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## Surrogate Model Training and Applications at the S-DALINAC based on FCNNs

Machine learning methods provide a significant potential for the optimized operation of complex facilities, such as particle accelerators. In this contribution, the first training and application of surrogate models to the electron accelerator S-DALINAC based on Fully-Connected Neural Networks (FCNN) will be presented.

An exhaustive data-mining algorithm has been developed to generate the training data using the live accelerator. The architecture and training of the surrogate model, as well as its introspection using both Sobol-based sensitivity analysis and Shap impact analysis will be presented. Additionally, the test of optimization algorithms on the surrogate model prior to the application on the live system are presented in this contribution. Future prospects of transforming this surrogate model to an online digital twin application, as well as drawbacks in the applicability of the model, will be discussed.

**Author:** SCHNEIDER, Dominic (Institut für Kernphysik, TU Darmstadt)

**Co-authors:** SCHLISSMANN, Felix; BIRKHAN, Jonny; ARNOLD, Michaela; PIETRALLA, Norbert

**Presenter:** SCHNEIDER, Dominic (Institut für Kernphysik, TU Darmstadt)

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