USC Viterbi
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Ming Hsieh Department of Electrical Engineering

Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering

Computer Engineering

Intermittent Computing Systems

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Friday, November 16th, 2018
2:00pm
EEB 248

The emergence of extremely low-power computing components and efficient energy-harvesting power systems has led to the creation of computer systems that operate using tiny amounts of energy scavenged from their environment. These devices create opportunities for systems where batteries and tethered power are inapplicable: sensors deeply embedded in pervasive civil infrastructure, in-body health monitors, and devices in extreme environments like glaciers, volcanoes, and space. The key challenge is that these devices operate only intermittently, as energy is available, requiring both hardware and software to tolerate power failures that may happen hundreds of times per second. This talk will describe the landscape of intermittent computing systems. I will focus on new programming and execution models that are robust to arbitrarily frequent power failures. In particular, the talk will focus on three models, DINO, Chain, and Alpaca, which we developed as a progression toward a system that is simple to program and offers reliable intermittent operation. I will then discuss how these models interact with our latest hardware platform, Capybara, enabling applications to dynamically re-configure the amount of energy continuously required by a region of code and supporting modal energy demands with a single hardware mechanism. I will close with a discussion of recent and upcoming deployment efforts for our intermittent systems work.

Brandon Lucia is an Assistant Professor of Electrical and Computer Engineering at Carnegie Mellon University. Lucia's lab's work spans programming languages, software and hardware computer systems, and computer architecture. Lucia's lab is defining the area of intermittent computing on energy-harvesting devices, and working on future reliable, efficient parallel computing systems, especially at the edge. Lucia's work has been recognized with a 2018 NSF CAREER Award, the 2018 ASPLOS Best Paper Award, three IEEE MICRO Top Picks in Computer Architecture, a 2015 OOPSLA Best Paper Award, the 2015 Bell Labs Prize, a 2016 Google Faculty Award, and an appointment to the DARPA ISAT study group. His website is https://brandonlucia.com and more information on his lab, which is supported by NSF, Intel, Google, SRC, DARPA, the Kavcic-Moura Fund, and Disney Research, is available at http://intermittent.systems.

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