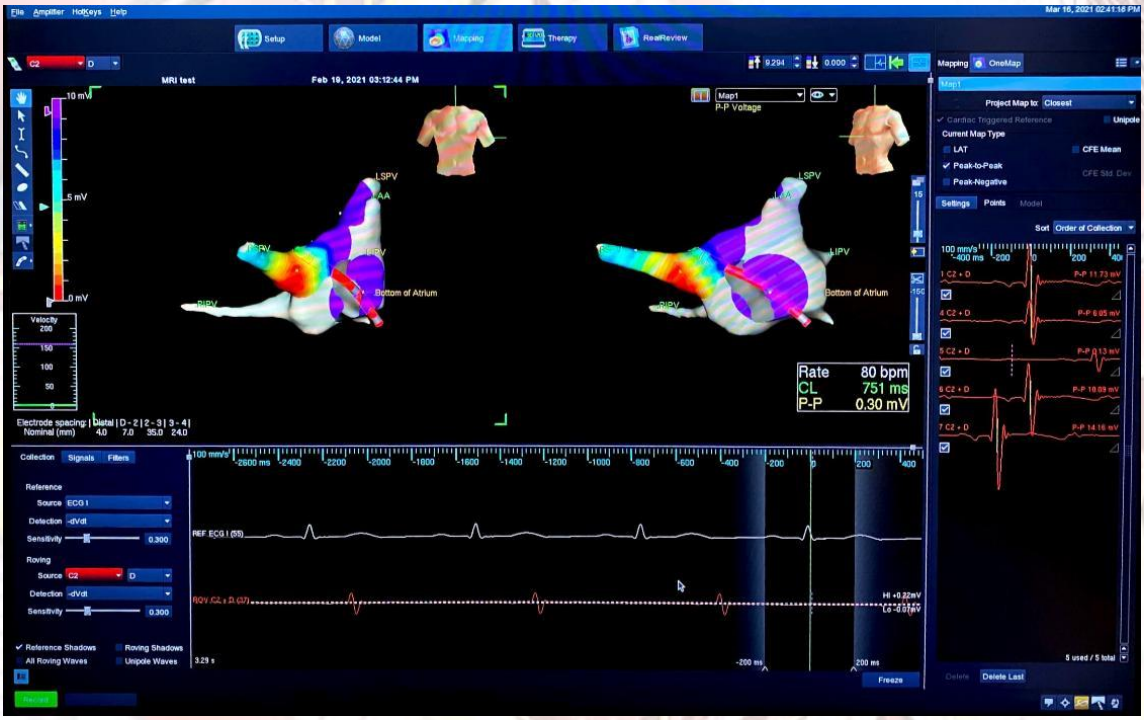
I have been working as a Research Assistant (RA) in the Cardiology Bioengineering Lab (https://www.hopkinsmedicine.org/research/labs/cardiology-bioengineering-laboratory) in the Johns Hopkins Medical Institution (https://www.hopkinsmedicine.org/) since July 2020. I broadly focus on MRI-guided electrophysiology (EP). I work towards developing a new generation MRI-conditional actively tracked radio frequency (RF) Ablation catheters. I work with a multidisciplinary group of mechanical engineers, electrical engineers, MRI physicists and EP physicians.



Demonstration of an MRI conditional catheter with Miniature heat dissipating Baluns (MBaluns)
Picture credits (DOI 10.1109/TBME.2019.2941460)

My responsibilities in the lab include:

- Building the catheter shaft
- CAD design of parts of the bi-directionally steerable catheter handle using Solidworks
- Designing miniature heat dissipating circuits called miniature baluns (MBaluns) for the catheter shaft
- Testing, prototyping, troubleshooting and quality assurance of the aforementioned
- Develop techniques using 3DSlicer (https://www.slicer.org/) image analysis and scientific visualization software for real time impedance-based tracking of these ablation catheter within the human body. I utilize the Ensite Velocity Cardiac Mapping system (https://www.cardiovascular.abbott/us/en/hcp/products/electrophysiology/mapping-systems/ensite/about/how-it-works.html) to create models of the heart. I utilize the system to create LAT and P-P voltage maps of the heart to validate all my experiments.
- Shadow EP physicians and mapping specialists in the Johns Hopkins Hospital during EP procedures to understand their requirements for delivering the best possible arrythmia treatment



Representation of Heart modelling and voltage mapping using Ensite Velocity Mapping System

My research is focused towards delivering quality patient care by making ablation procedures convenient using MRI imaging modality. These ablation catheters will possess performance close to that of commercial catheters with abilities to treat arrythmias inside the MRI scanner, completely eliminating the need for harmful radiation from alternate imaging modalities (CT, X-ray) that are currently required for carrying out the interventional procedures efficiently.