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Deep Learning-Based Time-of-Flight Reconstruction for Future Higgs Factories

Experiments at future e+e- collider Higgs factories present the opportunity to perform measurements of the Higgs boson and electroweak observables with unprecedented levels of precision. Utilizing such machines to their full physics potential places stringent requirements on the performance of the detector. As a high level reconstruction task, highly performant particle identification is crucial for broader event reconstruction and the precision measurements that are targeted. To this end time-of-flight reconstruction, relying on silicon sensor technologies with excellent time resolution, offers the possibility to significantly improve the identification of low momentum charged hadrons.

This project focuses on the development of a deep learning-based time-of-flight reconstruction algorithm. The algorithm will be designed to operate directly on the energy and time information contained in calorimeter shower measurements. The student would be embedded in the FTX Software (SFT) group, which is actively involved in the development of cutting-edge machine learning algorithms for future particle physics experiments. While the ultimate goal of the project would be a comparison with the existing tools, the exact direction of the project would be led by the interests of the students, with the possibility to explore a number of different deep learning approaches.

Field

B2: Data processing (software-oriented)

DESY Place

Hamburg

DESY Division

FH

DESY Group

FTX

Special Qualifications:

Programming knowledge in python is essential. Basic statistics and particle physics knowledge is needed. Some basic machine learning knowledge, possibly including python libraries such as pytorch, would be advantageous but is by no means required.

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