

# NSF 24-589: Computer and Information Science and Engineering : Core Programs

## Program Solicitation

### Document Information

#### Document History

- **Posted:** July 10, 2024
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[View the program page](#)



#### National Science Foundation

Directorate for Computer and Information Science and Engineering  
Division of Computing and Communication Foundations  
Division of Information and Intelligent Systems  
Division of Computer and Network Systems  
Office of Advanced Cyberinfrastructure

**Submission Window Date(s)** (due by 5 p.m. submitting organization's local time):

July 18, 2024 - September 30, 2024 Accepted anytime during this submission window

October 1 - September 30, Annually Thereafter

#### SMALL Projects

October 01, 2024 - October 23, 2024, October 1 - October 23, Annually Thereafter

#### OAC Core Projects

October 01, 2024 - October 23, 2024, October 1 - October 23, Annually Thereafter

#### MEDIUM Projects



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## Important Information And Revision Notes

- CISE encourages proposals from institutions in Established Program to Stimulate Competitive Research (EPSCoR) jurisdictions.
- Evaluation plans are no longer required for proposals in the Division of Computer and Network Systems core programs.
- The budget guidance for Research Experiences for Undergraduates (REU) supplements has been revised.
- Proposal submissions to the Small project class are accepted at anytime during the year-long annual submission window. Proposers should choose the annual submission end date listed in the Due Date drop down window in Research.gov to submit to the Small project class.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

## Summary Of Program Requirements

### General Information

**Program Title:**

Computer and Information Science and Engineering (CISE): Core Programs

**Synopsis of Program:**

The NSF CISE Directorate supports research and education projects that develop new knowledge in all aspects of computing, communications, and information science and engineering, as well as advanced cyberinfrastructure, through the following core programs:

Division of Computing and Communication Foundations (CCF):

- Algorithmic Foundations (AF) program;
- Communications and Information Foundations (CIF) program;
- Foundations of Emerging Technologies (FET) program; and
- Software and Hardware Foundations (SHF) program.

Division of Computer and Network Systems (CNS):

- Computer Systems Research (CSR) program; and
- Networking Technology and Systems (NeTS) program.

Division of Information and Intelligent Systems (IIS):

- Human-Centered Computing (HCC) program;
- Information Integration and Informatics (III) program; and
- Robust Intelligence (RI) program.

Office of Advanced Cyberinfrastructure (OAC):

- OAC Core Research (OAC Core) program;

Proposers are invited to submit proposals in several project classes, which are defined as follows:

- Small Projects -- up to \$600,000 total budget with durations up to three years: projects in this class may be submitted to CCF, CNS, and IIS only;
- Medium Projects -- \$600,001 to \$1,200,000 total budget with durations up to four years: projects in this class may be submitted to CCF, CNS, and IIS only; and
- OAC Core Projects -- up to \$600,000 total budget with durations up to three years: projects in this class may be submitted to OAC only.

A more complete description of these project classes can be found in Section *II. Program Description* of this document.

**Broadening Participation In STEM:**

NSF recognizes the unique lived experiences of individuals from communities that are underrepresented and/or underserved in science, technology, engineering, and mathematics (STEM) and the barriers to inclusion and access to STEM education and careers. NSF highly encourages the leadership, partnership, and contributions in all NSF opportunities of individuals who are members of such communities supported by NSF. This includes leading and designing STEM research and education proposals for funding; serving as peer reviewers, advisory committee members, and/or committee of visitor members; and serving as NSF leadership, program, and/or administrative staff. NSF also highly encourages demographically diverse institutions of higher education (IHEs) to lead, partner, and contribute to NSF opportunities on behalf of their research and education communities. NSF expects that all individuals, including those who are members of

groups that are underrepresented and/or under-served in STEM, are treated equitably and inclusively in the Foundation's proposal and award process.

