Fermilab U.S. DEPARTMENT OF ENERGY Office of Science

Using ML to Classify Photons for DUNE

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SIST 2022: 5 Slide/5 Min Presentations

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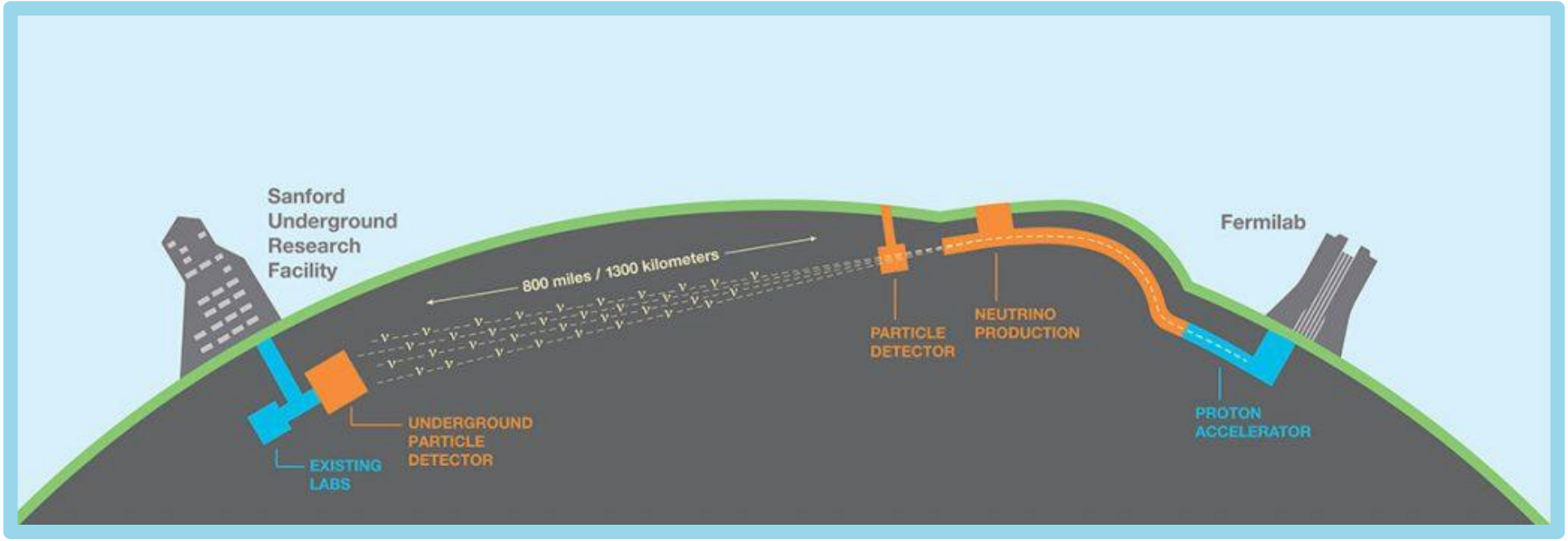
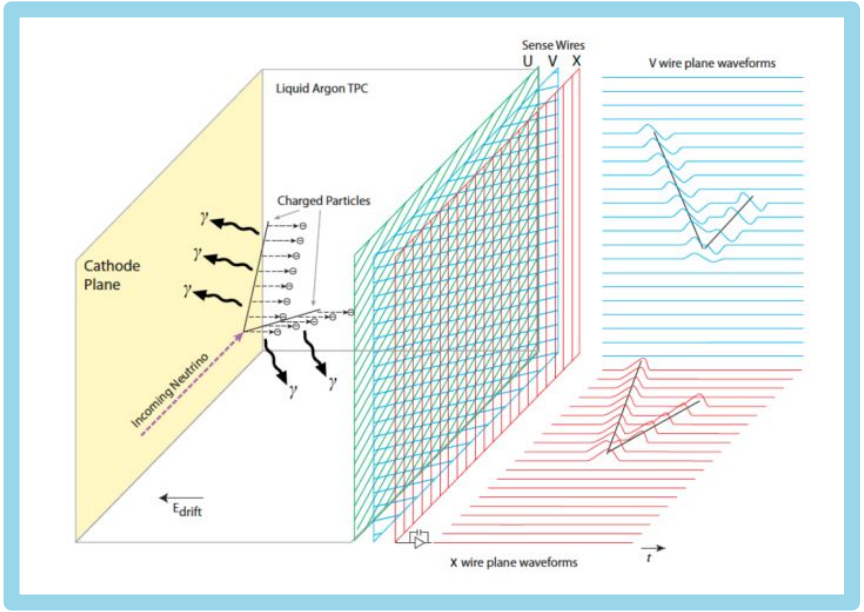
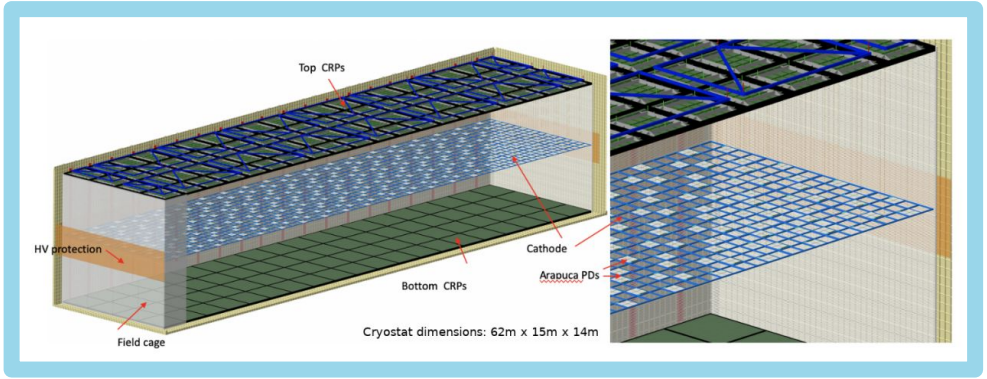
The Experiment: DUNE

