PREP Research Associate

This position is part of the National Institute of Standards (NIST) Professional Research Experience (PREP) program. NIST recognizes that its research staff may wish to collaborate with researchers at academic institutions on specific projects of mutual interest, thus requires that such institutions must be the recipient of a PREP award. The PREP program requires staff from a wide range of backgrounds to work on scientific research in many areas. Employees in this position will perform technical work that underpins the scientific research of the collaboration.

Research Title:
Computer Vision AI models for Additive Manufacturing image processing

The work will entail:

The NIST Information Technology Lab (ITL) and Engineering Lab (EL) are collaborating on a project for real-time image processing for Additive Manufacturing. To handle real-time constraints, computations on Field Programmable Gate Array (FPGA) devices will need to be enabled, likely involving both traditional Computer Vision algorithms and Deep Learning models.

We plan on instrumenting a hard real-time system that can meet the time sensitive deadlines for detecting sparks from a high-speed camera that is monitoring the interaction between the melt pool and laser. There are three methodologies to consider.

1. The camera contains a built-in FPGA that can process images as they are captured.

2. The capture card has a slightly higher-end FPGA.

3. The capture card can transfer image data into system memory, allowing the host system to process images using either the CPU, GPU, or a combination of both.

To this end, we are seeking a Computer Scientist who will focus on developing algorithms to process frames in real-time from a high frame rate camera. The processing algorithms may utilize the camera's built-in Field Programmable Gate Arrays (FPGA), the capture card's built-in FPGA, or traditional computer CPUs and GPUs.

Key responsibilities will include but are not limited to:
- Develop image analysis algorithms that target the highspeed camera's FPGA.
- Develop image analysis algorithms that target the capture card's FPGA.
- Develop image analysis algorithms that target the traditional computer's CPU(s) and GPU(s).
- Measure real-time throughput for developed image analysis workflows.
- Create AI/Deep learning workflows for training AI models for analyzing images in a series.

<u>**Qualifications**</u>

- A completed or in-process graduate degree in Computer Science, Engineering, Manufacturing, or a related field.
- 1—2 years of relevant experience.
- Familiarity with image analysis algorithms.
- Familiarity with FPGA programming.
- Familiarity with CPU and/or GPU image analysis.
- Experience with AI/Deep learning workflows, such as LSTMs.

- Ability to develop prototypes of tools needed to analyze data.
- Strong oral and written communication skills.
- US Citizen Preferred

Privacy Act Statement

Authority: 15 U.S.C. § 278g-1(e)(1) and (e)(3) and 15 U.S.C. § 272(b) and (c)

Purpose: The National Institute for Standards and Technology (NIST) hosts the Professional Research Experience Program (PREP) which is designed to provide valuable laboratory experience and financial assistance to undergraduates, post-bachelor's degree holders, graduate students, master's degree holders, postdocs, and faculty.

PREP is a 5-year cooperative agreement between NIST laboratories and participating PREP Universities to establish a collaborative research relationship between NIST and U.S. institutions of higher education in the following disciplines including (but may not be limited to) biochemistry, biological sciences, chemistry, computer science, engineering, electronics, materials science, mathematics, nanoscale science, neutron science, physical science, physics, and statistics. This collection of information is needed to facilitate administrative functions of the PREP Program.

Routine Uses: NIST will use the information collected to perform the requisite reviews of the applications to determine eligibility, and to meet programmatic requirements. Disclosure of this information is also subject to all the published routine uses as identified in the Privacy Act System of Records Notices: NIST-1: NIST Associates.

Disclosure: Furnishing this information is voluntary. When you submit the form, you are indicating your voluntary consent for NIST to use of the information you submit for the purpose stated.