Opportunity Title: Unsupervised Machine Learning for Extraction of 3D, High-Res Mode shapes/Vibrating Structures
Opportunity Reference Code: DOE-MSIPP-19-11-LANL

Organization Department of Energy (DOE)

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How to Apply A complete application must include the following to be considered:

- Completion of all required fields in the application and successful application submission
- Undergraduate or graduate transcripts as appropriate
- Two recommendations

If you have questions, send an email to us at MSIPPinternships@orau.org . Please include the reference code for this opportunity in your email.

For Technical information, contact David Mascarenas at dmascarenas@lanl.gov

Application Deadline 1/21/2019 11:59:00 PM Eastern Time Zone

Description The Minority Serving Institutions Partnership Program (MSIPP) Internships is a new program to promote the education and development of the next generation workforce in critical science, engineering, technology, and math (STEM) related disciplines that complement current and future missions of DOE national laboratories. The MSIPP Internship program is designed to provide an enhanced training environment for next generation scientists and engineers by exposing them to research challenges unique to our industry.

MSIPP Interns will be given the opportunity to complete Summer Internships aligned with ongoing U.S. Department of Energy Office of Environmental Management (DOE-EM) research under the direction of a host national laboratory. The internship will be performed at the host national laboratory, utilizing their facilities and equipment under the guidance of a research staff member.

Minority Serving Institutions are institutions of higher education enrolling populations with significant percentages of undergraduate minority students.

For more information about The Minority Serving Institutions Partnership Program (MSIPP) Internships, please visit http://srnl.doe.gov/msipp/internships.htm.

To see all MSIPP position postings visit: https://orise.orau.gov/msipp/

Project:

Full-field, high-resolution, blind-source separation-based methods for structural identification from video measurements have shown significant potential for enabling practical structural health monitoring solutions. These techniques have been shown to be able to detect 3% loss in stiffness in structures using only low-cost video measurements. This class of techniques have been shown to be extended to cases where temporal aliasing may occur [3], thus mitigating the need for the use of high speed imagers. Techniques have also been developed to allow these techniques to work when the imager is subject to its own motion and these techniques are expected to extend to the case where the structure under consideration is undergoing its own rigid-body motion. These techniques are also imager agnostic and have even been ported to exotic event-based imagers. The fact that these techniques work on the principle of finding statistically independent motion in video suggests they will naturally be resistant to noise caused by atmospheric scintillations. The work completed to date on this class of algorithms coupled with the low-cost associated with imagers suggest their continued development should be pursued to enable a framework that allows their use in the field for a variety of structural dynamics applications. One of the major advantages of imagers is their low-cost and the continued improvement of the technology driven by the consumer market. For example modern smart phones can have cameras capable of collecting images at 960 frames per second. The growth in the ubiquity of imagers suggests it would be wise to extend these techniques to capture and fuse data across multiple

imagers to obtain 3D mode shape estimates. The goal of this work is to extend our techniques to fuse data across multiple imagers, and then use unsupervised machine learning algorithms to extract 3D mode shapes from this data automatically. This work could have a signifigant impact on monitoring the next generation of infrastructure.

Location: This internship will be located at Los Alamos National Laboratory.

Salary: Selected candidate will be compensated by either a stipend or salary, and may include one round trip domestic travel to and from the host laboratory. Stipends and salaries will be commensurate with cost of living at the location of the host laboratory. Housing information will be provided to interns prior to arrival at the host laboratory, and will vary from lab to lab.

Application Deadline: January 21, 2019

Expected Start Date: May 28, 2019

Qualifications

Eligible applicants must:

- Be a citizen of the United States,
- Be at least 18 years of age**,**
- Currently enrolled as a full-time undergraduate or graduate student at an accredited Minority Serving Institution, https://orise.orau.gov/msipp/documents/approved-msi-school-list.pdf,
- Working toward a science, technology, engineering, or mathematics (STEM) degree,
- Have an undergraduate or graduate cumulative minimum Grade Point Average (GPA) of 3.0 on a 4.0 scale, and
- Pass a drug test upon selection to participate in the MSIPP. The process and timing for drug testing varies from lab to lab. Use of Marijuana/Cannabis or its derivatives if prescribed is legal in some states. However, having these drugs in your system is NOT legal at United States Federal Contractor sites and National Laboratories.

Successful candidates will:

Educational background in Computer Science, Electrical Engineering, Mechanical Engineering, or Civil Engineering.

Strong Programming skills:

- Matlab, Python, OpenCV, Robot Operating System, Ubuntu Linux
- Signal/Image/Video Processing Background Structural Dynamics
- Machine Learning
- Experience using data acquisition. Controls Background
- Experience using embedded computers: Beagle Bone, Rasbery Pi, Jetson

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Currently pursuing an Associate's Degree, Bachelor's Degree, Master's Degree, or Doctoral Degree.
- **Overall GPA:** 3.00
- **Discipline(s):**
  - **Computer Sciences** (17 👁)
  - **Engineering** (27 👁)
  - **Life Health and Medical Sciences** (1 👁)
  - **Mathematics and Statistics** (11 👁)
  - **Physics** (16 👁)

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Affirmation Certification:

I certify that I am at least 18 years of age, a US citizen, and currently enrolled as a student in a degree seeking undergraduate or graduate program in a STEM field at an accredited Minority Serving Institution (MSI). Click here to verify that you are enrolled at a current MSI.