Opportunity Title: Computational Researcher - Mathematics, Engineering, Physics
Opportunity Reference Code: AFRL711HPW-2019-0027

Organization U.S. Department of Defense (DOD)

Reference Code AFRL711HPW-2019-0027

Description

Who are we?

The Air Force Research Laboratory (AFRL) leads the discovery, development and delivery of the warfighting technologies for our air, space and cyberspace forces. We're pushing the boundaries and creating a new tomorrow through unparalleled research.

The Bioeffects Division of the AFRL leads the mission to exploit and protect against bio-effects of battlefield environmental stressors. Specific objectives include facilitating directed energy weapons development and use and preventing mission degradation due to directed energy exposure, enabling our forces to function safely, effectively, and efficiently on the directed energy battlefield.

What will you be learning?

This research opportunity involves creating a numerical toolbox for fractional calculus, which is a powerful branch of mathematics dealing with differentiation and integration of arbitrary order. Research has shown that biophysical processes, such as laser-tissue interaction, deviate from the predictions given by traditional mathematical models for short laser exposure times. In general, it was found that the shorter the exposure time is, the stronger the deviation will be. However, generalizing these models by recasting them as fractional order differential equations have resulted in models that show high agreement with experimental observation regardless of exposure duration.

As an ORISE participant you will not only have the unique opportunity to learn about these methods from leaders in the field, but will also apply them in a research-industry setting. First you will perform an initial literature survey to see what algorithms and methods already exist so that they may be replicated inside of the toolbox/library. This provides opportunities for hands-on learning including writing examples as well as routines for error analysis/performance metrics. The result will be the development of models that have the capability to simulate combinations of different biophysical processes that occur during directed energy exposure.

Where will you be learning?

This research opportunity takes place at the Tri-Service Research Laboratory located near San Antonio, TX at Fort Sam Houston (https://www.visitsanantonio.com/).

Why Apply?

This ORISE (https://orise.orau.gov/) research opportunity will allow you help solve some our most challenging scientific problems. As a result you will gain hands-on research experience for a high profile government agency. You will also gain exposure to top research scientist in your field and be able to network with other ORISE participants and add to your

professional network.

Appointment Length

This appointment is a twelve month research appointment, with the possibility to be renewed for additional research periods. Appointments may be extended depending on funding availability, project assignment, program rules, and availability of the participant.

Participant Benefits

Participants will receive a stipend to be determined by **USAFRL.** Stipends are typically based on the 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

Nature of Appointment

The participant will not enter into an employee/employer relationship with ORISE, ORAU, DOD, or any other office or agency. Instead, the participant will be affiliated with ORISE for the administration of the appointment through the ORISE appointment letter and Terms of Appointment.

Qualifications

Participant is expected to have working knowledge and experience with implementing numerical methods for solving differential equations in the C and/or Python programming languages. A background in mathematics, engineering, and/or computational physics would be favorable.

How to Apply:

Components of the online application are as follows:

- Profile Information
- Educational and Employment History
- Essay Questions (goals, experiences, and skills relevant to the opportunity)
- Resume (PDF)
- Transcripts/Academic Records - For this opportunity, an unofficial 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.
- 1 Recommendation(s)

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

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system.

If you have questions, send an email to **AIRFORCE@orise.orau.gov**. Please list the reference code of this opportunity in the subject line of the email.

All documents must be in English or include an official English translation.

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Master's Degree or Doctoral Degree received within the last 60 months or currently pursuing.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (2)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Other Non-Science & Engineering** (2)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (27)