



Project Title

Automated Nuclear Threat Assessment Using Machine Learning

Project Reference Code: DNDO-LLNL-Labov

Hosting Site

Lawrence Livermore National Laboratory
Livermore, CA

Project Description

There is a growing concern that a terrorist may try to use the global shipping system to deliver a nuclear weapon, or the parts to assemble a nuclear weapon, into the United States. The consequences of such an occurrence would be devastating. At Lawrence Livermore National Laboratory (LLNL) we have been tasked by the Department of Homeland Security (DHS) to combine our specialized knowledge of nuclear weapons with the latest advances in radiation physics, signal processing, and computer science to improve the security of our ports. DHS has already deployed radiation detection instruments at the ports, and these systems are confronted by about 10,000 shipments a day that contain some legitimate radioactive material. Customs and Border Protection (CBP) agents must analyze each one of these radiation alarms looking for a possible threat. At LLNL we are developing computer-based techniques to help CBP find hidden threats, and quickly approve legitimate shipments. In a collaboration with the Auton Lab at Carnegie Mellon University, we are using cutting-edge machine learning algorithms (such as Random Forests and Mixed-attribute-type Bayesian Networks) to combine gamma-ray and neutron measurements with nonradiation and contextual information to dramatically improve the accuracy and false alarm discrimination for radiation alarms. We are looking for students with interest in nuclear threat reduction, radiation interactions, signal processing, machine learning and/or software development. Experience with MATLAB, Java, C++ or SQL databases will be helpful but not required.

Disciplines

Computer Systems Design (including Signal Processing)
Computer Science (General)
Radiation Protection Engineering
Nuclear Physics

Mentor(s)

Simon Labov, slabov@llnl.gov, 925-423-3818

Internship Coordinator

Barry Goldman, goldman1@llnl.gov, 925-422-5177

The name and contact information of the hosting site internship coordinator is provided for further assistance with questions regarding the hosting site; local housing availability, cost, or roommates; local transportation; security clearance requirements; internship start and end dates; and other

administrative issues specific to that research facility. If you contact the internship coordinator, identify yourself as an applicant to the DNDO Summer Internship Program.

Interns will not enter into an employee/employer relationship with the Hosting Site, ORAU/ORISE, DHS, DNDO or DOE. No commitment with regard to later employment is implied or should be inferred.