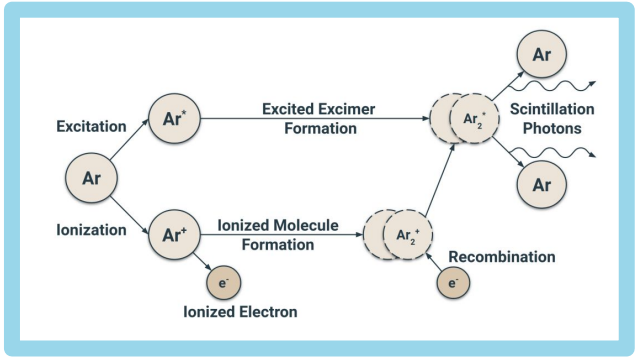


High powered beam from Fermilab to SURF used to learn a lot of things about neutrinos and unknown physics: neutrino oscillation physics, supernova physics, nuclear decay searches.

The DUNE FAR Detector

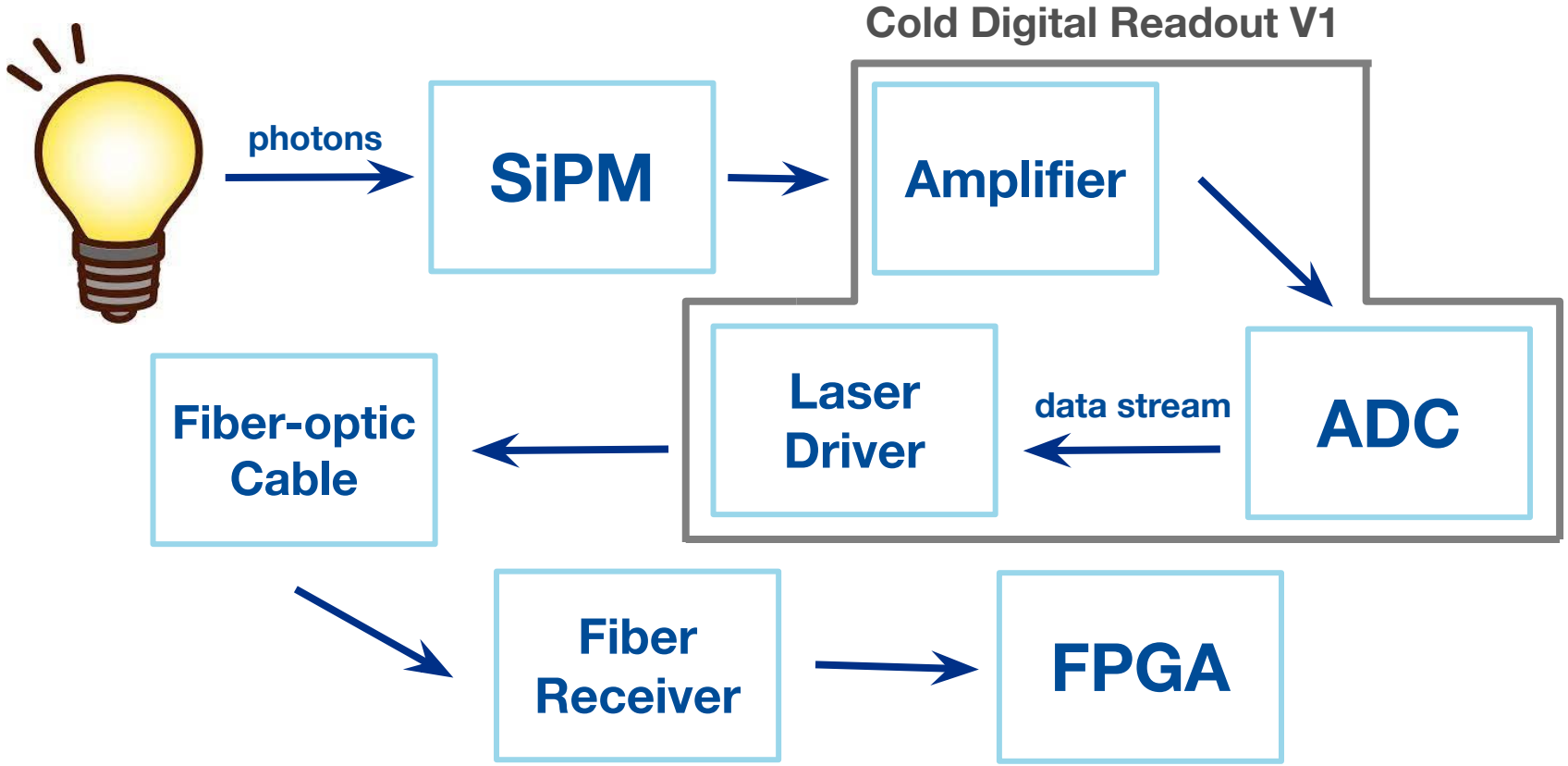




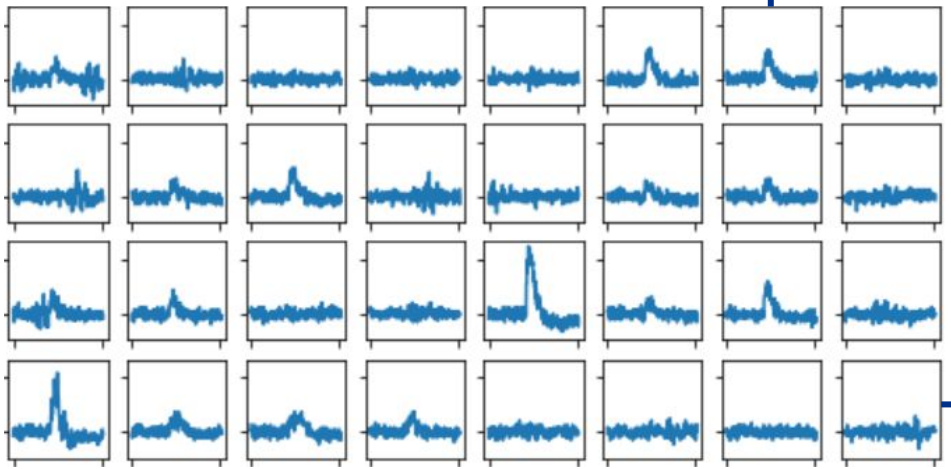


The photo on the left is a picture of a Liquid Argon Time Projection Chamber. Where I get my data will be from the Vertical Drift Time Projection Chamber, top right photo, which is a very similar setup, just vertical and not horizontal.

Where's My Data From?

