

**Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY17**

Project ID: FNAL-LDRD-2017-010

Project title: Training Deep Neural Networks for Neutrino Identification in the Cloud

Principal investigator: Evan Niner

Project description: (short description and explanation of cutting edge, high-risk, high-potential science or engineering)

Deep learning has great potential for the neutrino physics and HEP community at large. We propose to build on the work already done for NOvA, developing and optimizing new deep networks to identify substructure in the events, i.e. individual particles, rather than classifying the overall neutrino interaction. We will also pioneer a new way to access the required GPU resources: using off-site commercial resources via HEPCloud. Training networks is a great example of high “peak” demand and low average demand, making it well suited to the HEPCloud approach.

Tie to Mission: (explain the project’s relevance or anticipated benefits to Fermilab’s and DOE’s missions)

Looking past NOvA, the challenges and opportunities are all the greater with the fine-grained resolution of liquid argon detectors. In the short term protoDUNE 4 will provide an ideal dataset for testing the performance of single-particle identification techniques on events with tagged charged particles from the tertiary beam at CERN. If this technique shows promise in protoDUNE it can be carried forward to the DUNE far detector, a top priority of the high energy physics community in the coming decade.

Previous year’s accomplishments: (as applicable)

N/A

Work proposed for current fiscal year and anticipated / desired results:

Establish infrastructure and demonstrate training of deep networks using GPU resources on the HEPCloud. Establish benchmarks for evaluating network success. Select a network candidate for mainstream production in the NOvA framework.

Project funding profile: (costs, budgets, projected budgets, and total)

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	150,006	148,784	153,009	451,889

Project Start Data: 3/01/2017

Total Approved Project funds: \$ 451,889