NSF encourages IHEs that enroll, educate, graduate, and employ individuals who are members of groups underrepresented and/or under-served in STEM education programs and careers to lead, partner, and contribute to NSF opportunities, including leading and designing STEM research and education proposals for funding. Such IHEs include, but may not be limited to, community colleges and two-year institutions, mission-based institutions such as Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), women's colleges, and institutions that primarily serve persons with disabilities, as well as institutions defined by enrollment such as Predominantly Undergraduate Institutions (PUIs), Minority-Serving Institutions (MSIs), and Hispanic Serving Institutions (HSIs).

"Broadening participation in STEM" is the comprehensive phrase used by NSF to refer to the Foundation's goal of increasing the representation and diversity of individuals, organizations, and geographic regions that contribute to STEM teaching, research, and innovation. To broaden participation in STEM, it is necessary to address issues of equity, inclusion, and access in STEM education, training, and careers. Whereas all NSF programs might support broadening participation components, some programs primarily focus on supporting broadening participation research and projects. Examples can be found on the NSF [Broadening Participation in STEM](#) website.

#### **Cognizant Program Officer(s):**

*Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.*

- Stephanie Gage, Point of Contact, Foundations of Emerging Technologies (FET), telephone: (703) 292-8910, email: [ccf-fet@nsf.gov](mailto:ccf-fet@nsf.gov)
- Peter Brass, Point of Contact, Algorithmic Foundations (AF), telephone: (703) 292-2182, email: [ccf-af@nsf.gov](mailto:ccf-af@nsf.gov)
- Phillip A. Regalia, Point of Contact, Communications and Information Foundations (CIF), telephone: (703) 292-8910, email: [ccf-cif@nsf.gov](mailto:ccf-cif@nsf.gov)
- Almadena Y. Chtchelkanova, Point of Contact, Software and Hardware Foundations (SHF), telephone: (703) 292-8910, email: [ccf-shf@nsf.gov](mailto:ccf-shf@nsf.gov)
- Marilyn M. McClure, Point of Contact, Computer Systems Research (CSR), telephone: (703) 292-5197, email: [cns-csr@nsf.gov](mailto:cns-csr@nsf.gov)
- Ann C. Von Lehmen, Point of Contact, Networking Technology and Systems (NeTS), telephone: (703) 292-4756, email: [cns-core@nsf.gov](mailto:cns-core@nsf.gov)
- Jie Yang, Point of Contact, Robust Intelligence (RI), telephone: (703) 292-8930, email: [iis-ri@nsf.gov](mailto:iis-ri@nsf.gov)
- Dan R. Cosley, Point of Contact, Human-Centered Computing (HCC), telephone: (703) 292-8832, email: [iis-hcc@nsf.gov](mailto:iis-hcc@nsf.gov)
- Hector Munoz-Avila, Point of Contact, Information Integration and Informatics (III), telephone: (703) 292-4481, email: [iis-iii@nsf.gov](mailto:iis-iii@nsf.gov)
- Sheikh Ghafoor, Point of Contact, OAC Core Research (OAC Core), telephone: (703) 292-7116, email: [sghafoor@nsf.gov](mailto:sghafoor@nsf.gov)
- Juan J. Li, Point of Contact, OAC Core Research (OAC Core), telephone: (703) 292-2625, email: [jjli@nsf.gov](mailto:jjli@nsf.gov)

#### **Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):**

- 47.070 --- Computer and Information Science and Engineering

#### **Award Information**

**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 400 to 600

**Anticipated Funding Amount:** \$280,000,000

Dependent upon the availability of funds.

## Eligibility Information

### Who May Submit Proposals:

Proposals may only be submitted by the following:

- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.
- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members.

### Who May Serve as PI:

By the submission deadline, or for Small Projects, by the date of submission, any PI, co-PI, or other senior/key project personnel must hold either:

- a tenured or tenure-track position, *or*
- a primary, full-time, paid appointment in a research or teaching position

at a US-based campus of an organization eligible to submit to this solicitation (see above), with exceptions granted for family or medical leave, as determined by the submitting organization. Individuals with *primary* appointments at for-profit non-academic organizations or at overseas branch campuses of US IHEs are not eligible.

### Limit on Number of Proposals per Organization:

There are no restrictions or limits.

