PREP Research Associate

This position is part of the National Institute of Standards and Technology (NIST) Professional Research Experience Program (PREP). NIST recognizes that its research staff may want to collaborate with researchers at academic institutions on specific projects of mutual interest and, therefore, requires those institutions to be recipients of a PREP award. The PREP program involves staff from a wide range of backgrounds conducting scientific research across various fields. Individuals in this position will perform technical work supporting the collaboration's scientific research.

Research Title:
Performance Evaluation of AI Capabilities in Autonomous and Human-Robot Interaction (HRI) Systems

The work will entail:
To support the National Institute of Standards and Technology's Measurement Science for Manufacturing Robotics and Autonomous Systems (MSRAS) Program. The focus of this role is to advance standard test methods, metrics, and evaluation tools for artificial intelligence, machine learning, and advanced autonomy within human-robot environments, ensuring these systems operate with transparent, verifiable, and securely integrated decision-making frameworks.

U.S. Citizen Preferred

Key responsibilities will include but are not limited to:

- Conducting state-of-the-art measurement science research in robotics, advanced autonomy, and artificial intelligence systems.
- Utilizing deep learning, large language models (LLMs), reinforcement learning, and unsupervised machine learning techniques to enhance robot capabilities, human objective prediction, and decision-making architectures.
- Developing verification methods, transparent evaluation frameworks, and performance metrics to ensure robotic AI systems and automated sorting or ranking methodologies are inspectable and risk-aware.
- Implementing advanced filtering techniques and symbolic spatial relation models to optimize tracking, navigation, and behavioral classification in highly dynamic environments.
- Programming, simulating, and validating physical and simulated autonomous systems using a variety of modern software, libraries, and probabilistic frameworks.
- Helping develop standards, benchmark scenarios, and performance metrics for human-robot interaction (HRI), autonomous systems, and cooperative robotics integrated into complex environments.
- Developing test apparatuses, digital twins, and virtual/physical testbeds using 3D rendering, CAD, and sensor fusion tools to validate repeatability and reproducibility.
- Collaborating with interdisciplinary teams to design and optimize systems while publishing peer-reviewed research results in high-impact journals and international conferences.

<u>Qualifications</u>

- Ph.D. degree in Computer Science, Information and Computer Science, Modeling and Simulation Engineering, Aerospace Engineering, or a closely related quantitative field.
- Experience in: Deep learning models, large language models (LLMs), unsupervised clustering, autoencoders, probabilistic programming, AI planning tools, human-robot interaction, activity/intent recognition, path planning algorithms, state estimation, algorithmic auditing, explainable AI frameworks, usability studies, human-in-the-loop validation, risk-aware system design, 3D rendering, discrete event simulation, motion capture data integration, and inertial navigation system architectures.
- Proficiency in: Python, C/C++, Java, MATLAB, exposure to functional or specialized languages (e.g., Common Lisp), PyTorch, TensorFlow, ROS, OpenGL, probabilistic graphical libraries, LaTeX, 3D CAD modeling, 3D Printing workflow management, and modern developer tooling.

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.