



JOHNS HOPKINS  
Center for Environmental  
& Applied Fluid Mechanics

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Friday, April 5, 2019  
3:00 PM, 132 Gilman Hall

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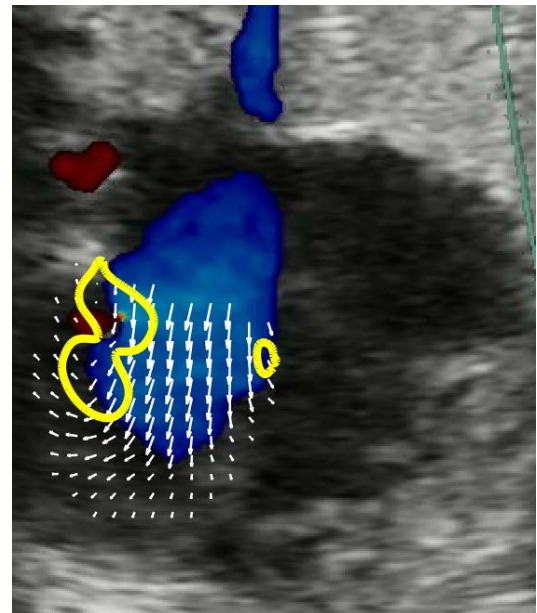
***"Clinical Flow Measurements Putting Experimental  
Fluid Mechanics in Clinical Practice"***

Presented by Prof. Pavlos P. Vlachos  
School of Mechanical & Biomedical Engineering  
Purdue University

In this talk, we will probe flows in humans, using in-vivo measurements in clinical settings, and we will discuss how traditional experimental fluids mechanics tools can translate into clinical practice.

Flows in the cardiovascular system manifest intrinsic complexity, which is often associated diseased states. Imaging modalities such as ultrasound/echocardiography and phase-contrast MRI provide unique opportunities and challenges for flow measurements in patients. Currently, the relationship between clinical flow measurements and clinical diagnostic parameters is qualitative, and often is reliant on heuristics and non-physical assumptions. Here, we will try to overcome these limitations by integrating medical imaging with experimental fluid mechanics, in order to, ultimately, improve accuracy, robustness, and clinical diagnostic utility of these tools.

First, we will discuss how using 4D flow MRI we can more reliably extract hemodynamic parameters that can be used for classification of risk of rupture of cerebral aneurysms. After, we will transition to the analysis of echocardiographic imaging for heart failure. We will show an improved approach for clinical implementation of EchoPIV (echocardiographic Particle Image Velocimetry) and a new method for the velocity reconstruction of Color-Doppler flow imaging. Finally, we will present a use-case in the analysis of fetal and neonatal echocardiograms of babies born with single ventricle (hypoplastic left heart syndrome).



**Color-Doppler velocity field reconstruction and vortex identification for a baby with hypoplastic left-heart syndrome in-utero.**