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PRESENTS

"MRI in new dimensions: Motion-resolved quantitative imaging by low-rank tensor magnetic resonance multitasking"

THURSDAY, April 2nd, 2020
12:00 – 1:00 PM
Zoom Link:
https://ucla.zoom.us/j/3578398609

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ABSTRACT:

Quantitative MRI provides many benefits over traditional qualitative imaging: reproducible tissue characterization, diagnosis of diffuse disease, the potential for earlier disease detection, and more. The standard approach to quantitative MRI of moving organs (e.g., the heart or abdominal organs) has been to “freeze” motion using a complicated mixture of ECG triggering and repeated breath holds. That approach is difficult, unreliable, and most importantly, unsuitable for patients with irregular heartbeats or trouble breath-holding, preventing the wide clinical adoption of quantitative MR in many areas. This seminar describes a new class of approaches to quantitative imaging, which redesign the MR imaging process around the concept of multiple time dimensions. Rather than trying to avoid motion, these approaches “multitask”, capturing motion alongside multiple simultaneous tissue processes for quantification—each of which is assigned its own time dimension. The "curse of dimensionality" classically associated with multidimensional imaging is overcome through a low-rank tensor inverse problem framework. This multitasking approach allows fast, accurate, and repeatable motion-resolved quantitative imaging, and enables non-ECG, free-breathing quantification of multiple tissue parameters at once, even in the heart.

BIOGRAPHY:

Anthony G. Christodoulou, PhD, is an Assistant Professor-in-Residence in the Departments of Medicine and Bioengineering at the University of California, Los Angeles, and Assistant Professor in the Biomedical Imaging Research Institute at Cedars-Sinai Medical Center. He received his doctorate in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign and his bachelor’s and master’s degrees in Electrical Engineering from the University of Southern California. Prof. Christodoulou's research focus is on magnetic resonance imaging (MRI) physics and image reconstruction for cardiovascular and cancer applications. He has authored publications in outlets including Nature Biomedical Engineering, Magnetic Resonance in Medicine, IEEE Signal Processing Magazine, and IEEE Transactions on Medical Imaging. His work on 4D cardiovascular MR (CMR) received the best paper award at the 2011 IEEE Engineering in Medicine and Biology Conference; his recent work on multidimensional quantitative imaging, dubbed MR Multitasking, received the 2016 Society for MR Angiography Best Oral Presentation Award, was a finalist for the 2017 Society for CMR (SCMR) Early Career Award, and received the 2018 SCMR Clinical Seed Grant Award. Prof. Christodoulou is a member of the ISMRM, SCMR, AHA, and IEEE.