Opportunity Title: Resource Constraint adaptive computing: Algorithm and optimization for ARL Autonomy Stack
Opportunity Reference Code: ARL-R-CISD-300163-NCCS

Organization	DEVCOM Army Research Laboratory
Reference Code	ARL-R-CISD-300163-NCCS
Description	**About the Research**

There is an internship opportunity from Army Research Laboratory at Aberdeen Proving Ground for graduate students with US. citizenship or green card holder. The ARL team is mainly focus on optimizing computationally expensive perception algorithms of Autonomy stack. Autonomous vehicles use various sensors such as RGB camera and Lidar to sense the environment and build the world map for autonomous maneuver. ARL autonomy stack has many perception algorithms including object detection, semantic segmentation, image classification etc. These sensors collect large amount of data that have to be processed by multiple perception algorithms sharing the limited computing resource in real-time. At the same time, Army has SWaP (Size, Weight, and Power) requirements which significantly limit the computing and communication resources of autonomous vehicles and also limit the battery size. Therefore, ARL team will develop and apply different approaches to optimize the perception algorithms to fit in tactical unmanned vehicles (UGVs) with limited computing resources to achieve real-time operation and accomplish the mission. The student will closely work with ARL researcher in optimizing and integrating containerized ML algorithms to UGVs and evaluating the model's performance in the lab and field tests.

The position will include the following:

1). Using Python, C++, and software repositories

2). Optimizing deep learning perception algorithms

3). Using containerization technologies such as Docker to create docker image for perception algorithms to be evaluated in ROS environment.

4). Deploying machine learning algorithms in a ROS environment on UGV

5). Documenting and publishing the results in technical reports or conference papers

The candidate does not need to have all skills right now but must be willing to learn new technology.

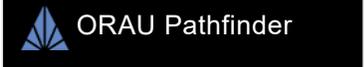*ARL Advisors: Peng Wang, Billy Geerhart*

ARL Advisor Email: peng.wang2.civ@army.mil, billy.e.geerhart2.civ@army.mil

KEYWORDS:

Deep Learning Perception model; model optimization; ROS

About Army Research Directorate (ARD)

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

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 Network Cyber & Computational Sciences (NCCS)

Sciences to enable and ensure secure resilient communication networks for distributed analytics in Multi-Domain Operations.

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.

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
- The objective of the research topic should be clear and have a defined outcome
- Explain the direction you plan to pursue

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- 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

A link to upload the proposal will be provided to the applicant once the advisor has made their selection.

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

Point of Contact	ARL

Eligibility Requirements	- **Degree:** Currently pursuing a Master's Degree or Doctoral Degree.
	- **Academic Level(s):** Any academic level.
	- **Discipline(s):**
	  - **Computer, Information, and Data Sciences** (17 👁)
	  - **Engineering** (3 👁)