

Opportunity Title: Physics-based machine learning approach for investigating the oxidation of metallic alloys

Opportunity Reference Code: AFIT-2020-0019

Organization U.S. Department of Defense (DOD)

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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 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.

Letter of Recommendation: While a letter of recommendation is not required to be considered, applicants are required to provide contact information for one recommendation in order to submit the application. Applicants are encouraged to request a letter of recommendation before submission as this may help reviewers have a better understanding of the applicant's qualifications and interests. If selected, a letter recommendation must be submitted on your behalf upon acceptance of the appointment.

Description AFIT's mission is to help build America's airpower by educating military and civilian Airmen to innovatively accomplish the Air Force's core missions in support of joint operations more effectively, efficiently, sustainably and affordably. We provide unique defense-focused, research-enabled, multi-disciplinary advanced academic education, as well as globally delivery of career-long, action-based, functional professional continuing



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education over a continuum of learning, on-command and on-demand. Our success is measured by the career-long contributions of our graduates, faculty and staff. AFIT accomplishes this mission through four schools: the Graduate School of Engineering and Management, the School of Systems and Logistics, the Civil Engineer School, and the School of Strategic Force Studies. To learn more about the research performed at AFIT, please visit www.afit.edu.

A research opportunity is currently available at the Air Force Institute of Technology (AFIT), Department of Engineering Physics (ENP), located at Wright-Patterson Air Force Base in Ohio.

The research participant will become part of an exciting computational research project to apply quantum mechanics, machine learning, genetic algorithms and Monte Carlo simulations to investigate the high temperature oxidation of structural materials for applications in the field of hypersonics. Under the guidance of a mentor, the research participant will contribute to the collection of data from first-principles calculations. The participant will develop skills in data processing by contributing to a python code for a potential function representation of the first-principles data or on-the-fly processing of ab initio molecular dynamics data. In addition, the intern will gain experience performing Monte Carlo simulations on materials in conjunction with other tools. The participant will contribute to the development of computational code to retrieve, transform and process data to address various needs associated with the research mission in order to develop our current understanding of the oxidation process in metal alloys and inform our design of next generation materials. The research participant may collaborate with the mentor and a project team on data processing and material modeling.

Research learning objectives may include:

- Learning innovative ways to apply machine learning within the field of material science to support next-generation high-throughput modeling approaches.
- Learning about high temperature oxidation and developing tools for an efficient modeling and prediction of the process.
- Gaining experience writing computational research code for different purposes including machine learning, Monte Carlo simulations, and the processing of data.
- Collaborating with other modelers within the team to gain a better understanding of emerging needs in structural materials modeling for hypersonics technology.

The research participant will receive continued training on writing and publishing peer-reviewed research manuscripts, and may develop in-person and remote communication skills through internal and external presentation of research findings.

This appointment is a four month research appointment, with the

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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 **AFIT**. 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



- Junior or senior undergraduate students majoring in physics, chemistry, materials science, mechanical or nuclear engineering or closely related disciplines.
- Some programming experience is necessary. Programming experience in Python is preferred.
- A minimum overall GPA of 3.1 is required for this opportunity.
- Experience with using supercomputers for computational work is a plus.

Eligibility Requirements

- **Citizenship:** LPR or U.S. Citizen
- **Degree:** Currently pursuing an Associate's Degree or Bachelor's Degree to be received by 5/31/2021 11:59:00 PM.
- **Overall GPA:** 3.10
- **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 )

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- **Science & Engineering-related** (1 )
- **Social and Behavioral Sciences** (27 )
- **Veteran Status:** Veterans Preference, degree received within the last 120 month(s).