PAUL SCHERRER INSTITUT

Invitation

LMU Seminar

Title: **Automation of accelerator tuning with safety constraints using Bayesian Optimisation**

Speaker: **Dr. Jochem Snuverink, PSI**

Time: **Friday, 28 January 2022, 10:00**

Place: **Zoom**

Abstract:

Tuning machine parameters of particle accelerators is a repetitive and time-consuming task that is challenging to automate. While many off-the-shelf optimization algorithms are available, in practice their use is limited because most methods do not account for safety-critical constraints in each iteration, such as loss signals or step-size limitations. One notable exception is safe Bayesian optimization, which is a data-driven tuning approach for global optimisation with noisy feedback.

As part of the "Particle Accelerators and Machine Learning" (PACMAN) project, a collaboration between PSI, ETH-Z, CERN and the SDSC (Swiss Data Science Centre), a ready-to-use tool was developed, which implements safe Bayesian optimization in addition to other standard optimisation algorithms, like line scanning, Nelder-Mead and CMA-ES.

This tool has been evaluated at SwissFEL and HIPA, and most recently at piE1.2 for the MIXE (muon induced xray emission) experiment. We report promising experimental results on each of these beamlines, in addition to limitations and possible further developments and u