NRL Naval Research Laboratory

Location:

Washington, DC

Website:

https://www.nrl.navy.mil

Contacts:

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Work Schedule Type:

Students will be required to work on-site a minimum of two days every two weeks and must be in commuting distance of the lab for the duration of the internship to enable that. Students may be required to work on-site more often, up to every day of the internship at the discretion of their Mentor's chain of command and will be based on the proposed work/project. Additionally, NRL also offers supplemental funding to all participating students to help offset housing and/or relocation costs.

Student Requirements:

Students must be U.S. citizens. (Permanent residents are not eligible.)

About the Lab

The US Naval Research Laboratory (NRL) is one of the largest scientific institutions within the US government. NRL provides the advanced scientific capabilities required to bolster our country's position of global naval leadership. Here, in an environment where the nation's best scientists and engineers are inspired to pursue their passion, everyone is focused on research that yields immediate and long-range applications in the defense of the United States. As corporate research laboratory of the Navy, NRL conducts a broadly based multidisciplinary program of scientific research in advanced technological development, techniques, systems, and related operational procedures.

About the Internship

Summer interns are provided with an environment that will foster their creativity, help them develop a problem-solving mindset, and give them the opportunity to participate in meaningful technical research. Additionally, they will gain experience in a professional workplace that specializes in STEM careers.

What will I do any given day as an intern at this lab?

Interns participate in lab functions in a number of ways including (but not limited to) assisting mentors with guided research projects; job and project shadowing with professional researchers; networking with STEM professionals and other interns; and attending technical meetings, seminars, and conferences.

What majors and disciplines are a good fit for interning at this lab?

The primary fields of interest are:

- Aeronautical Engineering
- Artificial Intelligence
- Autonomy
- Biology
- Chemical Enginering
- Chemistry
- Computer Science
- Electrical Engineering
- Electronics Engineering
- Information Sciences
- Machine Learning
- Material Sciences
- Mechanical Engineering
- Physics
- Robotics

What kinds of projects do interns at this lab participate in?

The Radar Division conducts research on basic physical phenomena of importance to radar and related sensors, investigates new engineering techniques applicable to radar, demonstrates the feasibility of new radar concepts and systems, performs related systems analyses and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors that are applicable to enhancing the Navy's ability to fulfill its mission.

The Information Technology Division conducts basic research, exploratory development, and advanced technology demonstrations in the collection, transmission, processing, presentation, and distribution of information to provide information superiority and distributed networked force capabilities that improve Naval operations across all mission areas. The Division provides immediate solutions to current operational needs as required while developing those technologies necessary to implement the Navy after next.

The Optical Sciences Division carries out a variety of research, development, and application-oriented activities in the generation, propagation, detection, and use of radiation in the wavelength region between near-ultraviolet and far-infrared wavelengths. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices, materials, and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis, prototype system development, and exploitation of R&D results for the solution of optically related military problems. In addition to its internal program activities, the Division serves NRL specifically and the Navy generally as a consulting body of experts in optical sciences. The work in the Division includes studies in quantum optics, laser physics, optical waveguide technologies, laser–matter interactions, atmospheric propagation, holography, optical data processing, fiber-optic sensor systems, optical systems, optical materials, radiation damage studies, IR surveillance and missile seeker technologies, IR signature measurements, and optical diagnostic techniques. A portion of the effort is devoted to developing, analyzing, and using special optical materials.

The Laboratories for Computational Physics and Fluid Dynamics (LCP&FD) are responsible for the research leading to and the application of advanced analytical and numerical capabilities that are relevant to NRL, Navy, Department of Defense, and other Government agencies. This research is pursued in the fields of compressible and incompressible fluid dynamics, reactive flows, fluid/structure interactions including submarine and aerospace applications, atmospheric and solar geophysics, magnetoplasma dynamics, application of parallel processing to large-scale problems such as unsteady flows of contaminants in and around cities, advanced propulsion concepts, flame dynamics for shipboard fire safety, jet noise reduction, and other disciplines of continuum computational physics as required to further the overall mission of NRL. The specific objectives of the LCP&FD are to develop and maintain state-of-the-art analytical and computational capabilities in fluid dynamics and related fields of physics; to establish in-house expertise in parallel processing for large-scale scientific computing; to perform analyses and computational experiments on specific relevant problems using these capabilities; and to transfer this technology to new and ongoing projects through cooperative programs with the research divisions at NRL and elsewhere.

