Opportunity Title: Heterogeneous operating in dynamic and unstructured environments
Opportunity Reference Code: ARL-R-SIS-400041-F1

Organization DEVCOM Army Research Laboratory

Reference Code ARL-R-SIS-400041-F1

Description This research develops computational methods that enable robots to perceive and
understand their environment; move, see, orient and collaborate in complex missions with
limited human intervention. As the focus is on robots that can be applied to the Army
domain, of particular interest are highly efficient, robust, and agile methods that exhibit
excellent properties with limited computational power, storage, and bandwidth.

Opportunities exist in the following areas:

- Robust perimeter defense systems
- Robotic autonomy in mixed-initiative operations
- Collaboration of heterogeneous robot teams in communications-limited environment
- Autonomous navigation at operational tempo
- Detection and tracking of moving objects from stationary and moving robots
- Multi-robot object tracking, classification and recognition
- GPS-denied localization of robots and objects in the scene
- Reasoning over semantic concepts
- Fusion of information from heterogeneous sensors for robot missions
- Optimization of complex algorithms for computationally limited platforms
- Experimentation and validation methods in robotics
- Adaptive sampling of information in decision-making
- Decision-making algorithms for human-robot collaborative tasks
- Game theory applied for multi-agent learning
- Distributed optimization communication for collaborative multi-robot tasks
- Multi-robot multi-task using Graphical Neural Networks (GNN)
- Multi-robot navigation using reinforcement learning techniques

ARL Advisor:

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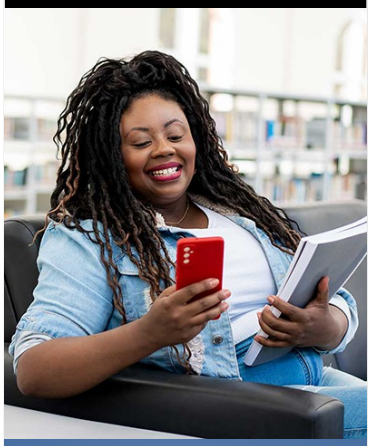
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About ARD

ARL's Army Research Directorate (ARD) focuses on exploiting concept

DEVCOM ARMY RESEARCH LABORATORY

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development, discovery, technology development, and transition of the most promising disruptive science and technology to deliver to the Army fundamentally advantageous science-based capabilities through laboratory's 11 research competencies. This intramural research directorate also manages the laboratory's essential research programs, which are flagship research efforts focused on delivering defined outcomes.

About ARL-RAP

The Army Research Laboratory Research Associateship Program (ARL-RAP) is designed to significantly increase the involvement of creative and highly trained scientists and engineers from academia and industry in scientific and technical areas of interest and relevance to the Army. Scientists and Engineers at the CCDC Army Research Laboratory (ARL) help shape and execute the Army's program for meeting the challenge of developing technologies that will support Army forces in meeting future operational needs by pursuing scientific research and technological developments in diverse fields such as: applied mathematics, atmospheric characterization, simulation and human modeling, digital/optical signal processing, nanotechnology, material science and technology, multifunctional technology, combustion processes, propulsion and flight physics, communication and networking, and computational and information sciences.

About SCIENCE OF INTELLIGENCE SYSTEMS (SIS)

Explores foundational concepts and builds cumulative capabilities to simultaneously address multiple axes of complexity for future Robotics and Autonomous Systems (RAS) operational concepts.

A complete application includes:

- **Curriculum Vitae or Resume**
- **Three References Forms**
  - An email with a link to the reference form will be available in Zintellect to the applicant upon completion of the on-line application. Please send this email to persons you have selected to complete a reference.
  - References should be from persons familiar with your educational and professional qualifications (include your thesis or dissertation advisor, if applicable)
- **Transcripts**
  - Transcript verifying receipt of degree must be submitted with the application. Student/unofficial copy is acceptable

If selected by an advisor the participant will also be required to write a **research proposal** to submit to the ARL-RAP review panel for :

- Research topic should relate to a specific opportunity at ARL (see Research Areas)
- The objective of the research topic should be clear and have a defined

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outcome
- Explain the direction you plan to pursue
- Include expected period for completing the study
- Include a brief background such as preparation and motivation for the research
- References of published efforts may be used to improve the proposal

Questions about this opportunity? Please email ARLFellowship@orau.org.

Qualifications

Discipline(s):

- Robotics
- Control Engineering
- Electrical and Computer Engineering
- Electronics Engineering
- Computer, Information and Data Sciences
- Mathematics and Statistics
- Physics

Preferred Qualifications:

- Experience with robotics hardware (e.g., sensors, actuators, motors).
- Familiarity with computer vision and image processing techniques.
- Knowledge of AI and autonomous systems.
- Proficiency in Python and C++.
- Experience with MATLAB.
- Robotics Frameworks: Familiarity with ROS 1 or ROS 2 for robotics applications,
- including building, deploying, and debugging robotic systems.

Point of Contact ARL-RAP

Eligibility Requirements

- **Degree:** Bachelor's Degree, Master's Degree, or Doctoral Degree.
- **Academic Level(s):** Associate's Degree (Journeyman Fellow), Bachelor's Degree (Journeyman Fellow), Master's Degree (Journeyman Fellow), or Doctoral Degree (Postdoctoral Fellow).
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (2)
  - **Computer, Information, and Data Sciences** (17)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (51)
  - **Mathematics and Statistics** (11)
  - **Physics** (16)
  - **Science & Engineering-related** (2)
  - **Social and Behavioral Sciences** (29)