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Forskning

My research is mainly involved in the development of machine learning methods to further the understanding of electron beams in modern accelerators. I work with the synchrotron facility MAX IV, where electrons are accelerated to very near the speed of light and utilized to extract X-rays for a varied range of scientific work. Since the electron beam moves at extremely high speeds, it is difficult to extract information of the distribution of the beam in time and energy. A new diagnostic tool has recently been installed in the facility for this exact purpose, but the measurement is destructive and the beam can not be reused after being measured in this way. This is where machine learning can prove useful. In my current project I develop methods for extracting the same information as the new diagnostic tool without disturbing the beam. I collect data from the entire accelerator and train artificial neural networks to map this non-destructive information to the destructive measurements.

Anställning

Doktorand
Synkrotronljusfysik
Lunds universitet
Lund, Sverige
2022 maj 9 → present

Profilområdesmedlem
LU profilområde: Ljus och material
Lunds universitet
Sverige
2023 jan. 1 → present

Forskningsoutput

Measurement of first and second order longitudinal dispersion in the MAX IV bunch compressor

Lundquist, J., Dixon, A., Mansten, E., Curbis, F., Björklund Svensson, J., Williams, P. H., Svärd, R., Thorin, S. & Werin, S., 2024.

Virtual diagnostics for longitudinal phase space imaging

Lundquist, J., Werin, S. & Curbis, F., 2023 maj 1, *Proc. IPAC'23*. JACoW Publishing, Geneva, Switzerland, s. 4471-4474 4 s. (IPAC'23 - 14th International Particle Accelerator Conference).

Virtual Diagnostic for Longitudinal Phase Space Imaging for the MAX IV SXL Project

Lundquist, J., Werin, S. & Curbis, F., 2022 aug. 1, *Proc. FEL2022*. JACoW Publishing, Geneva, Switzerland, s. 437-440 4 s. (International Free Electron Laser Conference).

ESS DTL Tuning Using Machine Learning Methods

Lundquist, J. S., Werin, S., Milas, N. & Nilsson, E., 2021, *Proceedings of IPAC2021*. JACoW Publishing, s. 1872-1875 4 s. (International Particle Accelerator Conference).

MACHINE LEARNING METHODS FOR SINGLE SHOT RF TUNING

Lundquist, J. S., Werin, S. & Milas, N., 2021, *IBIC 2021 - Proceedings of the 10th International Beam Instrumentation Conference*. Kim, C., Kim, D.-E., Lee, J. & Schaa, V. R. (red.). JACoW Publishing, Geneva, Switzerland, s. 313-316 4 s. (CERN-Proceedings).

Real-time accelerator diagnostic tools for the max iv storage rings

Meirose, B., Abelin, V., Bertilsson, F., Bolling, B. E., Brandin, M., Holz, M., Høier, R., Johansson, A., Kalbfleisch, S., Lilja, P., Lundquist, J. S., Molloy, S., Persson, F., Petersson, J. E., Serodio, H., Svärd, R. & Winchester, D., 2020 sep., I: *Instruments*. 4, 3, 26.

Projekt

Machine learning tools applied to linacs and FELs

Curbis, F. (Forskare), Lundquist, J. (Forskarstuderande) & Werin, S. (Forskare)
2022/05/02 → 2026/04/30