Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3612** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Applications of a deep convolutional autoencoder to process pulses from a p-type point contact germanium detector

Monday 19 June 2023 11:45 (15 minutes)

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 demonstrate that a deep convolutional autoencoder can denoise pulses while preserving the underlying pulse shape well. Results show that a deep learning-based approach is more effective than traditional denoising methods. I also present 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 highlight extensions of this research that our group is working on and show how our methods are broadly applicable to the particle astrophysics community.

Keyword-1

denoising

Keyword-2

autoencoders

Keyword-3

germanium detectors

Author: ANDERSON, Mark (Queen's University)

Presenter: ANDERSON, Mark (Queen's University)

Session Classification: (PPD/DNP) M1-1 Neutrinoless Double Beta Decay | Désintégration double bêta sans neutrino (PPD/DPN)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)