### Limit on Number of Proposals per PI or co-PI: 2

For the CISE: Core Programs, during any contiguous 12-month period, an individual may not participate as PI, co-PI, or Senior/Key Personnel in more than two proposals across all project classes. This limit was applied beginning with NSF 20-591, and will continue to apply to this solicitation and future versions of this solicitation, unless noted otherwise.

**These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently.** Any proposal that exceeds this limit at the time of submission for any PI, co-PI, or Senior/Key Personnel will be returned without review. **No exceptions will be made.** Proposals that are withdrawn prior to commencement of merit review, or those that are returned without review by NSF, will not count against this proposal limit. Proposers are strongly encouraged to verify the dates of prior submissions to CISE: Core Programs for all personnel on their teams to avoid their proposals being deemed non-compliant.

## Proposal Preparation and Submission Instructions

### A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**

- Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide (PAPPG)* guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).
- Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)).

## **B. Budgetary Information**

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

Not Applicable

- **Other Budgetary Limitations:**

Not Applicable

## **C. Due Dates**

- **Submission Window Date(s)** (due by 5 p.m. submitting organization's local time):

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### **SMALL Projects**

October 01, 2024 - October 23, 2024, October 1 - October 23, Annually Thereafter

### **OAC Core Projects**

October 01, 2024 - October 23, 2024, October 1 - October 23, Annually Thereafter

### **MEDIUM Projects**

## **Proposal Review Information Criteria**

### **Merit Review Criteria:**

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

### **Award Administration Information**

#### **Award Conditions:**

Additional award conditions apply. Please see the full text of this solicitation for further information.

#### **Reporting Requirements:**

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

## I. Introduction

The NSF Directorate for Computer and Information Science and Engineering (CISE) supports transformative research and education projects that develop new knowledge in all aspects of computing, communications, and information science and engineering, as well as advanced cyberinfrastructure, through multiple research programs across one office and three divisions:

The Division of Computing and Communication Foundations (CCF) supports research that studies the foundations of computing and communication.

The Division of Computer and Network Systems (CNS) supports research that studies novel or enhanced computing and/or networking, including using new technologies or new ways to apply existing technologies, with a focus on systems.

The Division of Information and Intelligent Systems (IIS) supports research that studies the inter-related roles of people, computers, and information.

The Office of Advanced Cyberinfrastructure (OAC) supports translational research and education activities in all aspects of advanced cyberinfrastructure that lead to systems capable of transforming science and engineering research.

## II. Program Description

This solicitation covers submission to the following CISE core programs. Please see the individual program webpages below for more information on what is within scope for these programs:

CCF:

- Algorithmic Foundations (AF) program [[Program Webpage](#)] supports potentially transformative projects in the theory of algorithms and computational complexity, characterized by algorithmic innovation and rigorous analysis;
- Communications and Information Foundations (CIF) program [[Program Webpage](#)] supports foundational research that addresses the theoretical underpinnings of information acquisition, transmission, and processing in communications and information processing systems;
- Foundations of Emerging Technologies (FET) program [[Program Webpage](#)] supports foundational research at the intersection of computing and biological systems, nanoscale science and engineering, quantum information science, and other promising disruptive technologies supporting novel computing/communication models; and
- Software and Hardware Foundations (SHF) program [[Program Webpage](#)] supports foundational research in the design, verification, operation, and evaluation of computer hardware and software through novel approaches, robust theories, high-leverage tools, and lasting principles;

CNS:

- Computer Systems Research (CSR) [[Program Webpage](#)] supports the advancement and holistic design and development of integrated software and hardware computing systems; and
- Networking Technology and Systems (NeTS) [[Program Webpage](#)] supports research that advances wired and wireless networking systems, develops a better understanding of the fundamental properties and trade-offs involved, as well as the abstractions and tools used in designing, building, measuring and managing them.

IIS:

- Human-Centered Computing (HCC) program [[Program Webpage](#)] supports research in human-computer interaction, integrating across fields including computing, information, social, and behavioral sciences, to (re)design technologies that amplify human capabilities, and understand how human, technical, and contextual aspects of computing and communication systems shape their benefits, effects, and risks;

- Information Integration and Informatics (III) program [[Program Webpage](#)] supports research on computational approaches to the full data lifecycle to maximize the utility of information resources; and
- Robust Intelligence (RI) program [[Program Webpage](#)] supports computational research to understand and enable intelligent systems in complex, realistic contexts.

