Artificial Intelligence for Science

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NSF's AI Investments

+$800M **in FY23**, funding AI activities across all **50 states, D.C., and Puerto Rico**

Research Projects

AI Institutes

Talent

Education

Infrastructure

Interaction with the Community

National Information Technology R&D Coordination (NITRD)

- NSF is a member of the NITRD program, which includes representatives from all the federal agencies with a footprint in information technology.

- The AI working group of federal agencies has released three strategic plans for AI.

- The plan has always included both the science needed to drive AI innovation, but also the AI needed to drive science.

- Pain points for AI for science:
  - Data
  - Compute
  - Culture and language
  - Ensuring the AI is
    - Safe
    - Fair
    - Privacy-preserving
    - Explainable
    - Accountable
    - Accurate
    - Reliable

https://www.nitrd.gov/coordination-areas/ai/

National AI R&D Strategic Plan: 2016 -> 2019 -> 2022

- Strategy 1: Make Long-Term Investments in AI Research
- Strategy 2: Develop Effective Methods for Human-AI Collaboration
- Strategy 3: Understand and Address the Ethical, Legal, and Societal Implications of AI
  - 2019 Update: Addressing ethical, legal, and societal considerations in AI
- Strategy 4: Ensure the Safety and Security of AI Systems
  - 2019 Update: Creating robust and trustworthy AI systems
- Strategy 5: Develop Shared Public Datasets and Environments for AI Training and Testing
- Strategy 6: Measure and Evaluate AI Technologies through Standards and Benchmarks
- Strategy 7: Better Understand the National AI R&D Workforce Needs
- Strategy 8: Expand Public–Private Partnerships to Accelerate Advances in AI
- Strategy 9: Establish a Principled and Coordinated Approach to International Collaboration in AI

Example NSF Programs

AI Institutes

National Artificial Intelligence Research Institutes

View guidelines
22-502

🖶 Print

ℹ **Important Information for Proposers**

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 22-1), is

Supports institutes focused on long-term, high-reward AI research, with themes including next-generation cybersecurity, neural and cognitive foundations of AI, climate-smart agriculture and forestry, trustworthy AI, and AI-augmented learning.

Synopsis

Artificial Intelligence (AI) has advanced tremendously and today promises personalized healthcare; enhanced national security; improved transportation; and more effective education, to name just a few benefits. Increased computing power, the availability of large datasets and streaming data, and algorithmic advances in machine learning (ML) have made it possible for AI research and development to create new sectors of the economy and revitalize industries. Continued advancement, enabled by sustained federal investment and channeled toward issues of national importance, holds the potential for further economic impact and quality-of-life improvements.

The 2019 update to the National Artificial Intelligence Research and Development Strategic Plan, informed by visioning activities in the scientific community as well as interaction with the public, identifies as its first strategic objective the need to make long-term investments in AI research in areas with the potential for long-term payoffs in AI. The National AI Research Institutes program enables longer-term research and U.S. leadership in AI through the creation of AI Research Institutes.

This program is a joint government effort between the National Science Foundation (NSF), U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA), U.S. Department of Education (ED) Institute of Education Sciences (IES), U.S. Department of Homeland Security (DHS) Science & Technology Directorate (S&T), National Institute of Standards and Technology (NIST), Department of Defense (DOD) Office of the Under Secretary of Defense for Research and Engineering (OUSD (R&E)), and IBM Corporation (IBM).

This program solicitation expands upon the nationwide network established by the first 18 AI Research Institutes to pursue transformational advances in a range of economic sectors, and science and engineering fields. In this round, the program invites proposals for institutes that have a principal focus in one of the following themes, detailed in the Program Description:

Program guidelines

Award information
Institute awards will be made for between $16,000,000 and $20,000,000 for four to five years ($4,000,000 per year on average). Proposals outside this range may be returned without review. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

Estimated number of awards
7 - NSF plans to make approximately one Institute award in each of themes 1-5, and one award to each of the two tracks listed in theme 6 as described below.

Proposals may only be submitted by certain types of organizations. Please see solicitation for details.

