APS Scientific Computation Seminar Series

Speaker: Christopher R. Field
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Ann Arbor, Michigan

Title: A Scalable, Real-Time Machine Vision Platform for Microscopy

Date: October 24, 2022

Time: 1:00 p.m. (Central Time)

Location: https://argonne.zoomgov.com/j/1615356746
Meeting ID: 161 535 6746
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Hosts: Mathew Cherukara and Nicholas Schwarz

Abstract: Image analysis workflows are currently a non-scalable, biased process that requires extensive effort and expertise. Attempts to generate a scalable and non-biased automated image analysis workflow using artificial intelligence and machine learning technologies at the point-of-acquisition have been thwarted by (i) limited, or impossible, access to external cloud computing resources and environments, (ii) lack of a consistent, streamlined end-user experience for distribution and deployment within these network-constrained environments, and (iii) poor interactivity of real-time image analysis results in closed electron microscope system software. In collaboration with the University of Michigan and support from the Department of Energy, Theia Scientific has developed a novel platform that addresses these deficiencies with real-time quantitative image analysis results overlaid onto microscope control software and user customizable dashboards through a web-based interface. This platform is readily scalable towards computing needs and has been deployed and demonstrated on edge and near edge devices with inherent means for rapid ad-hoc, heterogenous computational clustering. Results from recent experiments and deployments for in situ TEM ion irradiation experiments for nuclear materials at the University of Michigan's Ion Beam Laboratory (MIBL), Argonne National Laboratory's Intermediate Voltage Electron Microscopy (IVEM) facility, Idaho National Laboratory (INL), and Sandia National Laboratory's Ion Beam Laboratory (IBL) and Center for Integrated Nanotechnologies (CINT) with a convolutional neural network-based model will be presented.