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High School
Apprenticeships
Opportunities

Arizona

Arizona State University (Tempe):
Subject area: Material Science

High school apprentices will participate in hands-on experiments that will introduce them to the idea of integrating concepts from material chemistry, mechanics of materials, and composites to understand what causes materials to fail. They will also assist the Undergraduate Apprentices in testbed preparation while learning the importance of quantifying material strength and stiffness, and how these properties are affected by the environment.

Site open: Dec 4, 2023
Site close: Feb 29, 2024

California

University of California (Los Angeles)
Subject area: Material Science

Apprentices will be actively engaged in the hands-on characterization of AlN films. They will receive comprehensive training in atomic force microscopy (AFM) operation, probing techniques, and basic IV measurements for diode characterization. Additionally, they will be adeptly instructed in the use of Python and MATLAB to craft scripts for efficient data visualization.

Site open: Dec 4, 2023
Site close: Feb 29, 2024

U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL West (Playa Vista, CA)

ARL regional sites create strong, enduring S&T partnerships—working together to solve the Army's current and future challenges. ARL regional sites leverage regional expertise and facilities to accelerate the operationalizing of science for transformational overmatch.Technical Focus Areas: Human Information Interaction, Contextual Analytics, Hybrid Human Interfaces, Integrated Analysis and Assessment, Joint Human-Agent Decision Making, Cybersecurity, Embedded Processing, Intelligent Systems.

Rolling Application

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**High School
Apprenticeships
Opportunities**

Connecticut

Yale University (New Haven)

Subject area: Material Science

The high school apprentices will develop DEM simulations to investigate the stress history of packings of frictional and non-spherical particles in 3D. Through the High School and Undergraduate Research Apprenticeship Program, the students will learn to use numerical simulations to model geological flows and have significant exposure to scientific programming, the Unix environment, and running large-scale simulations on high-performance computation clusters. The students will also be trained to communicate their research to a broad range of audiences. Apprentices will gain insight into STEM careers, graduate school applications, and DOD graduate fellowships. We expect that the students will be coauthors on a peer-reviewed publication and present their work at an internal summer research symposium and a scientific conference.

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Florida

Florida International University (Miami)

Subject area: Computer Science

The apprentice research will be focused on five overarching research projects, 1) robust deep learning systems against deep fakes, 2) extracting forensic event signatures using network science techniques, 3) big data digital forensics, 4) drone forensics with machine learning-based fingerprinting and blockchain security, 5) extracting digital signatures and information through the development of new or improved digital forensic tools. Our large projects will be broken down into small task segments to provide a full research experience for each of the apprentices. This is dependent upon the overall research project status when students arrive. Each of these subprojects will be directly related to "real world" research in which the principal investigators and key personnel are engaged but tempered to provide a suitable and full research experience.

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High School
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Opportunities

Illinois

U.S. Army Corps of Engineers Engineer Research and Development Center Construction Engineering Research Laboratory (Champaign)

Under the guidance of mentors, you will conduct research alongside staff and primary researchers. Through your participation in the AEOP program at ERDC laboratories, you will be introduced to a real-world laboratory environment as well as modern research technologies and techniques. This experience will inspire you to continue to pursue STEM disciplines as a career pursuit.

Research Areas Includes: military installation and contingency bases sustainability, enhancing socio-cultural understanding in theater operations, improving civil work facilities and infrastructure, resilient facilities and infrastructure, smart sustainable materials, installation decision support and Urban and Stability Operations

Rolling Application

U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL South (Chicago)

ARL regional sites create strong, enduring S&T partnerships–working together to solve the Army's current and future challenges. ARL regional sites leverage regional expertise and facilities to accelerate the operationalizing of science for transformational overmatch.

Technical Focus Areas: High Performance Computing, Impact Physics, Machine Learning / Data Analytics, Materials and Manufacturing, Power and Energy, Propulsion Science, Quantum Science

Rolling Application

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High School
Apprenticeships
Opportunities

Maryland

University of Maryland (Baltimore)
Subject area: Immunology

Apprentices will do both theoretical and experimental components in basic concepts in Immunology relevant to Army research. Apprentices will learn how to understand the hypothesis and design experiments. and will eventually, will individually complete research on molecular and cellular experiments.