Limit on number of proposals per organization
2 - An organization may submit no more than two preliminary proposals to this solicitation as lead institution. An organization may submit up to two full proposals that correspond to preliminary proposals reviewed under this solicitation. In the event that an organization exceeds these limits, preliminary proposals will be accepted based on earliest date and time of preliminary proposal submission, i.e., the first two preliminary proposals will be accepted, and the remainder will be
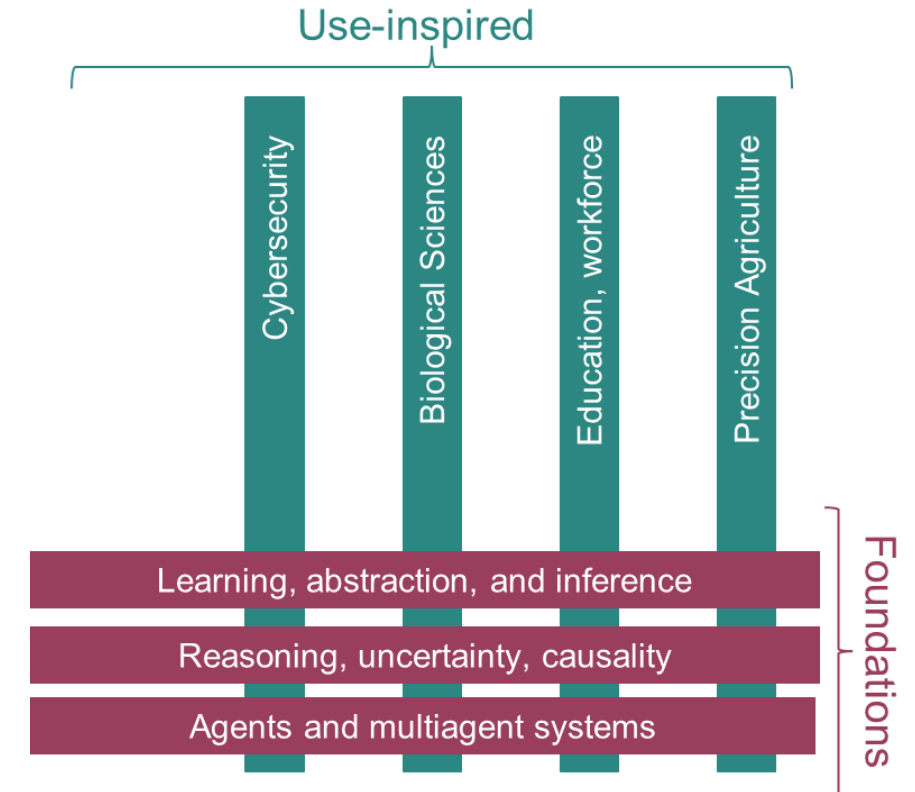
ACED: Accelerating Computing-Enabled Scientific Discovery (ACED)

View guidelines
NSF 24-541

Supports interdisciplinary collaborative research to explore new computational technologies and accelerate scientific discovery.

Synopsis

The ACED program seeks to harness computing to accelerate scientific discovery, while driving new computing advancements. The intent is to catalyze advancements on both sides of a virtuous cycle that: (a) benefit scientific disciplines through computational technologies and (b) foster novel computing technologies that will enable advances beyond the specific use cases or domains originally targeted. The program seeks continuous collaborations between at least two groups of researchers. One group is expected to consist of researchers in computing, which, for the purposes of this solicitation are those disciplines that are supported by the Core Programs of National Science Foundation's (NSF) Computer and Information Science and Engineering (CISE) directorate. The other group of researchers are expected to represent another scientific or engineering discipline, which, for the purposes of this solicitation, are defined as those supported within existing programs of the following NSF directorates: Biological Sciences, Engineering, or Mathematical and Physical Sciences.

The ACED program solicits proposals in two tracks:

Track I: Emerging Ideas Proposals: This track is intended to support speculative multidisciplinary projects that explore bold new research directions. The goal of these projects should be to obtain preliminary results, refine the overall research plan based on these results, and garner insights into whether these advances generalize beyond the targeted use case or domain. Projects are limited to $500,000 in total budget, with durations of up to 18-24 months. Proposals accepted in 2024 Deadline Date.

Track II: Discovery Proposals: The objective of this track is to support transformative interdisciplinary research that will significantly advance both computing and the scientific discipline(s) to be studied. Proposals should clearly identify the scientific problem(s) to be addressed; the specific computing techniques to be developed; and be supported by preliminary collaborations and/or results that demonstrate the potential of the proposed ideas. Projects are limited to $750,000 per year for a duration of up to 4 years for a total budget of up to $3,000,000. Proposals accepted in 2025-2026 Deadline Dates.

Upcoming due dates

Full proposal

2025

January 14 2025 - Deadline date
C January 14, Annually Thereafter
Discovery Proposals Only 2025 and 2026

Due by 5pm submitting organization's local time

Program guidelines

Award information
Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

Estimated number of awards
42 - Approximately 30 Track I awards are anticipated in year one, and approximately 12 Track II awards are anticipated over the next two years, subject to availability of funds and quality of proposals received.

