PANIC2021 Conference



Contribution ID: 366

Type: Poster

A Machine Learning Algorithm for Triggering the Project 8 Neutrino Mass Experiment

Tuesday 7 September 2021 19:04 (1 minute)

Project 8 is a next-generation neutrino mass experiment that uses Cyclotron Radiation Emission Spectroscopy (CRES) to measure the neutrino mass. CRES is a novel technique for β -decay spectroscopy that measures the frequency of the cyclotron radiation produced by energetic electrons trapped in a magnetic field. The cyclotron frequency can be directly converted into the energy spectrum, which yields the neutrino mass through measurement of the spectrum endpoint. The next phase of Project 8 seeks to measure the energy spectrum of molecular Tritium β - decay in an O(10 cm³) free space volume, using a multi-channel phased array of antennas. The low signal power (< 1fW) and multi-channel reconstruction place stringent constraints on the triggering and online signal processing algorithms. I present progress on a machine learning triggering algorithm that employs a Deep Convolutional Neural Network (DCNN) to detect the presence of cyclotron radiation signals buried in noise. The network achieves greater than 85% classification accuracy on simulated electron signals, outperforming conventional methods, and rivaling the performance of an optimal matched filter while requiring significantly fewer computational resources for online operation.

Primary author:ZIEGLER, Andrew (Penn State)Presenter:ZIEGLER, Andrew (Penn State)Session Classification:Poster Session II

Track Classification: Neutrino physics