

## 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 and thus requires that such institutions be the recipients 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. A candidate hired for this position will be through the university that is associated with the NIST PREP program and will be an employee of that University. For example, see [Professional Research Experience Program \(PREP\) | Professional Research Experience Program \(PREP\) \(umd.edu\)](#)

**Research Title:** Robotics and Perception Engineer: Perception Performance of Robotic Systems

**Position Description:** The Intelligent Systems Division at NIST is investigating the performance of 3D machine vision systems for various manufacturing applications. The research will focus on integrating 3D bin-picking vision systems with robotic arms and conducting experiments to evaluate their performance. This work will support the development of new metrics and standards for these systems.

### Duties:

- Integrate robot arms and commercial bin-picking systems into the NIST/ISD bin-picking testbed.
- Program collaborative robot arms for conducting various tasks and experiments.
- Research the effects of various factors (part color, part surface properties, bin color, bin depth, ratio of part size to bin size, part distribution in a bin) on bin picking performance (e.g., cycle time, pose uncertainty, etc.).
- Collect data from various 3D imaging systems.
- Design and develop 3D printed artifacts and optimize 3D printer parameters for improved quality of the 3D prints.
- Use metrology systems (e.g., laser trackers, CMMs, etc.) for establishing reference measurements.
- Use analysis software (e.g., Python, MATLAB, Spatial Analyzer, Polyworks, Excel, etc.) to interpret results and produce visualizations.
- Assist in the development of demonstrations for trade shows and conferences.
- Write reports and contribute to peer-reviewed publications.
- Work schedule: On-campus (Gaithersburg, MD), Full-time (40hrs/week)
- The applicant selected for this position will receive minimal training in the use of certain systems needed for the work.

### Qualifications:

- US Citizen preferred
- Education: Engineering majors with a master's degree, or in their final year of a master's degree.
- Programming experience in one or more of the following computer languages: Python, Java, C#
- Experience with the following:
  - Using the Robot Operating System (ROS2) for visualizing and controlling robots.

- CAD software: SolidWorks or OnShape.
- Using 3D printers (polymer and resin based) and optimizing 3D printing parameters.
- Using and programming in the Linux environment.
- Using MATLAB for data capture and analysis.
- Basic understanding of
  - Robot control theory (DH parameters, kinematics, etc.)
  - 3D sensors such as LiDAR or RGBD cameras
  - Programming robot forward and inverse kinematics
  - 3D point cloud data processing techniques using Point Cloud Library (PCL - <http://pointclouds.org>), CloudCompare, or other similar tools
  - Robotic bin picking systems
  - Using metrology tools such as CMM arms and metrology software.

## 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 the information you submit for the purpose stated.