OAC:

- OAC Core Research (OAC Core) program [[Program Webpage](#)] supports translational research on the design, development, deployment, experimentation, and application of advanced research cyberinfrastructure (CI) to enable new frontiers of discovery and innovation.

## PROJECT CLASSES

Proposals submitted to this solicitation must be consistent with one of three project classes defined below. Proposals will be considered for funding within their project classes.

- **SMALL Projects**

***SMALL projects are not accepted for the OAC Core Research program and will be returned without review if submitted to OAC Core.***

**Small projects, with total budgets up to \$600,000 or durations of up to three years**, are well suited to one or two investigators (PI and one co-PI or other Senior/Key Personnel) and at least one student and/or postdoctoral researcher. A Collaboration Plan (up to two pages) **may** be provided under Supplementary Documents. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

- **MEDIUM Projects**

***Medium projects are not accepted for the OAC Core Research program and will be returned without review if submitted to OAC Core.***

**Medium projects, with total budgets ranging from \$600,001 to \$1,200,000 for durations up to four years**, are well suited to one or more investigators (PI, co-PI and/or other Senior/Key Personnel) and several students and/or postdoctoral researchers. Medium project descriptions must be comprehensive and well-integrated, and should make a convincing case that the collaborative contributions of the project team will be greater than the sum of each of their individual contributions. Rationale must be provided to explain why a budget of this size is required to carry out the proposed work. Since the success of collaborative research efforts is known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, **a Collaboration Plan is required for any Medium project with more than one investigator**, even when the investigators are affiliated with the same institution. Up to two pages are allowed for Collaboration Plans and they must be submitted as a document under Supplementary Documents. The length and level of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Collaboration Plans and proposed budgets should demonstrate that senior/key personnel, and especially lead PIs, have allocated adequate time for both their individual technical contributions and the leadership of collaborative activities necessary to realize the synergistic effects of larger-scale research. **If a Medium project with more than one investigator does not include a Collaboration Plan, that proposal will be returned without review.** Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

- **OAC Core Projects**

**OAC Core projects, with total budgets up to \$600,000 for durations of up to three years**, are well suited to one or two investigators (PI and one co-PI or other Senior/Key Personnel) and at least one student and/or postdoctoral researcher. A Collaboration Plan (up to two pages) **may** be provided under Supplementary Documents. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

## Expanding Geographic and Institutional Diversity in Computer and Information Science and Engineering





Proposers should describe this request in a Supplementary Document including: (a) which public cloud providers will be used; (b) anticipated annual and total costs for accessing the desired cloud computing resources, based on pricing currently available from the public cloud computing providers; and (c) a technical description of, and justification for, the requested cloud computing resources. The proposal budget should not include the costs for accessing public cloud computing resources via CloudBank. Also, the total cost of the project, including the cloud computing resource request, may not exceed the budget limit described in this solicitation.

If incorporating this request into the proposal, a proposer should include "CloudAccess" (one word without spaces) as a keyword on the Project Summary page, at the end of the Overview section (before the section on Intellectual Merit). Proposers may contact CloudBank (see <https://www.cloudbank.org/faq>) for consultation on estimating the costs for using cloud computing resources.

See Section V.A. Proposal Preparation Instructions, Supplementary Documents, for more information on how to describe the cloud computing resource request as well as the associated budget.

### **REPRODUCIBILITY AND SHARING**

In the interest of completeness and transparency, PIs must describe, as part of their Data Management and Sharing Plans, how they will provide access to well-documented datasets, modeling and/or simulation tools, and code bases to support reproducibility/replicability of their methods and results for a reasonable time beyond the end of the project lifecycle.

### **EVALUATION**

PIs should include a plan to evaluate the approaches developed as part of the Project Description. Appropriate methods will depend on the research area, topic, size and scope of the proposed project. Examples include, but are not limited to, peer review of developed theories and proofs, controlled experiments on appropriate simulators/emulators/testbeds, user studies, or prototype deployments. The plan should be appropriate for the size and scope of the project.

