SOCOM23B-001: AI/ML Aided Aviation Sensors for Cognitive and Decision Optimization

ADDITIONAL INFORMATION

N/A

TECHNOLOGY AREAS:

Electronics | Information Systems | Sensors

MODERNIZATION PRIORITIES:

Advanced Computing and Software | Human-Machine Interfaces | Integrated Sensing and Cyber | Trusted AI and Autonomy

KEYWORDS:

Artificial Intelligence; Machine Learning; automation; synthetic data generation; data labeling; computer vision; deep learning; decision aiding, target recognition

OBJECTIVE:

Over the course of the last forty years aircraft have developed, acquired, and fielded sensor systems that span the electromagnetic spectrum (for example: Ultraviolet, Electro-Optics, Infra-Red, Radio Frequency). Historically, each system addressed a unique problem, and consequently was developed and manufactured by a distinct Original Equipment Manufacturer to address the corresponding requirement. While successfully accomplishing their siloed objectives, the data and information generated from these systems have yet to be leveraged by advances in Artificial Intelligence (AI) and Machine Learning (ML), particularly in Deep Learning sub-fields such as Computer Vision and Recommendation Systems. As a result, aviators today are inundated with unstructured data that prohibits the operator to make the final decision on how and when to use the information presented, and correspondingly inhibits peak performance. The objective of this topic is to develop applied research toward an innovative capability to deploy AI/ML to the edge of aircraft and their corresponding systems to enable a wave of new capabilities that increase lethality, safety, and mission effectiveness, while at the same time leveraging the large capital investments in already fielded suites of sensors.

IMPORTANT: For SOCOM instructions: please visit: https://www.defensesbirsttr.mil/SBIR-STTR/Opportunities/. Go to the bottom of the page and click the “DoD STTR 23.B” tab. Once there, go to the SOCOM STTR 23.B document.

ITAR:

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

DESCRIPTION:

There are several key innovative tasks required for this approach: The first is the establishment of the compute environment with host operating system necessary to enable the second key task, a Docker like platform where discrete sensor and data streams can be made modular and open source, to finally feed into the third task, tailorable AI/ML algorithms that leverage discrete streams of data into actionable information. As a part of this feasibility study, the proposers shall address all viable overall system design options with respective specifications on the key system attributes.

PHASE I:

Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraphs entitled “Objective” and “Description.”

The objective of this USSOCOM Phase I STTR effort is to conduct and document the results of a thorough feasibility

study (“Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I STTR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM STTR funds during Phase I feasibility studies. Operational prototypes developed with other than STTR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II:

Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on the application of AI/ML techniques for Aviation Sensors in order to optimize cognitive function and decision aiding.

PHASE III DUAL USE APPLICATIONS:

This system could be used in a broad range of military applications where legacy sensor systems have been developed, but can be enhanced through the application of AI/ML. Examples include the fusion and analysis of multiple sensor inputs to enhance and analyze safer vehicle traffic on roadways; cognitive aiding through the application of AI/ML for sensor data fusion in commercial aviation, and enhanced aerial surveillance and analysis of terrain for the purposes of managing deforestation, smart farming, or forest fire prevention.

REFERENCES:

1. Army Pursues Sensor-Related Artificial Intelligence Effort, 18 November 2022: https://www.afcea.org/signal-media/defense-operations/army-pursues-sensor-related-artificial-intelligence-effort; How can AI/ML improve sensor fusion performance: https://www.sensortips.com/featured/how-can-ai-ml-improve-sensor-fusion-performance-faq/; AI: how it’s delivering sharper route planning: https://aerospaceamerica.aiaa.org/features/ai-how-its-delivering-sharper-route-planning/

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