## 5th ICFA Beam Dynamics Mini-Workshop on Machine Learning for Particle Accelerators



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## Machine Learning based Optical Distortion measurement by Phase Advance in SSRF

Optical distortion measurement and correction are pivotal for the stable operation of accelerators. This study introduces a machine learning-based approach to optical distortion measurement and correction implemented on the Shanghai Synchrotron Radiation Facility (SSRF). We trained models from modulated orbits to phase advance and from phase advance to quadrupole models, establishing a data-driven method for optical distortion correction. A key advantage of this method is the elimination of the need to update the Jacobian matrix, thereby reducing computational iteration time. Our machine learning-driven optical distortion correction (LOCO) methods. Furthermore, our method, based on steady-state orbit data measurement with orbit modulation, achieves higher accuracy and requires lower measurement conditions compared to turn by turn (TBT) data measurement-based optical distortion correction and introduces an efficient strategy for future accelerator operations.

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