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3D visualization and analysis of neutron scattering data in the control room

Thursday, 23 May 2024 16:00 (2 hours)

Neutron scattering experiments have undergone significant technological development through large area detectors with concurrent enhancements in neutron transport and electronic functionality. Data collected for neutron events include detector pixel location in 3D, time and associated metadata, such as sample orientation and environmental conditions. Working with single-crystal diffraction data we are developing both interactive and automated 3D analysis of neutron data by leveraging NVIDIA's Omniverse technology. We have implemented machine learning techniques to automatically identify Bragg peaks and separate them from diffuse backgrounds and analyze the crystalline lattice parameters for further analysis. A novel CNN architecture has been developed to identify anomalous background from detector instrumentation for dynamical cleaning of measurements. Our approach allows scientists to visualize and analyze data in real-time from a conventional browser, which promises to improve experimental operations and enable new science. We have deployed a cloud based server, leveraging Sirepo technology, to make these capabilities available to beamline users in the control room.

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