Opportunity Title: Computer Science & Engineering: Information Technology Laboratory Summer Internship
Opportunity Reference Code: ERDC-ITL-2023-0033

Organization U.S. Department of Defense (DOD)

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How to Apply Click on *Apply* now to start your application.

Description The USACE Engineering Research and Development Center is headquartered in Vicksburg, MS, and employs scientists and engineers in laboratories throughout the United States to pursue cutting edge research for both civil and military projects. As a part of the Information Technology Laboratory, the High Performance Computing Modernization Program enables the DoD's research, acquisition, and operations of world-class, state-of-the-art, high-performance computing capabilities.

Project: Use a subset of the Rareplanes dataset to detect various categories of aircraft on a tarmac. Establish a tight bounding box around the objects. Use several advanced inpainting techniques to remove all objects of chosen category from the overhead photograph. Use the inpainting result as input into a generative adversarial network (GAN) to generate high-quality imagery with aircraft removed. Perform analysis workflow to compare GANs and inpainting results. Develop a small design of experiments to compare several variations of the GANs algorithms and parameter changes. Visualize results.

What will I be doing?

A subset of the Rareplanes dataset will be provided to you. Previously-developed workflow code will be introduced and demonstrated, with an accompanying question-and-answer session. Tutorials describing previous, similar research will be provided and demonstrated as an example of applied workflow, but significant changes will be required to adapt to the new scenario. The parameter sets for inpainting and GANs will be discussed in detail with you, and a relatively-small design of experiments (DoE) will be agreed-upon. A conda environment will be constructed by you on VULCANITE, and the research will be exercised to build a complete product by-hand. Then batch scripts will be built, based upon this “by-hand” research, to explore the space governed by the agreed-upon design of experiments. This will likely be an iterative process, comprised of debug sessions and work-arounds for intermittent problems. Upon successful completion of the DoE batch runs, a sensitivity analysis will ensue to quantify the contribution of various parameters to the global results.

You will meet twice weekly with your mentor to discuss progress and any problems discovered and brainstorm solutions and discuss possible workarounds, perhaps involving other ERDC experts in ITL and its sister laboratories. You will join in-house discussions and meetings, with engineering experts related to the project to see how it fits into the “bigger picture” of current research. Additionally, you will attend weekly branch meetings to meet Computational Analysis Branch personnel, to hear project descriptions outside the assigned project, and to develop an understanding of the mechanics of engineering problem solving in a real-world setting.

You will be introduced to ITL HPC experts to discuss elements of the hardware and the software systems associated with the summer project. You will tour the publicly-accessible HPC facilities to acquire a sense of the scale of the operation, the professionalism of the engineering team engaged in the research, and the complexity of the engineering decisions involved in supercomputing maintenance and upkeep.

Under the guidance of a mentor, you will create a brief technical report that defines the project problem space, scenarios chosen, the Rareplanes data used to represent the problem,

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visualization options reviewed, and analytic methods employed to address the problem. The final workflow will be fully described using HPC scripts and artifacts to delimit its research extent and to aid future replication of the project, if desired.

You will present project results at a formal presentation on the dates set aside by the HPC Modernization Program Office and there answer project-related questions at the Q&A session following the presentation.

Why should I apply? This fellowship provides the opportunity to independently utilize your skills and engage with experts in innovative ideas to move the proposed research forward.

Where will I be located? Vicksburg, Mississippi

What is the anticipated start date? Summer 2023 - Exact start date will be determined at the time of selection and in coordination with the selected candidate.

What is the appointment length? This appointment is a summer research appointment. Appointments may be extended depending on funding availability, project assignment, program rules, and availability of the participant.

What are the benefits? You will receive a stipend to be determined by the sponsor. Stipends are typically based on a participant's academic standing, discipline, experience, and research facility location. Other benefits may include the following:

- Health Insurance Supplement (*Participants are eligible to purchase health insurance through ORISE)*
- Relocation Allowance
- Training and Travel Allowance

About ORISE

This program, administered by Oak Ridge Associated Universities (ORAU) through its contract with the U.S. Department of Energy (DOE) to manage the Oak Ridge Institute for Science and Education (ORISE), was established through an interagency agreement between DOE and DoD. Participants do not enter into an employee/employer relationship with ORISE, ORAU, DoD or any other office or agency. Instead, you will be affiliated with ORISE for the administration of the appointment through the ORISE appointment letter and Terms of Appointment. Proof of health insurance is required for participation in this program. Health insurance can be obtained through ORISE. For more information, visit the ORISE Research Participation Program at the U.S. Department of Defense.

Qualifications

The qualified candidate will be a STEM major and completed Calculus 1 and 2 with intermediate programming skills in Python and/or R.
Elementary statistics, some experience with Linux (or BSD-derived) operating system preferred.

Security Investigation: Applicants should be able to pass a National Agency Check and Inquiries (NACI) security investigation should they be selected and accept the internship offer.

Application Requirements

A complete application consists of:

- Zintellect Profile
- Educational and Employment History
- Essay Questions (goals, experiences, and skills relevant to the opportunity)

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- Resume (PDF)
- Transcripts/Academic Records - For this opportunity, an official transcript or copy of the student academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. Click here for detailed information about acceptable transcripts.
- One recommendation. Your application will be considered incomplete and will not be reviewed until one recommendation is submitted. We encourage you to contact your recommender(s) as soon as you start your application to ensure they are able to complete the recommendation form and to let them know to expect a message from Zintellect. Recommenders will be asked to rate your scientific capabilities, personal characteristics, and describe how they know you. You can always log back in to your Zintellect account and check the status of your application.

Submitted documents must have all social security numbers, student identification numbers, and/or dates of birth removed (blanked out, blackened out, made illegible, etc.) prior to uploading into the application system. All documents must be in English or include an official English translation. If you have questions, send an email to USACE@orise.orau.gov. Please list the reference code of this opportunity in the subject line of the email. Please understand that ORISE does not review applications or select applicants; selections are made by the sponsoring agency identified on this opportunity. All application materials should be submitted via the “Apply” button at the bottom of this opportunity listing. Please do not send application materials to the email address above.

Connect with ORISE...on the GO! Download the new ORISE GO mobile app in the Apple App Store or Google Play Store to help you stay engaged, connected, and informed during your ORISE experience and beyond!

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** High School Diploma/GED, Associate's Degree, Bachelor's Degree, or Master's Degree received within the last 60 months or currently pursuing.
- **Overall GPA:** 3.00
- **Discipline(s):**
  - **Computer, Information, and Data Sciences** (17 👁)
  - **Engineering** (27 👁)
  - **Mathematics and Statistics** (11 👁)
  - **Physics** (16 👁)
- **Age:** Must be 18 years of age
- **Veteran Status:** Veterans Preference, degree received within the last 120 month(s).