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Second Year ARCS Scholar Boice Award

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A multiscale computational model of the heart for patient-specific diagnosis of heart failure with preserved ejection fraction (HFpEF)

A new way to measure myocardial stiffness non-invasively in HFpEF patients

What is the clinical problem?

- Pressure Overload
- Stiffening
- Thickening

What is the big picture and ultimate goal?

Recruit HFpEF Patients

Aim 1: 3D Motion

Aim 2: Compute 3D Stiffness

Aim 3: Validate

Myocardial Deformation & DENSE MRI

$$E = \begin{bmatrix} E_{CC} & E_{CL} & E_{CR} \\ E_{LC} & E_{LL} & E_{LR} \\ E_{RC} & E_{RL} & E_{RR} \end{bmatrix}$$

Green Strain

How does the 2D motion of the heart look like?

Global Short-Axis Green Strains in Healthy Subjects

Global Long-Axis Green Strains in Healthy Subjects

Can we develop a new model to measure stiffness?

$$W(\alpha_2, \alpha_3) = A_A e^{\lambda \alpha_2^2} + \Psi_A e^{\psi \alpha_3^2} + \sigma_0 \alpha_2$$

Biaxial Fiber Stress-Strain Data and Fitted Curves

I would like to acknowledge my advisor, Dr. John Oshinski, for his mentorship and support as well as my former advisor, Dr. John Criscione for his valuable input on the modeling. I also would like to thank the members of the Cardiothoracic Research Laboratory for supplying the animal data. In addition, I would like to extend my gratitude to my funding sources, the ARCS Foundation as well as the National Institutes of Health (NIH) through their T32 Cardiovascular Biomechanics Training @ EmTech Fellowship.

Scholar Awards Celebration
November 15, 2023



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Innovation
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