The Chemistry Division conducts basic research, applied research, and development studies in the broad fields of chemical/structural diagnostics, reaction rate control, materials chemistry,

surface and interface chemistry, corrosion passivation, environmental chemistry, and ship safety/survivability. Specialized programs within these fields include coatings, functional polymers/elastomers, clusters, controlled release of energy, physical and chemical characterization of surfaces, electrochemistry, assembly and properties of nanometer structures, tribology, chemical vapor deposition/etching, atmosphere analysis and control, environmental protection/reclamation, prevention/control of fires, mobility fuels, modeling/simulation, and miniaturized sensors for chemical, biological, trace analysis and data fusion, and explosives. The Navy Technology Center for Safety and Survivability is part of NRL's Chemistry Division. To enhance protection of Navy personnel and platforms from damage and injury in peace and wartime, this Center performs research, development, test and evaluation on fire and personnel protection, fuels, chemical defense, submarine atmospheres, and damage control aspects of ship and aircraft survivability; supports Navy and Marine Corps requirements in these areas; and acts as a focus for technology transfer in safety and survivability.

The Materials Science and Technology Division conducts basic and applied research in functional and structural materials and engages in exploratory and advanced development to generate new Navy technologies and defense capabilities. The Division efforts encompass metals, ceramics, polymers, composites, and biological materials for electrical, magnetic, optical, plasmonic, chemical, mechanical, and energy technologies. Major Division focus areas include fundamental material physics, innovative device design, performance in extreme environments, power and energy, materials informatics, and the interface between materials and biology. These efforts are performed by multidisciplinary teams of materials scientists, physicists, chemists, and engineers working at the atomic, nano, microstructural, mesostructural, and macroscopic scales. The integrated use of new experimental and computational techniques accelerates new scientific understanding and innovative engineering solutions. Advanced materials synthesis, processing, characterization, diagnostic capabilities, performance prediction methods, and life-cycle management methods are developed to further new device design, prototyping, and testing methods.

The Plasma Physics Division conducts a broad theoretical and experimental program of basic and applied research in plasma physics, space plasmas, intense electron and ion beams and photon sources, atomic physics, pulsed power sources, laser physics, advanced spectral diagnostics, and nonlinear systems. The effort of the Division is concentrated on a few closely coordinated theoretical and experimental programs. Considerable emphasis is placed on large-scale numerical simulations related to plasma dynamics; ionospheric, magnetospheric, and atmospheric dynamics; nuclear weapons effects; inertial confinement fusion; atomic physics; plasma processing; nonlinear dynamics and chaos; free electron lasers and other advanced radiation sources; advanced accelerator concepts; and atmospheric laser propagation. Areas of experimental interest include laser– plasma, laser–electron beam, and laser–matter interactions, high-energy laser weapons, laser shock hydrodynamics, thermonuclear fusion, electromagnetic wave generation, the generation of intense electron and ion beams, large-area plasma processing

sources, electromagnetic launchers, high-frequency microwave processing of ceramic and metallic materials, advanced accelerator development, inductive energy storage, laboratory simulation of space plasma phenomena, high-altitude chemical releases, and in situ and remote sensing space plasma measurements.

The Electronics Science and Technology Division conducts programs of basic science and applied research and development in nanoscience and nanotechnology, surface and interface sciences, electronic materials, computational modeling and simulation, power electronics, microwave, millimeter, and sub-millimeter technology, optoelectronics, photovoltaics, and radiation effects. The activities of the Division integrate device research with basic materials investigations and with systems research and development needs.

The Center for Bio/Molecular Science and Engineering is using the tools of modern biology, physics, chemistry, and engineering to develop advanced materials and sensors. The long-term research goal is first to gain a fundamental understanding of the relationship between molecular architecture and the function of materials, then apply this knowledge to solve problems for the Navy and Department of Defense community. The key theme is the study of complex bio/ molecular systems with the aim of understanding how "nature" has approached the solution of difficult structural and sensing problems. Technological areas currently being studied include molecular and microstructure design, molecular biology, self-assembly, controlled release and encapsulation, and surface patterning and modification. Much of the research deals with the self-assembly of lipids, proteins, and liquid crystals into complex microstructures for use in advanced material applications, and the harnessing of the recognition functions of proteins and cells for the development of advanced sensors. A highly multidisciplinary staff is required to pursue these research and development programs. The Center provides a stimulating environment for cross-disciplinary programs in the areas of immunology, biochemistry, electrochemistry, inorganic and polymer chemistry, microbiology, microlithography, photochemistry, biophysics, spectroscopy, advanced diagnostics, organic synthesis, and electro-optical engineering.

