

Opportunity Title: Deep Learning at the Tactical Edge
Opportunity Reference Code: ARL-NCCS-20260928-F1

Organization DEVCOM Army Research Laboratory

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How to Apply Applications must be submitted in [Zintellect](#).

A complete application includes:

1. Curriculum Vitae or Resume

- List relevant coursework and lab experience as well as all papers, presentations, or publications you may have authored or co-authored. Include any reprints or abstracts if they are available.

2. 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)

3. Transcripts

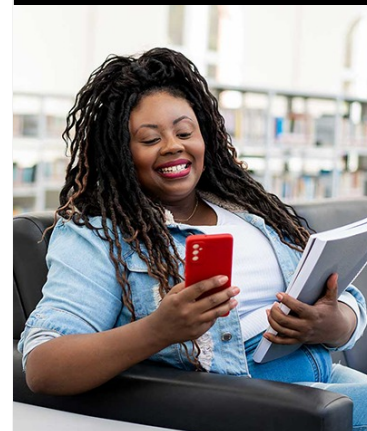
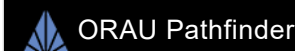
- Transcript verifying receipt of degree or current enrollment in an undergraduate or graduate program at an accredited university or technical institute. Student/unofficial copy is acceptable

4. Research Proposal

- 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
- 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

Description This opportunity seeks innovative methods to optimize diverse AI model architectures, including Large Language Models (LLMs) and transformer models for efficient deployment on resource-constrained tactical edge hardware. This opportunity addresses the critical gap created when contemporary AI models exceed the computing power and memory capacity of edge platforms, limiting real-time scene understanding and situational awareness. It emphasizes bringing inference closer to the point of need to enable low-latency, on-device reasoning for mission-critical operations such as target detection, threat assessment, autonomous navigation, and human-machine teaming. This opportunity invites both theoretical and experimental proposals spanning edge computing methods, neuromorphic architecture, multi-modal sensor fusion, hardware co-design, and improvements to specific model types like CNNs and LLMs. Ultimately, proposed solutions must balance performance, efficiency, and scalability across diverse AI models to address problems of U.S. Army interest, with



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interdisciplinary submissions encouraged.

Key Topics of Interest

- Edge computing & hardware co-design: New edge computing methods, neural architecture search, energy-efficient neuromorphic architectures, and accelerators (embedded GPUs, NPUs, FPGAs) optimized for low-latency inference in austere environments.
- AI model optimization: Improved objective functions, optimization algorithms, and abstractions to manage diverse model types and inference engines while balancing performance, efficiency, and scalability.
- Multi-modal sensing & fusion: Unified transformer-based encoders for joint reasoning over vision, language, and other sensor modalities to enable sensor fusion and real-time scene understanding.
- Model-specific advances: Enhanced CNNs (feature extraction, transfer learning, reduced overfitting) and LLMs/small transformers for the tactical edge (prompt optimization, multi-modal and continual learning, domain adaptation, improved context and reasoning).
- Mission applications: Target detection and classification, anomaly identification and threat assessment, autonomous navigation, and human-machine teaming

This opportunity seeks innovative theoretical and experimental approaches to enable efficient, reliable deployment of deep-learning models including CNNs, vision transformers, multimodal transformers, and large or small language models on resource constrained tactical-edge platforms. The objective is to close the gap between the computational and memory demands of modern AI and the limited power, size, weight, thermal, and processing capacity of deployed hardware, thereby enabling low-latency, on-device inference and reasoning in austere, communications-constrained environments. Areas of interest include edge-computing techniques, hardware–software co-design, neural architecture search, energy-efficient neuromorphic systems, and optimized embedded accelerators such as GPUs, NPUs, and FPGAs. Proposed methods should improve model efficiency through advances in objective functions, training and optimization algorithms, compression, abstraction layers, and inference-engine management while preserving accuracy, robustness, scalability, and operational reliability across heterogeneous model architectures. The opportunity also emphasizes multimodal sensing and fusion, including unified transformer-based encoders that jointly reason over vision, language, and other sensor streams to support real-time scene understanding. Model-specific advances may include improved CNN feature extraction, transfer learning, and overfitting mitigation, as well as tactical-edge LLM and transformer capabilities such as prompt optimization, domain adaptation, continual learning, multimodal reasoning, contextual understanding, and efficient inference. Solutions should ultimately support U.S. Army-relevant missions—including target detection and classification, anomaly detection and threat assessment, autonomous navigation, and

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human-machine teaming—with interdisciplinary submissions encouraged to balance mission performance, energy efficiency, and deploy ability. This opportunity seeks methods to efficiently deploy CNNs, vision and multimodal transformers, and language models on resource-constrained tactical-edge platforms. The goal is to overcome the power, memory, thermal, and compute limits of deployed hardware, enabling low-latency, on-device inference and reasoning in austere or communications constrained environments. Topics include edge-computing methods, hardware–software co-design, neural architecture search, neuromorphic systems, and optimized embedded accelerators such as GPUs, NPUs, and FPGAs. Proposed approaches should improve model efficiency, accuracy, robustness, scalability, and inference management through advances in optimization, compression, abstraction layers, and deployment frameworks. Priority areas also include multimodal sensor fusion using unified transformer encoders and model-specific improvements, such as CNN feature extraction and transfer learning, as well as LLM and small-transformer prompt optimization, domain adaptation, continual learning, contextual reasoning, and efficient inference. Solutions should support U.S. Army missions including target detection, anomaly and threat assessment, autonomous navigation, and human–machine teaming.

ARL Advisor:

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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 [Army Research Laboratory Research Associateship Program](#) (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,

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multifunctional technology, combustion processes, propulsion and flight physics, communication and networking, and computational and information sciences.

About Network Cyber & Computational Sciences (NC&CS)

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

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

Point of Contact [ARL-RAP](#)

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| Eligibility | <ul style="list-style-type: none">• Citizenship: U.S. Citizen Only |
| Requirements | <ul style="list-style-type: none">• Degree: Bachelor's Degree, Master's Degree, or Doctoral Degree.• Academic Level(s): Bachelor's Degree (Journeyman Fellow), Master's Degree (Journeyman Fellow), Doctoral Degree (Postdoctoral Fellow), Doctoral Degree 5+ years (Senior Fellow), or Faculty.• Discipline(s):<ul style="list-style-type: none">◦ Chemistry and Materials Sciences (12 )◦ Communications and Graphics Design (2 )◦ Computer, Information, and Data Sciences (17 )◦ Earth and Geosciences (21 )◦ Engineering (29 )◦ 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 ) |