

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY
20.A Small Business Technology Transfer (STTR)
Proposal Submission Instructions

GENERAL INFORMATION

The National Geospatial-Intelligence Agency has a responsibility to provide the products and services that decision makers, warfighters, and first responders need, when they need it most. As a member of the Intelligence Community and the Department of Defense, NGA supports a unique mission set. We are committed to acquiring, developing and maintaining the proper technology, people and processes that will enable overall mission success.

Geospatial intelligence, or GEOINT is the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence and geospatial information.

With our unique mission set, NGA pursues research that will help guarantee the information edge over potential adversaries. Information on NGA's SBIR/STTR Program can be found on the NGA SBIR/STTR website at:

<https://www.nga.mil/Partners/ResearchandGrants/SmallBusinessInnovationResearch/Pages/default.aspx>.

Additional information pertaining to the National Geospatial-Intelligence Agency's mission can be obtained by viewing the website at <http://www.nga.mil/>.

Inquiries of a general nature or questions concerning the administration of the SBIR program should be addressed to:

National Geospatial-Intelligence Agency
Attn: SBIR/STTR Program Manager, RA, MS: S75-RA
7500 GEOINT Dr., Springfield, VA 22150-7500
Email: SBIR@nga.mil

For technical questions and communications with Topic Authors, see DoD Instructions, Section. 4.15. For general inquiries or problems with electronic submission, contact DoD SBIR Help Desk at dodsbirsupport@reisystems.com or 703-214-1333 between 9:00 am and 5:00 pm ET.

PHASE I PROPOSAL INFORMATION

Follow the instructions in the DoD SBIR Program BAA for program requirements and proposal submission instructions at <https://sbir.defensebusiness.org/>.

NGA has developed topics to which small businesses may respond to in this fiscal year 2020 STTR Phase I iteration. These topics are described on the following pages. **The maximum amount of STTR funding for a Phase I award is \$100,000 and the maximum period of performance for a Phase I award is nine months.** While NGA participates in the majority of STTR program options, NGA does not participate in the Commercialization Pilot, Discretionary Technical and Business Assistance (TABAs) or Phase II Enhancement programs.

The entire STTR proposal submission (consisting of a Proposal Cover Sheet, the Technical Volume, and Cost Volume) must be submitted electronically through the DoD SBIR/STTR Proposal Submission system located at <https://www.dodsbirsttr.mil/submissions/> for it to be evaluated.

The Proposal Technical Volume must be no more than 20 pages in length including: table of contents, references, letters of support, appendices, technical portions of subcontract documents (e.g., statements of work and resumes) and any other attachments. Do not include blank pages, duplicate the electronically generated Cover Sheets or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 20-page limit. The Cover Sheet and Cost Volume do not count against the 20-page Proposal Technical Volume page limit. Any Technical Volume that exceeds the page will not be considered for review. The proposal must not contain any type smaller than 10-point font size (except as legend on reduced drawings, but not tables).

Selection of Phase I proposals will be in accordance with the evaluation procedures and criteria discussed in this BAA (refer to section 6.0 of the BAA).

Proposals not conforming to the terms of this BAA, and unsolicited proposals, will not be considered. Awards are subject to the availability of funding and successful completion of contract negotiations.

The NGA STTR Program reserves the right to limit awards under any topic, and only those proposals of superior scientific and technical quality in the judgment of the technical evaluation team will be funded. The offeror must be responsive to the topic requirements, as solicited.

If a small business concern is selected for a STTR award they must negotiate a written agreement between the small business and their selected Research Institution that allocates intellectual property rights and rights to carry out follow-on research, development, or commercialization. Please refer to the DoD Instructions, section 4.2.f to view a "Model Agreement for the Allocation of Rights".

An unsuccessful offeror has 3 days after notification that its proposal was not selected to submit a written request for a debriefing to the CO. Those offers who get their written request in within the allotted timeframe above will be provided a debriefing.

Federally Funded Research and Development Contractors (FFRDC) and other government contractors, whom have signed Non-Disclosures Agreements, may be used in the evaluation of your proposal. NGA typically provides a firm fixed price level of effort contract for Phase I awards. The type of contract is at the discretion of the Contracting Officer.

Phase I contracts will include a requirement to produce one-page monthly status reports and a more detailed interim report not later than 7 ½ months after award. These reports shall include the following sections:

- A summary of the results of the Phase I research to date
- A summary of the Phase I tasks not yet completed, with an estimated completion date for each task
- A statement of potential applications and benefits of the research.

The interim report shall be no more than 750 words long. The report shall be prepared single spaced in 12 pitch Times New Roman font, with at least a one inch margin on top, bottom, and sides, on 8 ½" by 11" paper. The pages shall be numbered.