Site open: **Dec 4, 2023**
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University of Maryland (College Park)
Subject area: Physics

The apprentice will learn to engage in theoretical work on cold-atom quantum simulators. Projects might involve, simulating many-body localization in cold-atom systems, exploring topological phases using numerical techniques, and investigating quantum phase transitions in cold atom systems.

Site open: **Dec 4, 2023**
Site close: **Feb 29, 2024**

The University of the District of Columbia
Subject area: Mechanical Engineering

The Center of Excellence for Acoustic and Seismic Sensing of Urban Environments (CEASSUE) summer apprentices will study land-atmosphere interactions in dense urban environments, by studying the effects of these interactions on propagating acoustic/seismic signals. The urban environment can modify surface exchanges with the atmosphere on a larger scale and thus affect flow fields in the area. Recovering mean profiles of wind speed, standard deviation of the vertical velocity, and turbulence intensity from acoustic propagation measurements is a well-known approach. However, the urban environment's complex reverberation, multipath, diffraction, and signature masking by building structures make this a very harsh environment for robust acoustic measurements. Therefore, coupling acoustic measurements with seismic sensing data, to identify building structure and near-surface ground properties, would enhance the accuracy of the recovered flow field parameters.

Site open: **Dec 4, 2023**

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U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL Adelphi Laboratory Center (Adelphi)

DEVCOM ARL seeks to remain at the forefront of executing the highest-quality research possible, building leaders in the scientific community, setting a bold Army-relevant science agenda and pushing beyond existing boundaries in search of new ideas.

ARL fully integrates our internal and external foundational research efforts to shape future concepts with scientific research and knowledge, and deliver technology for modernization solutions to win in the future operating environment.

Rolling Application

U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL Aberdeen Proving Ground (Aberdeen Proving Ground)

The U.S. Army Combat Capabilities Development Command, known as DEVCOM, Army Research Laboratory is the Army's research laboratory strategically placed under the Army Futures Command. ARL is the Army's sole foundational research laboratory focused on cutting-edge scientific discovery, technological innovation, and transitioning capabilities for the future Army.

Rolling Application

U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds, MD- Bi-Directional Adaptation

This project aims to revolutionize communication between Soldiers and systems, going beyond traditional methods. By focusing on real-time multimodal interactions, it will explore innovative solutions for team-level trust calibration, cohesive team dynamics, dynamic information presentation, and optimizing human-system performance in real-time. This will involve researching and developing technologies that enable Soldiers to communicate with systems as naturally and efficiently as they do with fellow humans, utilizing speech, gestures, and other forms of body language. Army Research DirectorateCompetency: Human In Complex Systems

Rolling Application

U.S. Army Combat Capabilities Development Command - Adelphi Laboratory Center - Develop real-time, In-Situ Aerosol Detection System

Develop innovative real-time, in-situ detection systems for discriminating and identifying harmful biological and chemical aerosol, such as coronavirus disease 2019 (COVID-19), bacteria, from complex atmospheric aerosol particles using multiple optical methodologies.

Rolling Application

U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds Estimating and Predicting Human Behavior

Focusing on the variability of human behavior within complex systems, this project will develop techniques to sense, interpret, and predict change in human states such as stress, fatigue, and intent. By understanding these human elements, the project aims to adapt technologies more effectively and infer the operational environment contexts, thus enabling intelligent systems to better comprehend and collaborate with their human counterparts.

Rolling Application

U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds - GNC Research with the Julia Programming Language

The Julia programming language aims to solve the "two-language" problem by being as easy to write as python and as fast to run as C. However, it is not widely used in guidance navigation and controls (GNC) communities. Transitioning work in flight simulation, control theory, state estimation, image-based navigation, reinforcement learning, and other areas goes far beyond syntax differences. We're looking for candidates with strong coding and problem-solving skills to help us figure out how to do GNC research with this new tool.

Rolling Application

U.S. Army Combat Capabilities Development Command - Adelphi Laboratory Center- Human-Guided System Adaptation

This project addresses the rapid evolution of military and civilian AI technologies. It will develop methodologies allowing Soldiers to guide the adaptation of these technologies effectively. This includes creating interfaces and protocols for Soldiers to interact with and steer the development of intelligent systems, ensuring that these technologies remain relevant, useful, and upgradable in rapidly changing combat environments.

