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Application of Machine Learning in Event-Mode Neutron Imaging

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The application of artificial intelligence (AI) is a growing field, especially with artificial neural networks (ANN). These tools are helpful for various applications, one of them being the optimization of data processing routines for detectors, from only optimizing classical processing algorithms in speed and efficiency to paving the way to new possibilities.
With this perspective in mind, we apply such ANNs to a novel type of neutron imaging detector: event-mode detection. The goal is the recreation of a part of the data processing routine. In particular, the reconstructing of scintillator events from scintillation photons.
This recreation of the classical algorithm was tried with convolutional neural networks (CNN). The current performance evaluation of these ANNs does not yet yield sufficient results to reach the set goal. So far only a general area of events could be successfully reconstructed by the ANN. Though the chosen approach and simplifications limited the current performance, they unveiled insights into changing the ANNs topology and the bounds of the CNNs in use.
In light of the fact that the AI does not reach the full performance of the classical algorithm so far, the results show loose proof of concept, and the general idea prevails. It is suspected that changes in the currently tried ANNs can solve the exposed problems completely. Therefore, opening a possibility for further inquiry, in addition to giving a perspective of surpassing the classical approach.

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