Proposals may only be submitted by certain types of PIs. Please see solicitation for details.

Limit on number of proposals per PI or Co-PI
1 - An investigator may participate as Principal Investigator (PI) or co-Principal Investigator (co-PI) In **no more than one**

Looking at new aways to spur AI for Science

- What novel in situ or remote sensing techniques are needed to enable efficient, accurate scientific data collection?
- What new data curation, aggregation, and analytics techniques are needed to enable predictable, high-accuracy learning and inference?
- What novel and generalizable artificial intelligence techniques are needed to accelerate scientific discovery?
- What new methods are needed to ensure correctness, reliability, robustness, reproducibility, safety, and efficiency?
- What are the theoretical foundations and technological innovations needed to enable digital twins?
- What is needed to enable programmable scientific laboratories that are partially or fully automated?

Smart Health: Use-inspired Basic AI Research

- *Scientific advances* in science *targeting* a key health problem.

- Advancing AI Research, while providing new technology to the biomedical research community

- Building a community of researchers with language to cross the communities

Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science (SCH)

View guidelines
NSF 23-614

Supports the development of transformative advances in computer and information science, engineering, mathematics, statistics, behavioral and cognitive research to address pressing questions in the biomedical and public health communities.

Synopsis

The purpose of this interagency program solicitation is to support the development of transformative high-risk, high-reward advances in computer and information science, engineering, mathematics, statistics, behavioral and/or cognitive research to address pressing questions in the biomedical and public health communities. Transformations hinge on scientific and engineering innovations by interdisciplinary teams that develop novel methods to intuitively and intelligently collect, sense, connect, analyze and interpret data from individuals, devices and systems to enable discovery and optimize health. Solutions to these complex biomedical or public health problems demand the formation of interdisciplinary teams that are ready to address these issues, while advancing fundamental science and engineering.

Upcoming due dates

Full proposal

2024

October 3 2024 - Deadline date
↻ October 3, Annually Thereafter

Due by 5pm submitting organization's local time

Program guidelines

Award information
will be invested in proposals submitted to this solicitation in each year of the solicitation, subject to the availability of funds and the quality of the proposals received.

Expanding AI Innovation (ExpandAI)

Goals	Approach
Broaden the American institutions leading AI research	Promotes capacity development for new AI programs at MSIs, as well as partnerships between MSIs and AI Institutes
Expand American AI workforce in area of economic and national security significance	Collaboration across NSF and with USDA, NIST, DHS, and DOD
Broaden participation in AI research, education and workforce development	Capacity Building grants for planning and growth to establish AI activities
	Partnership grants to scale up established AI activities in collaboration with AI Institutes

