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Concept of an *active learning-assisted* measurement using multiplexing setup at a three-axes spectrometer

Tuesday, 5 December 2023 14:00 (3 hours)

Three-axes spectrometers (TAS) are considered one of the most flexible and versatile instruments for inelastic neutron scattering measuring fundamental excitations (phonons, magnons, and crystalline electric field) in materials with sub-meV energy resolution. However, the limitation of a three-axes spectrometer usually comes from the restriction of a point-by-point measurement strategy in the reciprocal space which does not allow investigations in short time scales. To increase the data collection efficiency in terms of ($\boldsymbol{Q}$,ω)-coverage of a conventional TAS instrument, multiplexing techniques have been developed (such as CAMEA at PSI, UFO-IN12 at ILL, BAMBUS-PANDA and Multiplexing-PUMA at MLZ). In these techniques for an incoming neutron energy E_i in the primary side of the spectrometer, several ($\boldsymbol{Q}$, E_f)-channels are employed to cover a larger range of ($\boldsymbol{Q}$,ω) in the secondary side of the spectrometer. In parallel, there is also a growing interest in optimizing and enhancing the measurement strategy at a conventional TAS by employing artificial intelligence. Here we will be presenting a concept to generalize an *active learning-assisted* TAS measurement [1] for multiplexing setups and show its potential for improving the experimental strategy for users.

Reference: [1] M. T. Parente, G. Brandl, C. Franz, U. Stuhr, M. Ganeva, and A. Schneidewind. Active learning-assisted neutron spectroscopy with log-Gaussian processes. Nat. Comm. **14**, 2246 (2023).

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