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Closed-loop approach for automated instrument tuning and alignment

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

In the rapidly evolving landscape of experimental research, the integration of advanced technologies has conducted in a **new era** of precision and efficiency. Robotic systems, supported by artificial intelligence, have become important tools for conducting experiments with high levels of control and accuracy. Among these rapid developments, the closed-loop approach stands out as a paradigm shift in the field of **automated instrument tuning**. In this poster, I am going to show you how closed-loop machine learning suite based on Bayesian optimization can help with not only performing the experiments but also instrument calibration. I will demonstrate this approach on several examples, like alignment of triple axis spectrometer, tuning of computer vision camera system, Laue pattern spot finding or optimization of sample grabbing and tuning.

Underlying software package based on the integration between NICOS [1] and NIMS-OS [2] will be presented, **simplifying** use of closed-loop machine learning, and providing the method to broader audience of scientists.

[1] Brandl, Georg, et al., *10th International Workshop on Personal Computers and Particle Accelerator Controls*. No. IMPULSE-2014-00016. FZJ, 2014.
[2] Tamura, Ryo, Koji Tsuda, and Shoichi Matsuda. *arXiv preprint* arXiv:2304.13927 (2023).

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