

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)

Focused on building the team, important steps in Machine Learning (ML) algorithm development.

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

Continued algorithm development. Team effort has been identified from the P.I, post-doctoral effort, University of Chicago graduate students and Fermilab computing professional will develop comprehensive ML applications for Cosmology and Astrophysics.

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

Prior year(s) costs	FY18 ½	FY19	FY20	FY21 ½	Total
N/A	18,342	116,207	290,000	275,451	700,000

Project Start Data: 3/15/2018

Total Approved Project funds: \$ 700,000