Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY15

Project ID: FNAL-LDRD-2015-009
Project title: High Energy Physics Pattern Recognition with an Automata Processor
Principal investigator: Michael Wang

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

Develop a proof of concept demonstrating that an Automata Processor (AP) is ideally suited to fast high energy physics (HEP) pattern recognition applications and can provide an off-the-shelf alternative to demanding online applications traditionally addressed by custom hardware solutions. An AP algorithm will be developed for track pattern recognition problems based upon the Compact Muon Solenoid (CMS) pixel detector and Liquid Argon time projection chambers (LArTPCs) for future neutrino experiments.

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

Experiments at all the frontiers of high energy physics require efficient solutions to pattern recognition problems. The Automata Processor has promise to deliver superior performance for such problems and may enable new investigations at future experiments that would otherwise not be possible.

Previous year's accomplishments: (as applicable) FY15, not applicable

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

The proposed work for the project for FY15 will be to deliver and characterize a working implementation of an Automata Processor solution to a CMS electromagnetic track trigger problem with the results written up for a journal. The development of this implementation will include becoming involved with the Center for Automata Processing(CAP) co-founded by Micron Technology and the University of Virginia. In this manner, optimizations and future development of the AP by Micron Technology can receive input from the studies undertaken by this project. If successful, a working implementation will be delivered and characterized for a LArTPC track-finder and pattern recognition for the LArTPC waveform in the second year of the project.

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

Prior year(s) costs	FY15	FY16	FY17	Total
N/A	219,648	224,311	--	443,960