Proposers to the OAC Core program are **required** to include either a validation or transition-to-practice plan for their proposed research in the Project Description. A validation plan may include setup, mechanisms, metrics, and exploration of leading-edge production systems (or equivalent simulated, emulated, or experimental systems). Transition-to-practice entails planning for incorporation of research results into production research cyberinfrastructure.

### **ACCESS TO EXPERIMENTAL RESEARCH CYBERINFRASTRUCTURE**

PIs are encouraged to consider utilizing NSF-supported research infrastructure (such as the [Platforms for Advanced Wireless Research](#), [FABRIC](#), [Chameleon](#), and [CloudLab](#)) when formulating their research plans and submitting proposals. Descriptions of the capabilities of each system and their availability can be found at their websites: <https://advancedwireless.org/>, <https://fabric-testbed.net/>, <https://www.chameleoncloud.org/>, and <https://cloudlab.us/>.

For projects requiring access to high-performance computing resources, data infrastructure, or advanced visualization resources at scales beyond what is available locally, PIs are encouraged to consider production scale and testbed advanced research cyberinfrastructure, such as those supported by the [ACSS Program](#), the [Frontera Leadership-class system](#), the [Partnership to Advance Throughput Computing](#), and others. Access to the broadening array of advanced cyberinfrastructure systems is coordinated through the ACCESS program. Descriptions of such infrastructure can be found at the following websites: <https://www.nsf.gov/awardsearch/advancedSearchResult?ProgEleCode=7619&BooleanElement=Any&BooleanRef=Any&ActiveAwards=true>, <https://www.tacc.utexas.edu/systems/frontera>, <https://path-cc.io/>, and <https://www.ACCESS.org/>.

More information about high-performance computing resources available to NSF PIs can be found in the PAPPG Chapter II.E.7.

### **FAIRNESS, ETHICS, ACCOUNTABILITY, AND TRANSPARENCY**





Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov. PAPPG Chapter II.E.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.D.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

#### **Proposal Titles:**

Proposal titles should begin with an acronym that indicates the most relevant core program. Select a **bolded acronym** from the following list determined by the most relevant core program area (if more than one area is relevant, please see instructions below):

CCF:

- Algorithmic Foundations (**AF**) program;
- Communications and Information Foundations (**CIF**) program;
- Foundations of Emerging Technologies (**FET**) program; and
- Software and Hardware Foundations (**SHF**) program;

CNS:

- Computer Systems Research (**CSR**) program; and
- Networking Technology and Systems (**NeTS**) program;

IIS:

- Human-Centered Computing (**HCC**) program;
- Information Integration and Informatics (**III**) program; and
- Robust Intelligence (**RI**) program.

OAC:

- OAC Core Research (**OAC Core**) program;

The acronym should be followed by a colon, then the project class followed by a colon, then the title of your project. For example, if you are submitting a Small proposal to the CSR program, then your title would be **CSR: Small: Title**.

If you submit a proposal as part of a set of collaborative proposals, the words "Collaborative Research" followed by a colon should appear at the beginning of the title, before the program acronym. For example, if you are submitting a collaborative set of proposals for a Medium project to the RI program, the title of each proposal would be **Collaborative Research: RI: Medium: Title**. Please note that if submitting via Research.gov, the system will automatically insert the prepended title "Collaborative Research" when the collaborative set of proposals is created.

Proposals from PIs in institutions that have RUI (Research in Undergraduate Institutions) eligibility should have a proposal title that begins with the program acronym followed by a colon, then the project class followed by a colon, then "RUI" followed by a colon, and then the title, for example, **SHF: Small: RUI: Title**.

PIs submitting GOALI (Grant Opportunities for Academic Liaison with Industry) proposals should select the "GOALI" type of proposal in Research.gov or Grants.gov. The proposal title should begin with "GOALI" followed by a colon, then the program acronym followed by a colon, then the project class followed by a colon, and then the title, for example, **GOALI: HCC: Small: Title**. Please note that Research.gov will automatically insert "GOALI" at the beginning of the proposal title when the "GOALI" type of proposal is selected in the proposal setup wizard in Research.gov. For additional information and guidance about GOALI proposals, see PAPPG Chapter II.F.