The Acoustics Division conducts basic and applied research addressing the physics of acoustic signal generation, propagation, scatter, and detection with the objective of improving the strategic and tactical capabilities of the Navy and Marine Corps in the ocean and land operational environment. The Division's scientists and engineers perform collaborative research with scientists affiliated with national and international academic, private, and governmental research organizations. The Division's research spans classical and quantum physics, signal processing, the impact of fluid dynamics on the ocean sound speed field, the propagation and scatter of acoustic signals in the ocean and land environments, structural and physical acoustics including the development of microelectromechanical systems (MEMS) and nanotechnology based sensors, and the application of networked unmanned underwater vehicles and associated sensors to the Navy's antisubmarine warfare, mine countermeasures, and intelligence, surveillance, and reconnaissance missions.

The Remote Sensing Division conducts a program of basic and applied research aimed at the development of new concepts for sensors and imaging systems for objects and targets on Earth, in the near-Earth environment, and in deep space. The research, both theoretical and experimental, deals with discovering and understanding the basic physical principles and mechanisms that give rise to target and background emission and to absorption and emission by the intervening medium. The accomplishment of this research requires the development of sensor systems technology. This development effort includes active and passive sensor systems to be used for the study and analysis of the physical characteristics of phenomena that give rise to naturally occurring background radiation, such as that caused by Earth's atmosphere and oceans, as well as human-made or induced phenomena, such as ship/submarine hydrodynamic effects. The research includes theory, laboratory, and field experiments leading to ground-based, airborne, and space-based systems for use in such areas as environmental remote sensing (including improved meteorological support systems for the operational Navy), astrometry, astrophysics, surveillance, and nonacoustic antisubmarine warfare. Special emphasis is given to developing space-based platforms and exploiting existing space systems.

The Space Science Division conducts a broad-spectrum research, development, test, and evaluation program in solar-terrestrial physics, astrophysics, upper/middle atmospheric science, and astronomy. Division researchers develop instruments to be flown on satellites, sounding rockets, and balloons; specialized ground-based facilities; and mathematical models. Researchers apply these and other capabilities to the study of the atmospheres of the Sun and Earth, including solar activity and its effects on Earth's ionosphere, upper atmosphere, and middle atmosphere; laboratory astrophysics; and the unique physics and properties of celestial sources. The science is important to orbital tracking, radio communications, and navigation that affect the operation of ships and aircraft; utilization of the near-space and space environment of the Earth; and the fundamental understanding of natural radiation and geophysical phenomena.

The Space Systems Development Department (SSDD) is the space and ground support systems research and development organization of NRL's Naval Center for Space Technology. The primary objective of the SSDD is to develop command, control, communications, computers, and intelligence, surveillance, and reconnaissance hardware and software solutions to space, airborne, and ground applications to respond to Navy, Department of Defense, and national mission requirements with improved performance, capacity, reliability, efficiency, and/or life cycle cost. The Department must derive system requirements from the mission, develop architectures in response to these requirements, and design and develop systems, subsystems, equipment, and implementation technologies to achieve the optimized, integrated operational space, airborne, and ground system. These development responsibilities extend across the entire space/airborne/ground spectrum of hardware, software, and advanced technologies, including digital processing and control, analog systems, power, communications, payload command and telemetry, radio frequency, optical, payload, and electromechanical systems, as well as systems engineering.

The Spacecraft Engineering Department (SED) is the focal point for the Navy's capability to design and build spacecraft. Activities range from concept and feasibility planning to on-orbit initial operational capability for NRL's space systems. The SED provides spacecraft bus expertise for the Navy and maintains an active in-house capability to develop satellites; manages Navy space programs through engineering support and technical direction; in concert with the Space Systems Development Department, designs, assembles, and tests spacecraft and space experiments, including all aspects of space, launch, and ground support; analyzes and designs structures, mechanisms, and a variety of control systems, including attitude, propulsion, reaction, and thermal; integrates satellite designs, launch vehicles, and satellite-to-boost stages; and functions as a prototype laboratory to ensure that designs can be transferred to industry and incorporated in

Reference List:

SaxmanOne. (n.d.). *Labs*. LABS | College internship, U.S. Navy, STEM, science, research laboratory. https://www.navalsteminterns.us/nreip/labs.html