ME Seminar

Image-Based Biomechanics in the Era of Personalized Medicine

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ABSTRACT

In the age of digital twins, when clinical management is moving towards a more personalized approach, it is often desired to evaluate patient-specific geometry and mechanical behavior. While ex-vivo tests can estimate individualized tissue properties, they are usually not a viable solution due to either tissue unavailability, or due to the tests being destructive. In my talk, I will shed light on novel methods for evaluation of patient-specific vascular biomechanics using an innovative combination of in-vivo imaging modalities (ultrasound and MRI), and image-based biomechanical modeling. In particular, aortic wall motion takes the central stage since it inherently contains information on local mechanical behavior of the aorta. I will also demonstrate the value of building multi-scale circulation loops representing (patho-) physiological conditions – illustrating that they not only serve to validate new techniques, but also possess the ability to shed light on disease mechanisms which may otherwise go unnoticed. Finally, a futuristic outlook on ways to improve the translational potential of these sophisticated models will be discussed.

ABOUT THE SPEAKER

Dr. Mirunalini Thirugnanasambandam obtained her undergraduate degree in Mechanical Engineering from College of Engineering Guindy, Anna University, Chennai. She did her Masters' degree in Mechanical Engineering at McGill University, Canada, where she worked on signal processing techniques in non-linear systems. Her curiosity about non-linear systems in nature led her to pursue a PhD in cardiovascular biomechanics at University of Texas at San Antonio, USA, with Prof. Ender Finol, while doing a research exchange at Ecole des Mines, St Etienne, France, with Prof. Stephane Avril. She began her postdoctoral research at University of Bern, Switzerland, where she worked with Prof Dominik Obrist, and later began her current postdoctoral position at Eindhoven University of Technology, Netherlands with Dr. Richard Lopata. Her research focuses on both experimental and computational sides of cardiovascular mechanics, with special emphasis on abdominal aortic aneurysms and coronary microvascular obstruction. She has developed and validated computationally inexpensive novel methods to estimate vascular biomechanics from medical images.

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