Electrical and Computer Engineering

FIU Engineering & Computing

Electrical and Computer Engineering Lecture Series

Making Molecular Movies to Optimize Complex Materials And Devices

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Senior Scientist

SLAC National Accelerator Laboratory

Friday, October 28, 2022

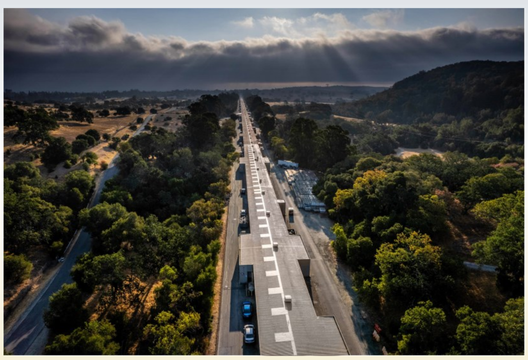
11:00 AM — 12:30 PM

EC 3930

Register to Attend Via Zoom: https://bit.ly/3RqRyIL

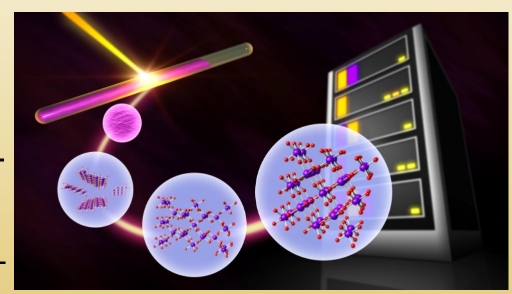
Meeting ID: 960 1821 3793

Passcode: ECE3900



We are on the brink of the second microelectronic and computing revolution that promises to out-shine the one that started 50 years ago and changed the world. The second revolution promises to integrate sensing with computing and storage, while increasing the speed and reducing energy consumption by orders of magnitude. It leverages new and often exotic quantum processes exhibited by complex materials and engineers novel devices from them. These materials are significantly more complex than Si, and defects, interfaces, and metastability play a critical role in controlling their performance.

The traditional approach of only monitoring bulk/device performance while tweaking multi hierarchical fabrication processes becomes increasingly slow, expensive, and frequently fails to find the optimum as the materials and devices become more complex. Understanding these processes at the time and length scale at which they function unblinds the Blackbox relationship between device fabrication and performance; it is the only rational path to the realization of the second computing revolution. In this presentation, Apurva will illustrate the role *operando* molecular scale visualization, from femtoseconds to tens of seconds, will play in understanding and controlling the next generation of computing technology.



Biography: I am a materials scientist by training with 30 years of experience investigating molecular-scale processes that control function, aging, and failure of complex materials and devices. Advance characterization methods that give insight into molecular processes have undergone a dramatic change over those 30 years with the advent of brighter sources (from X-rays synchrotrons and free-electron lasers to MeV accelerator-based electron sources), and faster and larger area detectors. The depth and the precision of insights have improved significantly but the amount of raw data has increased by orders of magnitude as well, making extraction of deep insights harder. Over the last decade, I have, therefore, focused on leveraging emerging machine learning and artificial intelligence techniques to not only accelerate knowledge extraction from complex, multi-dimensional, and noisy data but also make data collection smarter.

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