

**Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY18**

Project ID: FNAL-LDRD-2018-006

Project title: Modeling Physical Systems with Deep Learning Algorithms

Principal investigator: Brian Nord

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

The project is conduct research in the strategic area of deep learning (DL) and its applications to cosmological physics with the purpose of extracting physical parameters from unprecedentedly large data sets. The detection and measurement of the myriad objects in current and future surveys with traditional algorithms is inefficient.

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

Cosmology and astrophysics is undergoing yet another phase transition in both the quantity and complexity of data generated from observations and simulations. On the other hand, modern cosmological models provide compelling, yet incomplete descriptions of the universe. With the increase in data set volume, deep learning offers a powerful computing paradigm for the future of cosmological model-building rooted in statistical frameworks.

Previous year's accomplishments: (as applicable)

N/A

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

We propose to address these challenges by designing, constructing and implementing a software pipeline on high-performance GPU computers. We will develop a pipeline for automated multiobject identification and measurement in cosmological survey data, with a focus on strong gravitational lensing.

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

Prior year(s) costs	FY18 ½	FY19	FY20	FY21 ½	Total
N/A	100,000	250,000	250,000	100,000	700,000

Project Start Date: 3/15/2018

Total Approved Project funds: \$ 700,000