PHASE II GUIDELINES

Phase II is the demonstration of the technology found feasible in Phase I. All NGA SBIR Phase I awardees from this BAA will be allowed to submit a Phase II proposal for evaluation and possible selection. To minimize the gap between the Phase I and Phase II, it is suggested that if the vendor submit their proposal during month 7 of the Phase I award.

Small businesses submitting a Phase II Proposal must use the DoD SBIR/STTR electronic proposal submission system (<https://www.dodsbirsttr.mil/submissions/>). This site contains step-by-step instructions for the preparation and submission of the Proposal Cover Sheets, the Cost Volume, and how to upload the Technical Volume. For general inquiries or problems with proposal electronic submission, contact the DoD SBIR/STTR Help Desk at (1-703-214-1333) or Help Desk email at dodsbirsupport@reisystems.com (9:00 am to 5:00 pm ET).

NGA STTR Phase II Proposals have three UNCLASSIFIED Volumes: Proposal Cover Sheets, Technical Volume, and Cost Volume. The Technical Volume has a 40-page limit including: table of contents, pages intentionally left blank, references, letters of support, appendices, technical portions of subcontract documents (e.g., statements of work and resumes) and any attachments. Do not include blank pages, duplicate the electronically generated Cover Sheets or put information normally associated with the Technical Volume in other sections of the proposal as these will count toward the 40-page limit.

Technical Volumes that exceed the 40-page limit will be reviewed only to the last word on the 40th page. Information beyond the 40th page will not be reviewed or considered in evaluating the offeror's proposal. To the extent that mandatory technical content is not contained in the first 40 pages of the proposal, the evaluator may deem the proposal as non-responsive and score it accordingly.

The NGA STTR Program will evaluate and select Phase II proposals using the evaluation criteria in Section 8.0 of the DoD SBIR/STTR Program BAA. Due to limited funding, the NGA STTR Program reserves the right to limit awards under any topic and only proposals considered to be of superior quality will be funded.

NGA typically provides a firm fixed price contract as a Phase II award. The type of contract is at the discretion of the Contracting Officer.

Phase II proposals shall be limited to \$1,000,000 over a two-year period with a Period of Performance not exceeding 24 months. A work breakdown structure that shows the number of hours and labor category broken out by task and subtask, as well as the start and end dates for each task and subtask, shall be included.

Phase II contracts shall include a requirement to produce one-page monthly status and financial reports, an interim report not later than 10 months after contract award, a prototype demonstration not later than 23 months after contract award and a final report not later than 24 months after contract award. These reports shall include the following sections:

- A summary of the results of the Phase II research to date
- A summary of the Phase II tasks not yet completed with an estimate of the completion date for each task
- A statement of potential applications and benefits of the research.

The interim and final report shall be prepared single spaced in 12 pitch Times New Roman font, with at least a one-inch margin on top, bottom, and sides, on 8½” by 11” paper. The pages shall be numbered.

RESEARCH INVOLVING HUMAN SUBJECTS

The NGA STTR Program discourages offerors from proposing to conduct human subject or animal research during Phase I due to the significant lead time required to prepare regulatory documentation and secure approval, which will significantly delay the performance of the Phase I award.

Research under this award involving the use of human subjects, to include the use of human anatomical substances or human data, shall not begin until NGA Research provides authorization that the research protocol may precede. Written approval to begin research protocol will be issued from NGA Research, under separate notification to the recipient. Written approval from the NGA Research is also required for any sub-recipient that will use funds from this award to conduct research involving human subjects.

Research involving human subjects shall be conducted in accordance with the protocol submitted to and approved by NGA Research. Non-compliance with any provision may result in withholding of funds and or termination of the award.

USE OF FOREIGN NATIONALS

See the “Foreign Nationals” section of the DoD program announcement for the definition of a Foreign National (also known as Foreign Persons).

Due to the nature of our business, the use of foreign nationals on a NGA contract is PROHIBITED. ALL offerors proposing to use foreign nationals on the effort will be ineligible for award. This includes the use at universities or any other subcontractor.

DISCLOSURE OF INFORMATION

(a) The Contractor shall not release to anyone outside the Contractor's organization any unclassified information, regardless of medium (e.g., film, tape, document), pertaining to any part of this contract or any program related to this contract, unless—

- (1) The Contracting Officer has given prior written approval; or
- (2) The information is otherwise in the public domain before the date of release; or
- (3) **The information results from or arise during the performance of a project that has been scoped and negotiated by the contracting activity with the contractor and research performer and determined in writing by the Contracting Officer to be fundamental research*** in accordance with National Security Decision Directive 189, National Policy on the Transfer of Scientific, Technical and Engineering Information. In effect on the date of contract award, and the USD (AT&L) memoranda on Fundamental Research, dated May 24, 2010, and on Contracted Fundamental Research, dated June 26, 2008 (available at DFARS PGI 204.4).

