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Neural networks for ID gap orbit distortion compensation in PETRA III

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In recent years, the use of machine learning methods has proved to be capable of considerably speeding up both fundamental and applied research. Accelerator physics applications have also profited from the power of these tools. This includes a wide spectrum of applications from beam measurements to machine performance optimisation.

PETRA III is one of the world's brightest storage-ring-based X-ray radiation sources. The beamlines are supplied with light from various undulators tailored to the specific needs of the experiments. In the ideal case, a perfectly tuned undulator always has a first and second field integrals equal to zero. But, in practice, field integral changes during gap movements can never be avoided for real-life devices.
Deep Neural Networks can be used to predict the distortion in the closed orbit induced by the undulator gap variations on the circulating electron beam. In this contribution a few current state-of-the-art deep learning algorithms were trained on measurements from PETRA III. The different architecture performances are then compared to identify the best model for the gap-induced distortion compensation.

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Footnotes

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