

# GFA - PSD Accelerator Seminar

## Adaptive Feedback Control and Machine Learning for Particle Accelerators

**Tuesday, 17 March 2020, 15.00 h, WBGB/019**

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The precise control of charged particle beams, such as an electron beam's longitudinal phase space, (current and energy profiles), as well as the maximization of the output power of a free electron laser (FEL), or the minimization of beam loss in accelerators, are extremely challenging tasks.

For example, even when all FEL parameter set points are held constant both the beam phase space and the output power have high variance because of the uncertainty and time-variation of thousands of coupled parameters and of the electron distribution coming off of the photo cathode. Similarly, all large accelerators face challenges due to time variation, leading to beam losses and changing behavior even when all accelerator parameters are held fixed. We present the development and application of machine learning methods along with automatic, model-independent feedback for automatic tuning of charge particle beams in particle accelerators. We present experimental results from the LANSCE linear accelerator at LANL, the EuXFEL at DESY, the AWAKE experiment at CERN, the SPEAR3 light source at SLAC, the FACET plasma wakefield accelerator facility at SLAC, and at the LCLS FEL at SLAC.

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