***Note: This has to be negotiated prior to award of the contract. A request for determination after award will not be entertained and will result in the clause being pushed down to all subcontracts. Non-performance could result in cancelation of contract.**

(b) Requests for approval under paragraph (a)(1) shall identify the specific information to be released, the medium to be used, and the purpose for the release. The Contractor shall submit its request to the Contracting Officer at least 10 business days before the proposed date for release.

5X52.227-9000 UNAUTHORIZED USE OF NGA NAME, SEAL AND INITIALS

(a) As provided in 10 U.S.C. Section 425, no person may, except with the written permission of the Director, National Geospatial-Intelligence Agency, knowingly use the words “National Geospatial-Intelligence Agency”, National Imagery and Mapping Agency” or “Defense Mapping Agency”, the initials “NGA”, “NIMA” or “DMA”, the seal of the National Geospatial-Intelligence Agency, National Imagery and Mapping Agency or the Defense Mapping Agency, or any colorable imitation of such words, initials, or seal in connection with any merchandise, retail product, impersonation, solicitation, or commercial activity in a manner reasonably calculated to convey the impression that such is approved, endorsed, or authorized by the Director, NGA.

(b) Whenever it appears to the U.S. Attorney General that any person is engaged or about to engage in an act or practice which constitutes or will constitute conduct prohibited by paragraph (a), the Attorney General may initiate a civil proceeding in a district court of the United States to enjoin such act or practice. Such court shall proceed as soon as practicable to hearing and determination of such action and may, at any time before such final determination, enter such restraining orders or prohibition, or take such other action as is warranted, to prevent injury to the United States, or to any person or class of persons whose protection the action is brought.

5X252.204-7000-90 PUBLIC RELEASE OF INFORMATION

Information pertaining to this contract shall not be released to the public except as authorized by the Contracting Officer in accordance with DFARS 252.204-7000, Disclosure of Information. Requests for approval to release information pertaining to this contract shall be submitted to the Contracting Officer by means of NGA Form 5230-1, National Geospatial-Intelligence Agency Request for Clearance for Public Release.

NGA STTR 20.A Topic Index

NGA20A-001 Generalization Bounds in Deep Learning

NGA STTR 20.A Topic Descriptions

NGA20A-001 TITLE: Generalization Bounds in Deep Learning

TECHNOLOGY AREA(S): Information Systems

RESEARCH & TECHNOLOGY AREA(S):

ADVANCED CAPABILITIES:

ACQUISITION & SUSTAINMENT AOR:

OBJECTIVE: Develop useful bounds on the generalization performance of deep learning algorithms, to support further developments in algorithm design for object detectors and other neural networks.

DESCRIPTION: The National Geospatial Intelligence Agency (NGA) produces geospatial intelligence (GEOINT) for national defense purposes. As the supply of overhead imagery expands, NGA is increasingly employing automated methods to exploit this imagery, including deep learning. Over the last decade, the theory behind why deep learning algorithms generalize successfully from train to test data has not kept pace with its empirical success. The absence of bounds on generalization performance is a serious hindrance to the reliability, explainability, and trustworthiness of neural networks, especially for tasks where a representative test set may be impossible or impractical to obtain and mathematically-guided approaches may be of benefit.

NGA seeks innovative approaches to rigorously bounding generalization error in deep learning algorithms, with the aim of supporting further developments in algorithm design for object detectors and other deep learning algorithms. The approach should be theoretical rather than empirical, culminating in a mathematically rigorous theorem bounding the expected generalization error of a trained network in terms of the properties of the training and test distributions and the network architecture and optimization method. The approach should use experiment as validation for results rather than as their source. The approach should be scalable to deep convolutional neural networks, and should be able to achieve useful bounds even for very high-dimensional data such as images.

If successful, the product should be suitable for guiding further algorithm design, especially in contexts in which the distribution of the training and testing distributions are distinct. Possible applications could include guiding network architecture design for particular datatypes; pruning networks for efficiency while maintaining performance; estimating network performance on data drawn from previously unseen distributions; active learning to inform data labeling efforts for network training; and generating synthetic data to train neural networks. Proposers should detail how the small business participant will take advantage of the products of this research.

PHASE I: Establish a useable generalization bound on fully-connected neural networks of at least three layers and validate this bound experimentally on simple datasets. Develop a strategy for extending this bound to deep convolutional networks. The results and plan for extending to convolutional networks should be documented in the report.

PHASE II: Establish a useable generalization bound on deep convolutional neural networks and validate this bound experimentally on multiple complex datasets. Document this result in a publishable report.

PHASE III DUAL USE APPLICATIONS: Extend results to situations in which the probability distributions underlying train and test sets differ. Document this result in a publishable report.

REFERENCES:

1. Zhang, Chiyuan, et al. "Understanding Deep Learning Requires Rethinking Generalization." arxiv: 1611.03530.

2. Kawaguchi, et al. "Generalization in Deep Learning." arxiv: 1710.05468.

KEYWORDS: GEOINT, mathematics, theoretical bound, machine learning, neural networks, imagery, detectors