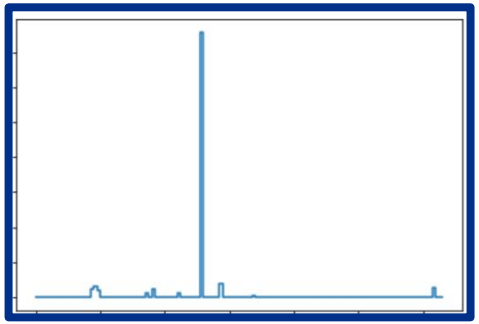


What I’m Doing…



- photon_detected
- no_photon_detected

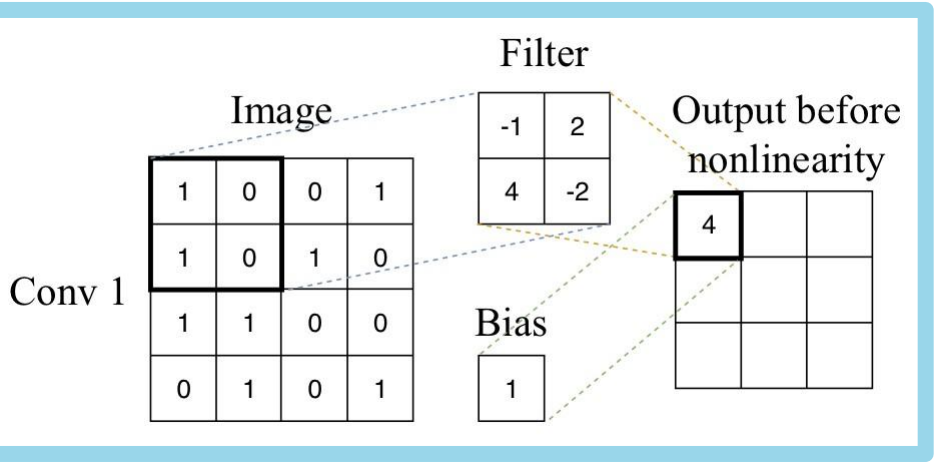
prediction



I’m taking the data from the prototype and developing/improving an algorithm that will be able to classify if a detection occurred or not. Then predicting the number of photons that were captured if a photon was detected.

How I'm Doing it…

Example Convolution



Using a Convolutional Neural Network I'm able to train the machine learning algorithm using the images of the graphs from the prototype.

Deep Neural Network