Contribution ID: **18**   Type: **not specified**

Using Machine Learning to Improve Dynamic Aperture Estimates

Wednesday, 29 November 2023 12:15 (20 minutes)

The dynamic aperture (DA) is an important concept in the study of nonlinear beam dynamics. Several analytical models used to describe the evolution of DA as a function of time, and to extrapolate to realistic time scales that would not be reachable otherwise due to computational limitations, have been successfully developed. Even though these models have been quite successful in the past, the fitting procedure is rather sensitive to several details. Machine Learning (ML) techniques carry the potential to address some of these challenges. Two applications of ML approaches will be presented and discussed in detail. Firstly, ML has been used to efficiently detect outliers in the DA computations. Secondly, ML techniques have been applied to improve the fitting procedures of the DA models, thus improving their predictive power

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Session Classification: AI/ML for Accelerators