Solicitation:
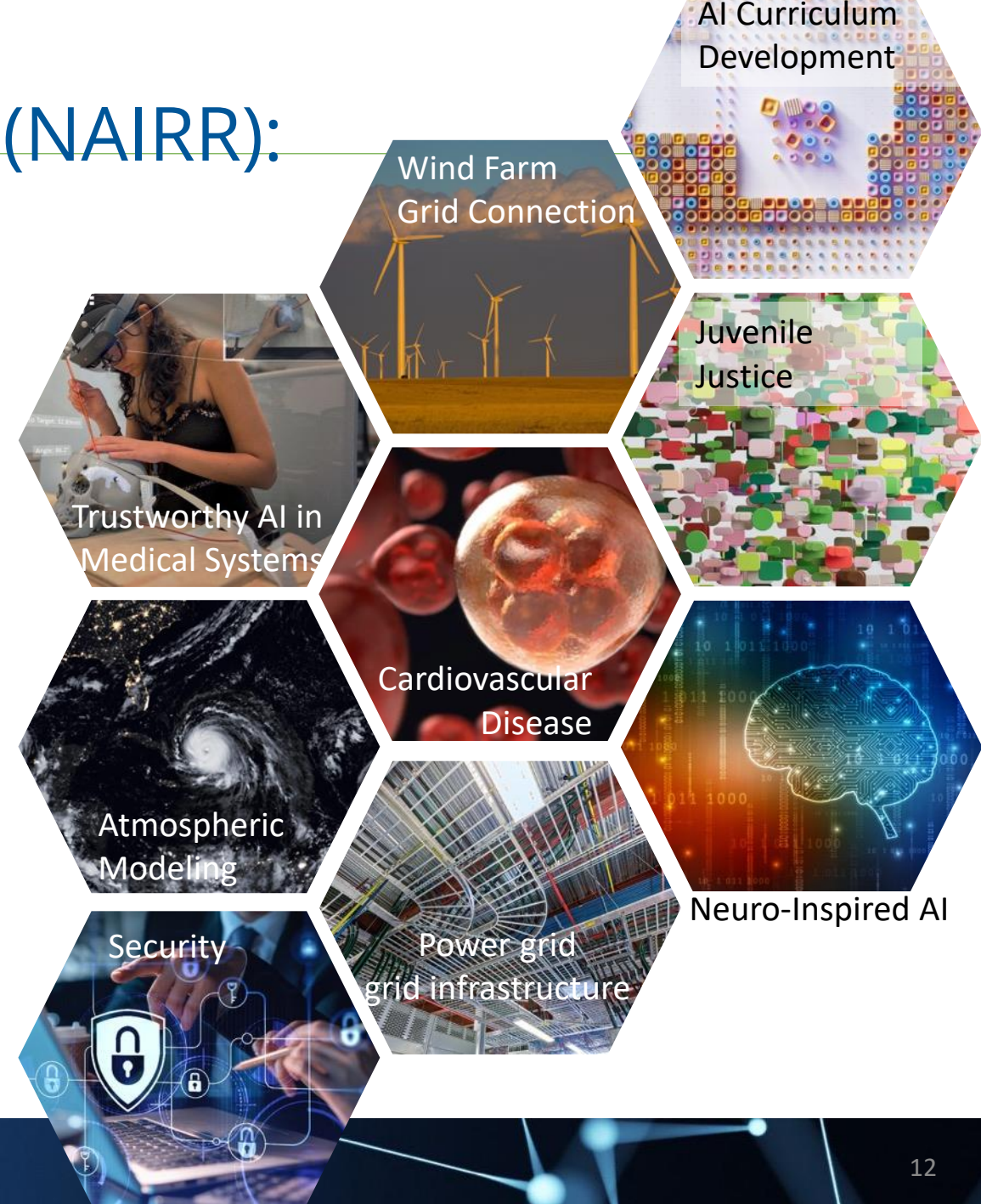https://www.nsf.gov/pubs/2023/nsf23506/nsf23506.htm

National AI Research Resource (NAIRR)

Envisioning a National Artificial Intelligence Research Resource (NAIRR): Preliminary Findings and Recommendations (May 2022)

- AI holds potential to solve critical societal and global challenges

- Many potential contributors lack access to requisite resources

- Researchers investigating AI to serve the public good and to train the next generation of researchers need access to essential resources

AI Curriculum Development

Wind Farm Grid Connection

Juvenile Justice

Trustworthy AI in Medical Systems

Cardiovascular Disease

Atmospheric Modeling

Neuro-Inspired AI

Security

Power grid grid infrastructure

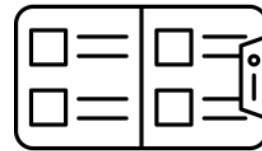# Vision for the National AI Research Resource

A widely-accessible, national research infrastructure that will advance the U.S. AI R&D environment, discovery, and innovation by empowering a diverse set of users through access to:
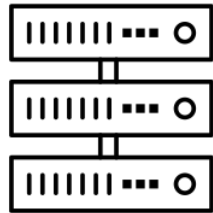
Secure, high-performance, privacy-preserving **computing**

High-quality **datasets**

Catalogs of **testbeds** and **educational materials**

Training tools and **user support** mechanisms

Goals:

Spur **innovation**

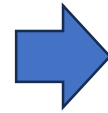Increase the **diversity** of talent in AI

Improve U.S. **capacity** for AI R&D
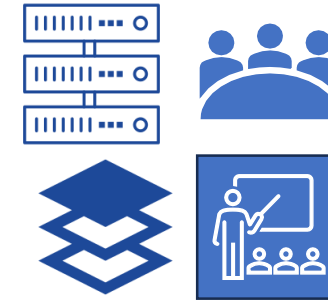
Advance **trustworthy AI**

NAIRR Pilot Organization

User Journey

US-based Researchers, Educators & Students

→

NAIRR Pilot
Portal

https://nairrpilot.org

→

Pilot Resources and Opportunities

The NAIRR Pilot provides infrastructure and resources; it does not fund end-user research.

Operations

NAIRR Open	**NAIRR Secure**	**NAIRR Software**	**NAIRR Classroom**
Enable open AI research and access to diverse AI resources via a central portal and coordinated allocations	Enable AI research needing privacy and security-preserving resources. Assemble exemplar privacy preserving resources.	Facilitate use of AI software, platforms, tools and services across platforms	Reach new communities through education, training, user support and outreach

Governance

Community Design Process

U.S. DEPARTMENT OF **ENERGY** | Office of Science   **NIH**