



Contribution ID: 1667 Contribution code: THPS070

Type: **Poster Presentation**

Automation of sample alignment for neutron beamlines

Thursday 5 June 2025 15:30 (2 hours)

Neutron scattering experiments are a critical tool for the exploration of molecular structure in compounds. The TOPAZ single crystal diffractometer at the Spallation Neutron Source and the Powder Diffractometer at the High Flux Isotope Reactor study these samples by illuminating them with different energy neutron beams and recording the scattered neutrons. Aligning and maintaining the alignment of the sample during an experiment is key to ensuring high quality data are collected. At present this process is performed manually by beamline scientists. RadiaSoft in collaboration with the beamline scientists and engineers at ORNL has developed a machine learning based alignment software automating this process. We utilize a fully-connected convolutional neural network configured in a U-net architecture to identify the sample center of mass. We then move the sample using a custom python-based EPICS IOC interfaced with the motors. In this poster we provide an overview of our machine learning tools and show our results aligning samples at ORNL.

Footnotes

Paper preparation format

LaTeX

Region represented

America

Funding Agency

This work is funded by the Department of Energy Office of Science, Office of Basic Energy Science award number DE-SC0021555

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Session Classification: Thursday Poster Session

Track Classification: MC6: Beam Instrumentation and Controls, Feedback and Operational Aspects:
MC6.T05 Beam Feedback Systems