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# Studies on a deep convolutional autoencoder for denoising pulses from a p-type point contact germanium detector

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I present studies on a deep convolutional autoencoder originally designed to remove electronic noise from a p-type point contact high-purity germanium (HPGe) detector. With their intrinsic purity and excellent energy resolutions, HPGe detectors are suitable for a variety of rare event searches such as neutrinoless double-beta decay, dark matter candidates, and other exotic physics. However, noise from the readout electronics can make identifying events of interest more challenging. At lower energies, where the signal-to-noise ratio is small, distinguishing signals from backgrounds can be particularly difficult.

I focus on the results of a recent publication from our group to demonstrate that a deep convolutional autoencoder can denoise pulses while preserving the underlying pulse shape well. Our research shows that a deep learning-based model is more effective than traditional denoising methods. I also highlight several studies on how the use of this autoencoder can lead to better physics outcomes through improvements in the energy resolution and better background rejection. Finally, I present extensions of this research that our group is working on. Our approach is straightforward to apply to other detector technologies and has great potential to be used in particle physics experiments as well as any other fields dealing with noisy one-dimensional signals.

## Submitted on behalf of a Collaboration?

No

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