USC Viterbi School of Engineering
Ming Hsieh Department of Electrical and Computer Engineering

Seminar

The Future of Computing and Neuromodulation

Dejan Markovic

Electrical and Computer Engineering
UCLA

Thursday, March 24, 2022
EEB 248 @ 10am
and Via Zoom

Zoom link: https://usc.zoom.us/j/98098319220?pwd=Vlh2aDVjdE5sdHVaOUxQekNjeVlvUT09

Meeting ID: 980 9831 9220, Passcode: 266892

Abstract: This talk will discuss future technologies addressing unmet needs in science, medicine, and engineering. Data-driven attentive computing requires runtime flexible and efficient hardware and software. Simple hardware leads to complex software (e.g. FPGA) and simple software leads to complex hardware (e.g. CPU). Runtime reconfigurable arrays (RTRAs) balance hardware and software to enable spatial *and* temporal flexibility for dynamic or uncertain environments. RTRA features multi-program tenancy, multi-size compile, and priority handling for >100x compute capacity gains over FPGA, and within 5x of (inflexible) hardware accelerators, as shown on a blind signal classification use case. Medical implants also require efficiency and flexibility, with heavily constrained size, weight and power, for novel clinical research and therapeutic systems. Despite notable clinical successes (e.g. Parkinson's disease), limitations in existing devices prevent them from expanding to other indications such as mental health or Alzheimer's disease. I will discuss the Neuro-stack, a versatile closed-loop system, verified in human subject experiments, towards miniaturized neural duplex of the future. These applications also reveal opportunities in system-level design automation to address design productivity and system assembly challenges.

Biography: Dejan Marković is a Professor of Electrical and Computer Engineering at the University of California, Los Angeles (UCLA). He is also affiliated with UCLA Bioengineering Department, Neuroengineering field. He completed the Ph.D. degree in 2006 at the University of California, Berkeley, for which he was awarded 2007 David J. Sakrison Memorial Prize. His current research is focused on implantable neuromodulation systems, domain-specific compute architectures, and design methodologies. Dr. Marković co-founded Flex Logix Technologies, a semiconductor IP startup, in 2014, and helped build foundational technology of Ceribell, a medical device startup. He received an NSF CAREER Award in 2009. In 2010, he was a co-recipient of ISSCC Jack Raper Award for Outstanding Technology Directions. He also received 2014 ISSCC Lewis Winner Award for Outstanding Paper. Prof. Markovic is a Fellow of the IEEE.