BME 3rd Year Seminar Series
Friday, December 13th, 2024
1:30 – 2:30 PM EST
MJIS 1001

Evaluation links:
Samridhi Kulshrestha: https://purdue.ca1.qualtrics.com/jfe/form/SV_9vHbXGpJXmvgBZs
Zhuoan Li: https://purdue.ca1.qualtrics.com/jfe/form/SV_8v4jNrVY6UYRbzE

Evaluation surveys should only be completed after the seminar has taken place, and only by those who attended the seminar. We appreciate those who are able to attend and provide feedback; These surveys will help us determine the recipient of the 2024 Fearnot Prize for the best presentation!

Development of a sustained-release polymeric implant for long-term intra-ocular pressure reduction
Samridhi Kulshrestha (Andrew Otte/Luis Solorio, advisors)

Abstract: Glaucoma is one of the leading causes of irreversible blindness worldwide and is the top cause of blindness among adults in the U.S. Reduction in intraocular pressure has been proven to be the only effective way to prevent further vision loss due to glaucoma, achieved through the use of prostaglandins, beta blockers, and alpha-adrenergic agonists via eye drops or in combination with oral carbonic anhydrase inhibitors. Unfortunately, these treatments have issues, such as patient non-compliance, rapid drug clearance, and off-target effects. The current state-of-the-art treatments include non-biodegradable implants (e.g. Iluvien) or a one-time use per eye biodegradable implants (e.g. Durysta). Durysta is constrained to a single-time use potentially due to the generation of acidic degradation by-products from the controlled release excipient (poly(lactide-co-glycolide)). Additionally, a critical need exists to develop implants delivering carbonic anhydrase inhibitors, such as dorzolamide, that are more frequently prescribed due to better patient tolerability compared to prostaglandins. To

address these limitations, my project aims to explore alternative biodegradable polymers such as polycaprolactone (PCL) and poly(ortho esters) (POEs), as they degrade into more neutral by-products and offer tunable drug release properties. The hot melt extrusion technology used for manufacturing the implant cuts off any post-processing costs as it is a solvent-free method. The goal is to leverage biodegradable and biocompatible polymers that degrade into more neutral by-products and optimize manufacturing techniques like solvent-free hot melt extrusion to achieve a long-term drug delivery system with minimal adverse effects, improved patient compliance, and allows for repeat administration.

Quantification of Extracellular Volume Fraction in Cardiac MRI without Blood Sampling Using Multi-Stage Training Deep Learning

Zhuoan Li (Behzad Sharif/Craig Goergen, advisors)

Abstract: Blood sampling for hematocrit (HCT) measurement presents a significant barrier to the widespread clinical use of extracellular volume fraction (ECV) in diagnosing myocardial diseases. We aimed to overcome this limitation by developing and evaluating a deep learning (DL) model to predict HCT directly from cardiovascular magnetic resonance (CMR) data. The approach focused on leveraging multi-center CMR T1 values alongside clinical features to enhance prediction accuracy and assess the impact of additional features on model performance. A multi-stage DL model was trained using data from multiple centers, incorporating native blood-pool T1 values and clinical parameters such as gender. Results demonstrated that the DL model had a stronger correlation with true HCT than traditional linear regression methods. Furthermore, the synthetic ECV derived from the predicted HCT showed excellent agreement with true ECV values, validating the model's reliability and clinical relevance. We highlight the potential of DL models to enhance HCT prediction by integrating additional features, eliminating the need for invasive blood sampling. By streamlining the measurement of ECV, this advancement offers a more accessible and efficient approach to diagnosing myocardial diseases, paving the way for broader adoption of CMR in clinical practice.