Proposals that extend beyond the scope of one CISE core program or area are welcome. In such cases, PIs should identify the acronym for the **most relevant** core program or area, followed by any other relevant program acronym(s) separated by colons, for example, **CSR: AF: Medium: Title**. In this example, the proposal would be submitted to the CNS CSR program and would be considered by both the CSR and AF programs. CISE Program Officers will work with their NSF colleagues to ensure that these proposals are appropriately reviewed and considered for funding.

#### **Project Summary:**

The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, a statement on the broader impacts of the proposed activity, and a set of keywords.

All proposals must include 3-6 keywords that describe the general area(s) of the investigation, to assist in identifying reviewers with appropriate knowledge and expertise to review the proposal. *The list of keywords should be the last paragraph of the Overview section of the Project Summary.*

The keywords should describe the main scientific/engineering areas explored in the proposal. Keywords should be prefaced with "Keywords" followed by a colon and each keyword set should be separated by semicolons. Keywords should be of the type used to describe research in a journal submission and may include technical areas of expertise necessary to review the proposal. For example, they might appear as, **Keywords: energy-aware computing; formal logic; graph theory; qubits; information visualization; privacy.**

If cloud computing resources are being requested from CloudBank, then the keyword "CloudAccess" (one word without space) should be included at the end of the Overview section (before the section on Intellectual Merit) on the Project Summary page.

#### **Project Description:**

In addition to the guidance contained in the PAPPG, please refer to Section II, Program Description for additional information and instructions on preparing this section of the proposal.

#### **Budget:**

The total budget of the project, including any cloud computing resource request from CloudBank, may not exceed the budget limits for the respective project classes described in this solicitation. The total cost of the cloud computing resources requested from Cloudbank should not be included in the NSF budget and should be specified only in the associated supplementary document (see below for additional instructions).

Example for proposals requesting CloudBank: a proposal submitted to the Small size class, has a total proposal budget limit of \$600,000. If a PI wishes to request \$20,000 in cloud computing resources through CloudBank, then the proposal budget should not exceed \$580,000. The remaining \$20,000 for cloud computing resources should be specified in the Supplementary Document. If a proposal is a collaborative project with two PIs from two different organizations, then each PI may request cloud computing resources separately through independent Supplementary Documents as long as the total budget (on the budget pages plus the amount requested for cloud computing resources in the Supplementary Documents) does not exceed \$600,000 for a small project, or \$1.2 million for a medium project.

#### **Data Management and Sharing Plan:**

In addition to the guidance contained in the PAPPG, information on the Dissemination and Sharing of Research Results is available at: <https://www.nsf.gov/bfa/dias/policy/dmp.jsp>.

For specific guidance for Data Management and Sharing Plans submitted to the Directorate for Computer and Information Science and Engineering (CISE) see: [https://www.nsf.gov/cise/cise\\_dmp.jsp](https://www.nsf.gov/cise/cise_dmp.jsp).

See also the guidance on Reproducibility and Sharing in the Program Description section above.

#### **Supplementary Documents:**



- A **Standalone BPC Plan** does not include Departmental BPC Plans. Instead, the BPC activities of all PIs are listed in a single document that is up to 3 pages for the whole project and specifically addresses all five elements of a BPC plan: (1) the goal and context of the proposed activity, (2) intended population(s), (3) strategy, (4) measurement, and (5) PI engagement. *This option must be used if one or more of the collaborating institutions do not have a Departmental BPC Plan verified by BPCnet.*
- A **Connected BPC Plan** may be used when each PI and co-PI will engage in an activity listed in a Departmental BPC Plan verified by BPCnet from their institution. Note that the (1) goal and context, (2) intended population, (3) strategy, and (4) measurement are already addressed in Departmental BPC Plans verified by BPCnet. Therefore, a **Connected BPC Plan** is a document that only has to address the following, organized as:
  - up to 2 pages that describe (5) what strategies in the departmental plan the PI and co-PIs will focus on, their specific roles, and their preparation for their work;
  - followed by the Departmental BPC Plans verified by BPCnet from each institution.

