2027 SARRA Mentors and Projects Book

Service Academies and ROTC Research Associates

LANL Postdoc & Student Programs Office
SponsoredPrograms@lanl.gov

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ROTC:

Due to the way this program is funded and the way clearances work, many projects cannot accommodate ROTC applicants. ROTC can always visit https://lanl.jobs/students to view additional openings outside of the SARRA umbrella.

Los Alamos NATIONAL LABORATORY

Project 1 Information:

"Dynamic fission heating under nuclear environment for relevant classified applications"

This project focuses on assessing rapid heating in nuclear environments, particularly during Reactivity Insertion Accidents (RIA) in nuclear fuel systems. It begins with a literature review, including relevant classified materials, to establish a strong theoretical foundation. Working with nuclear and thermal engineering mentors, the intern will help develop an analytic solution for heat transfer with a time-dependent heat source derived from MCNP simulations. A complementary 1D heat transfer model will be built in Python to simulate and validate thermal behavior against the analytic solution. The project provides hands-on experience in nuclear safety analysis, simulation development, and interdisciplinary collaboration.

Mentor: S. Jun Kim

Group Name: Advanced Engineering Analysis

Student Information:

Preferred Major: Nuclear engineer (or computer science) would be good candidate

Required Skills: MCNP (radiation transport calculation, python coding)

Helpful Skills/Experience: Reactor design experience, Heat transfer calculation, data mining using scientific tool like (SciPy)

Minimum Clearance: Secret + CNWDI

ROTC: No, just Military Academies

Positions: 1

Project 2 Information:

"Simulation of Space-based Radio Frequency Sensing Capabilities for USNDS"

The goal of this project is to simulate radio frequency sensor performance under varying environmental conditions to support the United States Nuclear Detonation Detection System (USNDS). An electromagnetic pulse (EMP) is created by the interaction of a NuDet's gamma ray output with the atmosphere in the presence of the Earth's magnetic field. Electromagnetic pulses created in the atmosphere propagate to space and can be detected by space-based radio frequency sensors. The orientation of the geomagnetic field at the EMP source with respect to the sensing location affects the polarization and magnitude of the direct and earth-reflected signals. In addition, the local ionization produced by a NuDet may affect the propagation of a reflected pulse. This project will use new capabilities in the DIORAMA modeling tool to simulate

EMP source generation and propagation to demonstrate sensor reception under varying environmental conditions due to the magnetic field and source ionization.
Mentor: Sonja Behnke
Group Name: Electromagnetic Sciences & Cognitive Space Applications

Student Information:

Preferred Major: Computer Science, Physics, Electrical Engineering, Aerospace Engineering
Required Skills: Python
Helpful Skills/Experience: Linux
Minimum Clearance: No clearance required
ROTC: Yes
Positions: 1

Project 3 Information:

"Studying solar storms and impact on satellite systems"

The LANL Space and Atmospheric Burst Reporting System (SABRS) payload package, located in GEO, includes space environment sensors to observe and monitor the local space environment. During geomagnetic storms, immense amounts of energetic and magnetized plasma are ejected from the sun with some fraction of these directed towards the Earth. The natural magnetic field surrounding Earth acts as a shield, deflecting much of the solar plasma away from the surface. However, electrons and ions that make up the solar plasma interact with this magnetic barrier. Through a series of complex processes, plasma can enter and become trapped in the region of space dominated by Earth's magnetic field that we call the magnetosphere. Energetic charged particles in the magnetospheric environment can cause negative effects such as spacecraft surface charging, internal dielectric charging, electrostatic discharging (ESD), and total ionizing dose, all of which can impact space systems. The research effort will involve using the SABRS Plasma Spectrometer (PS) sensor to characterize solar events during the current solar maximum and correlate spacecraft charge to specific particle populations and ESD events. Additionally, a dosimeter located near SABRS PS will be used to correlate total ionizing dose caused by higher energy particles in the MeV range. The combined data sets will serve to provide information regarding how the magnetosphere is impacted during severe space weather events and how the space environment has impacted the SABRS host satellite (STPSat-6).
Mentor: Jason Derr
Group Name: Electromagnetic Sciences & Cognitive Space Applications

Student Information:

Preferred Major: EECS, Physics, Math, Computer Science
Required Skills: Some knowledge of basic physics (ideally physics 1 and 2)
Helpful Skills/Experience: Computer Programming (Python), Electromagnetic Theory, Wave Mechanics, Optics
Minimum Clearance: No clearance required
ROTC: No, just Military Academies
Positions: 1

Project 4 Information:

"Automated Synthesis of Organic Molecules for Critical Element Separation"

This project will develop laboratory automation to prepare organic molecules, such as ligands and/or polymer monomers, for the selective separation and recovery of critical elements or materials under extreme conditions. The student will help translate chemical synthesis procedures into automated workflows, optimize preparation conditions, and support screening of candidate molecules for separation performance. The project offers hands-on experience in organic chemistry, robotics, and data-driven experimentation, with the goal of accelerating the development of separation technologies that strengthen domestic critical material supply chains for U.S. energy and national security.

Mentor: Xiaokun (Claire) Yang
Group Name: Inorganic Isotope & Actinide Chem

Student Information:

Preferred Major: Organic Chemistry, Chemical Engineering, Materials Science and Engineering
Required Skills: Comfortable handling chemicals in a research lab environment
Helpful Skills/Experience: Programing experience on instrument/computer systems
Minimum Clearance: No clearance required
ROTC: No, just Military Academies
Positions: 2

Project 5 Information:

"Life and death in the slow lane: gaining a 3-D picture of drug resistance and toxicity in biological systems"

The student will assist in a funded research project that is a part of our response to chemical and biological threats against members of the military and civilians. The project will focus on two proteins of medical significance. The first is a bacterial protein involved in the expulsion of antibiotics and drugs, the second is acetylcholinesterase, which is a key component of neurotransmission and is a target of toxic organophosphorus compounds. These are slow processes that require new methodology to study them. We are interested in how substrates gain access to the proteins and what structural changes occur, using X-ray based techniques to track these processes. The student will work on protein purification, crystallization, and data analysis as part of the internship.

