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Machine Learning for Signal Processing in the NEWS-G Experiment

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The NEWS-G experiment at SNOLAB uses spherical proportional counters, or SPCs, to detect weakly interacting massive particles (WIMPs), which are a prime candidate for dark matter. Interactions within the gas-filled sphere create a primary ionization. The signal from the resulting electrons is passed through a digitizer and this generates raw pulses that are observed as time-series data. However, these signals have noise from electronics and other particles entering the detector. I will discuss the use of machine learning techniques for removing noise from different pulse shape types, as well as rejecting bad pulses in the data. There is a large amount of simulated data available which is used to train and test neural networks. Models are trained on this data, and subsequently can be applied to real data once fully trained. These models can potentially denoise and clean data more efficiently and with less error than traditional pulse processing, making them an important tool for the NEWS-G experiment.

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