The BPC plans should be submitted as one document (including departmental plans for Connected BPC plans) under the "Supplementary Documents" section by the lead institution. The BPC plan should not be utilized as a space to elaborate on other broader impact activities unrelated to addressing members of groups underrepresented in computing.

Any organizational resources that support BPC activities should also be described in the Facilities, Equipment and Other Resources section of the proposal (for additional information about Facilities, Equipment and Other Resources, see PAPPG Chapter II.D.2) if not already described in the BPC plan.

*Documentation of collaborative arrangements of significance to the proposal through Letters of Collaboration (if applicable):*

There are two types of collaboration, one involving individuals/organizations that are included in the budget, and the other involving individuals/organizations that are not included in the budget. Collaborations that are included in the budget should be described in the Project Description. Any substantial collaboration with individuals/organizations not included in the budget should be described in the Facilities, Equipment and Other Resources section of the proposal (see NSF PAPPG Chapter II.D.2). In either case, whether or not the collaborator is included in the budget, a letter of collaboration from each named participating organization *other than the submitting lead, non-lead, and/or subawardee organizations* should be provided at the time of submission of the proposal. Such letters should explicitly state the nature of the collaboration, appear on the organization's letterhead and be signed by the appropriate organizational representative. These letters must not otherwise deviate from the format provided in the NSF PAPPG Chapter II.D.2.

Please note that letters of support may not be submitted. Such letters do not document collaborative arrangements of significance to the project, but primarily convey a sense of enthusiasm for the project and/or highlight the qualifications of the PI or co-PI. **Reviewers will be instructed not to consider these letters of support in reviewing the merits of the proposal.**

*Embedded REU Supplement Documentation (if applicable):*

Requests for single-year or multi-year REU supplement as part of a proposal should include a description of the REU activity (follow the guidance in the [REU program solicitation](#) and) as a supplementary document, not to exceed three pages. Include the budget for the REU activity in the project budget in section F (Participant Support Costs). As part of the Budget Justification, provide a separate explanation of the REU supplement request, with the proposed student costs itemized and justified.

*Other specialized information (if applicable):*

RUI Proposals: PIs from primarily undergraduate institutions should include a Research in Undergraduate Institutions (RUI) Impact Statement and Certification of RUI Eligibility in this section.

GOALI proposals: PIs submitting GOALI proposals should include signed industry-university agreement letters on intellectual property in this section.











The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
  - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
  - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management and Sharing Plan, Mentoring Plan, and the optional Broadening Participation in Computing Plan, as appropriate.

#### **Additional Solicitation Specific Review Criteria**

For Medium proposals, reviewers will be asked to:

- Comment on the extent to which the project scope justifies the level of investment requested, and the degree to which the Collaboration Plan (if required) adequately demonstrates that the participating investigators will work synergistically to accomplish the project objectives.
- Comment on whether key personnel, and especially lead PIs, have allocated adequate time for both their individual technical contributions and the leadership of collaborative activities necessary to realize the synergistic effects of larger-scale research.
- Comment on whether the Broadening Participation in Computing (BPC) plan meaningfully addresses the five elements of a BPC Plan: (1) the goal and context of the proposed activity, (2) intended population(s), (3) strategy, (4) measurement, and (5) PI engagement.

For all proposals reviewed by the CSR and NeTS programs, reviewers will be asked to consider how well the proposal describes an evaluation plan that assesses and, where appropriate, quantifies the research outcomes.

#### **B. Review and Selection Process**

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.









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NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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## Privacy Act And Public Burden Statements

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by proposers will be used for program evaluation and reporting within

the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding proposers or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See [System of Record Notices, NSF-50](#), "Principal Investigator/Proposal File and Associated Records," and [NSF-51](#), "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton  
Reports Clearance Officer  
Policy Office, Division of Institution and Award Support  
Office of Budget, Finance, and Award Management  
National Science Foundation  
Alexandria, VA 22314

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