Mentor: Julian Chen

Group Name: Microbial And Biome Sciences

Student Information:

Preferred Major: Chemistry, Biology

Required Skills: A background in chemistry and biology, and an eye for detail and precision

Helpful Skills/Experience: Wet biological lab skills preferred, i.e. pipetting, buffers, chromatography. Computational and quantitative skills (Python, online data analysis).

Minimum Clearance: No clearance required

ROTC: No, just Military Academies

Positions: 1

Project 6 Information:

"Space Research AI Agents"

Our team is responsible for the AIML/data engineering capabilities for our division. Project work could focus on AI agent orchestration, custom harnessing, and fine-tuning models to improve their performance on areas of interest.

Mentor: Josh

Group Name: Space Data And Software Systems Group

Student Information:

Preferred Major: Computer Science

Required Skills: agentic workflows, LLM fine-tuning, distributed compute, self starter

Helpful Skills/Experience: Strong CS background
Minimum Clearance: Secret + CNWDI
ROTC: No, just Military Academies
Positions: 2

Project 7 Information:

"Examination of Scintillator Quenching Effects on Instrument Calibrations"

Recent measurements have quantified scintillator quenching effects for various scintillator materials. Scintillator quenching is an important detector effect which occurs following a large ionization in a scintillator, reducing the ability of the material to produce scintillation light and complicating the identification of the particles measured by the detector. Modeling this effect in simulation is important to accurately describe the data products from scintillators used to measured charged particles in orbit. This project involves computational analysis to apply a number of algorithms to predict light output for protons over a range of energies of interest and analyze the resulting effects on instrument data. The output of Monte Carlo simulations will be analyzed with these methods to determine the impact on instrument calibration, dependent on the method used to estimate quenching effects. If time allows, inspection of orbital data will identify the effect of quenching on spacecraft measurements.

Mentor: August Gula
Group Name: Space Science & Applications

Student Information:

Preferred Major: Nuclear Physics, Nuclear Engineering
Required Skills: Python
Helpful Skills/Experience: Monte Carlo methods, particle detection, scintillators,
Minimum Clearance: No clearance required
ROTC: Yes
Positions: 1

Project 8 Information:

"Antigen Discovery"

The trainee with join a DTRA-funded project team developing an antigen discovery pipeline meant to inform vaccine design. The trainee will incorporate a new module into the pipeline and will then evaluate / benchmark it. This is a programming project. The trainee will learn about coding, containers, HPC, vaccine development, and antigen recognition by the immune system.
Mentor: William Hlavacek
Group Name: Theoretical Biology & Biophysics

Student Information:

Preferred Major: Computer Science
Required Skills: Programming
Helpful Skills/Experience: Experience in software development
Minimum Clearance: No clearance required
ROTC: No, just Military Academies
Positions: 1

Project 9 Information:

"Nuclear Weapons Effects Analysis"

Nuclear Weapons Effects spans a wide variety of disciplines and specific projects will be formed relating to the student's skills and interests. Examples of recent student projects include understanding effects on satellites from space detonations, estimating modern submarine kill from underwater detonations based on WWII nuclear tests, generating a tool to evaluate different nuclear strike scenarios. While STEM majors are preferred, History and Political Science students would also find interesting work in the weapons effects field.
Mentor: Tim Goorley
Group Name: Theoretical Design

Student Information:

Preferred Major:
Required Skills:
Helpful Skills/Experience:
Minimum Clearance: Secret + CNWDI
ROTC: No, just Military Academies
Positions: 2

Project 10 Information:

"Uncertainty Quantification for Ballistic Trajectories Using Tensor Trains"

Variations in the initial conditions and aerodynamic performance in unguided munitions can result in uncertainty in the trajectory of air launched weapons. This study seeks to use a Tensor Train Uncertainty Quantification framework to assess the uncertainty in the impact point due to a range of relevant uncertainty parameters.

Mentor: Stephen Andrews

Group Name: Verification And Analysis

Student Information:

Preferred Major: Any STEM major

Required Skills:

Helpful Skills/Experience:

Minimum Clearance: Secret + CNWDI

ROTC: No, just Military Academies

Positions: 1

Project 11 Information:

"Weapon System Engineering"

System integration regarding nuclear weapon system engineering business processes performed across the weapon lifecycle for the nuclear security enterprise using an integrated set of common software tools. Ensure the underpinning information and desired results for each activities supporting the individual process is digitally captured for all the nuclear weapons business processes using the various common software tools. These processes span the weapon lifecycle up to and beyond weapon acceptance into the nuclear weapons stockpile.

Mentor: Dax Contreras

Group Name: Weapons Program Integration Office

Student Information:

Preferred Major: Industrial, Systems, Mechanical, Electrical, Aerospace, Chemical

Required Skills: Strong analytical and organizational skills, attention to detail, clear technical communication, proficiency with spreadsheets, and the ability to learn new software tools.

Helpful Skills/Experience: Familiarity with systems engineering, process mapping, requirements traceability, data management, configuration control, or basic scripting and automation.
Minimum Clearance: Top Secret + CNWDI
ROTC: No, just Military Academies
Positions: 1
