**Research Plan: Improving Particle Discrimination in Dark Matter Experiments Using Neural Networks**

**Rationale**

The identification of background radiation events is a major hurdle to overcome in all experiments for dark matter detection. The current practice of manually developing a discriminator function to eliminate background events is difficult and labor-intensive when available calibration data is frequently impure and present only in small quantities. Machine learning, particularly in the form of neural networks, has the potential to be a powerful solution, because it allows automation of the process in a reusable way. However, there are issues that must be overcome. For instance, impure data can be detrimental to the training of many types of models, and data often comes in formats that are non-trivial to process, such as audio and 3D geometries.

**Engineering Goal**

The goal of this project is to develop machine learning systems that can effectively learn to discriminate between signal and background events in the context of the PICO-60 and DEAP-3600 dark matter detection experiments.