

Funding Opportunity Title: Distributed Analytics in Tactical Networks

Funding Instrument Type: Cooperative Agreement

Funding Opportunity Number in Grants.gov: W911NF-23-S-0001-SPECIALNOTICE-Distributed Analytics in Tactical Networks

Description:

The aim of this Special Notice under the DEVCOM Army Research Laboratory (ARL) Broad Agency Announcement (BAA) (W911NF-23-S-0001) as amended, under Grants.gov Opportunity W911NF-23-S-0001-SPECIALNOTICE-Distributed Analytics in Tactical Networks, is to solicit proposals related to the ARL BAA Topic, "Networking Structure, Dynamics, and Protocols". The future battlefield will be increasingly complex (dynamics, scale, heterogeneity, peer adversaries) and resource constrained (bandwidth, storage, memory, computing power). This complex network must support multiple conflicting demands and must support distributed analytics at the edge. The Army is interested in collaborating with an awardee on research efforts to further develop adaptive, goal-driven, semantically-aware, distributed analytics for situational understanding at the tactical edge. Proposals are expected to focus on one of the research goals and to identify possible linkages to the other research goals.

Unless stated here, all terms and conditions in the ARL BAA W911NF-23-S-0001 as currently amended are in effect for this special notice.

Research Goals:

1. Distributed in-network reasoning with adaptive analytics at the edge. Novel frameworks and algorithms that enable analytics at the edge under limited resource availability (machine learning (ML) services, compute, memory, storage, and comms) through intelligent information management techniques. Suggested research topics for consideration are:
 - a. Adaptive networked information management, including fusion, reshaping, and deduplication/compression for resource-adaptive analytics at the point of need.
 - b. Semantic information and knowledge representation of applications and analytics performance of multimodal applications in distributed and resource constrained compute environments.
 - c. Active system querying and resource reallocation for intelligent information gathering and environment monitoring.
2. Agile AI at the Edge. Analytics at the edge must adapt not only to varying requirements (such as accuracy and latency) but also to resource availability (ML services, compute, memory, storage, and comms) and to the adversarial environment. Suggested research topics for consideration are:
 - a. Movable and adaptable AI algorithms at the point of need with resource-constrained compute and bandwidth-limited networks.
 - b. AI/ML model training and fine-tuning/adaptation at the edge, including joint approaches to move data and models.
 - c. AI/ML models that automatically adapt to adversarial attacks, providing accuracy-resilience tradeoffs.
3. Cross-layer multimodal networking and communications. Future tactical networks will comprise a multitude of diverse communication technologies and interfaces spanning the electromagnetic spectrum. Novel approaches are required to control extremely heterogeneous networks to

ensure resilience in highly dynamic tactical scenarios, adapting to meet survivability, throughput, and latency challenges. Suggested research topics for consideration are:

- a. Multi-flow multi-modal network optimization with multiple and time-varying metrics: distributed optimization and quantification of accuracy-overhead tradeoffs.
 - b. Multi-agent network control (e.g., monitoring, traffic engineering, routing, load balancing, etc.) strategies that take into account heterogeneity of communication modalities, diverse network flow objectives and priorities.
4. Network Monitoring for sensing temporal & spatial network dominance / identification of windows of opportunity (WoO): WoO will be dynamic and possibly short-lived, requiring fast accurate inferencing, which will entail efficient collection of metrics/attributes from different domains ("network state") that evolve at different time and spatial scales, and are stochastic. Suggested research topics for consideration are:
- a. Strategies to gather relevant information to infer network state and identify windows of network overmatch or vulnerability (connectivity, coverage, or capacity). Quantification of underlying accuracy-timeliness-overhead tradeoffs.
 - b. Network state prediction including duration/location of windows of overmatch/vulnerability, while accounting for incomplete information and uncertainty caused by environment and system dynamics.

Proposals are expected to focus on one of the four research goals listed above and to identify possible linkages to the other research goals.

Proposal submission:

Proposal must be submitted in accordance with the preparation and submissions instructions under BAA W911NF-23-S-0001. In order to be considered for award associated with this Special Notice, proposals must be received by 20 March 2024. The proposal content information is as specified under BAA W911NF-23-S-0001.

Evaluations will be conducted in accordance with the criteria stated in the BAA section E.1.a. for Proposals submitted against BAA Research Topics. Proposals submitted against a BAA research topic will be evaluated using the following criteria:

- i. The overall scientific and/or technical merits of the proposal.
- ii. The potential contributions of the effort to the Army mission.
- iii. The qualifications, capabilities, and experience of the proposed PI, team leader, or other key personnel who are critical to achievement of the proposed objectives.

Proposals will be subject to an Army Research Risk Assessment prior to award, in accordance with BAA section E.2.e.

Proposal evaluation is expected to be complete, and any award selections are expected to be made by 1 July 2024, with award execution by 30 September 2024. An applicant whose proposal is selected for award will be contacted by a Grants Specialist or Grants Officer.

Questions on this Special Notice:

Clarifying questions regarding this special notice may be submitted to the TECHNICAL Point of Contact listed below by 28 February 2024.

Awards:

The Government reserves the right to make multiple awards, or no award, as a result of this Special Notice. Awards will be in the form of Cooperative Agreements. The Army expects, but is not limited, to fund 3-4 awards. The expected award range is from \$500,000 to \$700,000 per award per year for 2 years. Awards will be yearly with options.

Points of Contact:

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