Rolling Application

U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds - Human-System Teaming

This project seeks to understand and leverage dynamic interactions within human-system teams. It will develop principles for effective collaboration between Soldiers and intelligent systems, focusing on emergent team properties, variability in performance, shared situational understanding, and dynamic task allocation. Special emphasis will be on adapting to changing conditions, such as loss of capabilities, shifting goals, and adversarial interference.

Rolling Application

U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds -Hybrid Human-Technology Intelligence

The focus here is on anti-disciplinary research to enhance human-system teams in multi-domain operations. This involves pioneering hybrid approaches that integrate human cognitive capabilities with advanced technology. The project will study the bottlenecks in human cognition, develop technological solutions to overcome these, and explore new methods to leverage human neural processing for creating or enhancing intelligence within human-system teams.

Rolling Application

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U.S. Army Combat Capabilities Development Command-Aberdeen Proving Grounds

The project is focused on growth, synthesis, metrology and functional (optical, electrical, magnetic, electromagnetic) property characterization of semiconductor and metal quantum dots, nanotubes, and two-dimensional (2D) nanomaterials. Metrology tools involve electron microscopies, surface probe microscopies, X-ray crystallography and a suite of spectroscopic techniques including Raman, UV-Visible. Specific properties of interest are electrical and thermal transport, magneto-optical effects, linear and non-linear optical (NLO) effects, strong light-matter interaction, plasmonic and polaritonic effects. The interns work with senior researchers and learn nanomaterials synthesis and characterization techniques, physics of nano and quantum materials and develop device concepts and assembly for applications in photonics, electronics, and magnetics.

Rolling Application

Massachusetts

Massachusetts Institute of Technology (Cambridge)
Subject area: Biology

Apprentices will learn the organization of species that will be precisely controlled through DNA hybridization. They will evaluate its impact on biofilm formation and metabolism with the modification of Geobacter and Shewanella with different sequences of DNA and patterning electrodes with complementary sequences. Optimization of this patterning protocol will be the goal of the summer research. When combined, metabolic and redox state analysis will provide a foundation to address our hypotheses regarding the impact of interspecies spacing and orientation on nutrient sharing and metabolite transport. From these data, we can inform and refine both our approach to patterning and the specific patterns chosen to investigate emergent phenotypes observed or engineer the coculture for specific applications.

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U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL Northeast (Boston)

ARL regional sites create strong, enduring S&T partnerships−working together to solve the Army's current and future challenges. ARL regional sites leverage regional expertise and facilities to accelerate the operationalizing of science for transformational overmatch.

Technical Focus Areas: Materials & Manufacturing Sciences, Artificial Intelligence & Intelligent Systems, Cyber & Secured Comms at the Tactical Edge

Rolling Application

New York

Cornell University (Ithaca)
Subject area: Chemistry

The apprentices will conduct DSC (Differential Scanning Calorimetry) measurements to determine the freezing points of these fluids as a function of pore size and mineralogy. Apprentices will work collaboratively to elucidate the crystallization of fluids in confinement, as discussed in a recent article on benzene crystallization. The anticipated scientific outcomes include the determination of the changes in freezing points as a function of pore size, fluid chemistry, water-hydrocarbon mixtures, and the crystallization behavior of confined fluids. During the first half of the 10-week summer experience, the apprentices will investigate the freezing behavior of single-component fluids. In the second half, the apprentices will build on this understanding and extend these studies to include two-component fluid mixtures.

Site open: Dec 4, 2023
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New York University (New York)
Subject area: Computer Science

Apprentices will research single qubits, the idea of this topic is to familiarize apprentices with key concepts of quantum mechanics and learn to transpose them in terms of circuits using Qiskit. After getting familiar with what a qubit is, the apprentice will learn how to represent it and how to control it using Qiskit, we move on to a larger system. Apprentices will then look into Quantum State

Tomography, this is how one can determine the effect of a circuit on an arbitrary state. Fully characterizing the state of a quantum state requires performing a tomography of the state. Finally, apprentices will learn about the impact of noise on a qubit with the methods that can be used to characterize a qubit. In the second half of the summer program, we focus on experimental realizations of basic quantum tools.

