

APS/CNM 2020 Workshop on Autonomous Control of Experiments Agenda

Tuesday, September 1, 2020

Session Chair – Nicholas Schwarz	
1:30 PM – 2:00 PM	<i>Welcome</i> Mathew Joseph Cherukara, Subramanian Sankaranarayanan, Nicholas Schwarz, Chengjun Sun, Argonne National Laboratory
2:00 PM – 2:30 PM	<i>Marrying AI and Physics Towards Accelerating Scientific Discovery</i> Payel Das, IBM
2:30 PM – 3:00 PM	<i>Autonomous control at X-ray sources from accelerator to detector</i> Daniel Ratner, SLAC National Accelerator Laboratory
3:00 PM – 3:30 PM	Break
Session Chair – Mathew Cherukara	
3:30 PM – 4:00 PM	<i>Autonomous X-ray Scattering</i> Kevin Yager, Brookhaven National Laboratory
4:00 PM – 4:30 PM	<i>Autonomous Materials Discovery Under Uncertainty, Driven by Gaussian Processes</i> Marcus Noack, Lawrence Berkeley National Laboratory
4:30 PM – 5:00 PM	<i>Discussion</i>

Wednesday, September 2, 2020

Session Chair – Subramanian Sankaranarayanan	
1:30 PM – 2:00 PM	<i>Online, Quantitative Data Analysis for Coherent X-ray Imaging with the PyNX toolkit</i> Vincent Favre-Nicolin, European Synchrotron Radiation Facility
2:00 PM – 2:30 PM	<i>Machine Learning, Reinforcement Learning and Classical statistical physics: Opportunities for automated experimentation for non-equilibrium states and physics discovery</i> Rama Vasudevan, Oak Ridge National Laboratory
2:30 PM – 3:00 PM	<i>Smart Data Acquisition and Automated Data Curation for Electron Microscopy</i> Charudatta Phatak, Argonne National Laboratory
3:00 PM – 3:30 PM	Break
Session Chair – Chengjun Sun	
3:30 PM – 4:00 PM	<i>Accelerating X-ray absorption spectroscopy characterization by high-throughput computations and machine learning</i> Chi Chen, The University of California, San Diego
4:00 PM – 5:00 PM	<i>Discussion</i>

APS/CNM 2020 Workshop on Autonomous Control of Experiments Description

The APS and CNM are positioned to help solve some of the most challenging and novel scientific questions facing the energy needs of the nation. The design of new materials to manipulate classical and quantum information with high fidelity and ultralow power consumption and the enabling of systems for efficient energy storage, transportation, and conversion that will drive the emerging economy based on renewable energy are just a few examples. Addressing these scientific opportunities will be aided by the intrinsic capabilities of APS-U era facilities along with new measurement techniques and technological advances in detectors.

These advances in sources and detectors (x-ray and electron) will result in orders of magnitude higher data rates, and increased complexity from multi-modal data streams. Human-in-the-loop experiments become infeasible in the face of such large and varied data streams. As experiments progress to speeds where humans are too slow to make control decisions, adaptive control becomes imperative. This workshop is organized to discuss the state-of-the-art and potential of autonomous control of experiments. It provides an opportunity for academics, laboratory and facility staff, researchers, and students from both x-ray and electron characterization communities to exchange ideas and think creatively about new avenues for collaborations and advance autonomous characterization and experimentation.