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State University of New York (SUNY) (Buffalo)
Subject area: Computer Science
The apprentice will be learning the basics of simple and well-established neural networks. Apprentices will be tasked with custom-designing a neural network that performs a distinct task. The task assigned will focus on simple classification tasks, i.e., the ability of a neural network to be trained to identify a category of one input by examining its features. Apprentices will then test their network and report on their findings.

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U.S. Military Academy at West Point (West Point)
At West Point, apprentice research is organized and executed through centers and institutes. These centers and institutes, along with the Academic Research Division provide the infrastructure necessary to tackle the Army and nation's most challenging problems. Ongoing research is focused on solving current and future Army challenges using a diverse, interdisciplinary team of experts.

Rolling Application

Ohio
Miami University (Oxford)

High School
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Subject area: Physics

High school and undergraduate apprentices pair will build a diode laser system capable of detecting nuclear spin in alkali atoms. The apprentices are provided the optical components, machined mounts, and required electronics for current-driving, temperature-stabilizing, and frequency-scanning the laser diode, and are asked to build the laser system from scratch. Manual-style written instructions are provided to them. In 2024 we will add another extremely useful device to the list - the Spatial Light Modulator (SLM), which enables real-time manipulation of the amplitude and phase of an electromagnetic wavefront, and is widely used in laser pulse shaping and microscopic laser surgery. The EOM, AOM, and SLM are invaluable tools in the burgeoning field of quantum information processing, and we have set aside 2 weeks to train the apprentice pair on them.

Site open: Dec 4, 2023
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Tennessee

University of Memphis

Subject area: Mechanical Engineering

High school apprentices will research IR-based grain surface temperature. By designing a measurement method for mm-sized objects whose temperature can be independently measured using thermocouples. To develop a reliable technique to measure grain surface temperature, a surface temperature measurement method that uses measured flux of IR photons from a mm-sized sphere will be designed by the high school student intern. The thermal energy balance of the object will be used to guide the design of a surface temperature method to predict conditions where the most sensitivity (or highest signal-to noise ratio) may be obtained. Standard techniques to analyze IR images of single grains will be used to infer surface temperature (along with uncertainties) from the measured IR fluxes. The results of such a surface temperature measurement technique would allow validation of the temperature predictions produced by modeling in the parent ARL award. The detection of IR photons emitted by grains will be used to infer the average temperature of the grains and the surface temperature of individual grains.

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Texas

U.S. Army Combat Capabilities Development Command Army Research Laboratory - ARL South (South, Austin/San Antonio/College Station)

ARL regional sites create strong, enduring S&T partnerships—working together to solve the Army's current and future challenges. ARL regional sites leverage regional expertise and facilities to accelerate the operationalizing of science for transformational overmatch.

Technical Focus Areas: AI/ML for Autonomy, Energy/Power, Cybersecurity, Bio, Materials & Manufacturing

Rolling Application

Virginia

George Mason University (Fairfax)
Subject area: Computer Science

Apprentices will implement efficient and robust mmWave communication protocols that include robust beam sweeping and beam hopping schemes, Low-probability-of- intercept, and low-probability-of-detect communication schemes with active obfuscation on the mmWave signals. In the beam sweeping phase, Tx and Rx aim to find a set of best tx and rx beam patterns (sectors) at both sides to achieve a good tradeoff between high signal-to-noise ratio (SNR) and spatial diversity. In the beam hopping phase, Tx and Rx will hop among different beam patterns in order to achieve a low probability of detection against Eve and a low probability of disruption against the jammer. Various online learning protocols will be implemented, including multi-armed bandit (MAB), Q-learning, safe reinforcement learning (RL), etc. These learning algorithms aim to deal with the uncertainty brought by the dynamics of the environment as well as the jamming behavior. The safe RL algorithm aims to meet a quality-of-service (QoS) performance (e.g., short-term BER or delay lower than a threshold) during the entire exploration and exploitation process. Different system parameter settings will be examined, including transmission power, distance between different parties and their relative positions, Tx/Rx patterns, learning and exploration rates, static and mobile scenarios, etc.

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