THE NETWORKING & INFORMATION TECHNOLOGY R&D PROGRAM
AND THE
NATIONAL ARTIFICIAL INTELLIGENCE INITIATIVE OFFICE

SUPPLEMENT TO THE PRESIDENT'S FY2025 BUDGET

A report by the

SUBCOMMITTEE ON NETWORKING & INFORMATION TECHNOLOGY RESEARCH & DEVELOPMENT

and the

SUBCOMMITTEE ON MACHINE LEARNING & ARTIFICIAL INTELLIGENCE

of the

NATIONAL SCIENCE & TECHNOLOGY COUNCIL

November 2024

About the Office of Science and Technology Policy

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization, and Priorities Act of 1976 to provide the President and others within the Executive Office of the President with advice on the scientific, engineering, and technological aspects of the economy, national security, health, foreign relations, and the environment, among other topics. OSTP leads interagency science and technology policy coordination efforts, assists the Office of Management and Budget with an annual review and analysis of federal research and development in budgets, and serves as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the federal government. More information is available at https://www.whitehouse.gov/ostp.

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The National Science and Technology Council (NSTC) is the principal means by which the Executive Branch coordinates science and technology policy across the diverse entities that make up the federal research and development enterprise. A primary objective of the NSTC is to ensure science and technology policy decisions and programs are consistent with the President's stated goals. The NSTC prepares research and development strategies that are coordinated across federal agencies aimed at accomplishing multiple national goals. The work of the NSTC is organized under committees that oversee subcommittees and working groups focused on different aspects of science and technology. More information is available at https://www.whitehouse.gov/ostp/nstc.

About the Subcommittee on Networking & Information Technology Research & Development

The Networking and Information Technology Research and Development (NITRD) Program has been the Nation's primary source of federally funded work on pioneering information technologies (IT) in computing, networking, and software since it was first established as the High-Performance Computing and Communications program following passage of the High-performance Computing Act of 1991. The NITRD Subcommittee of the NSTC guides the multiagency NITRD Program in its work to provide the R&D foundations for ensuring continued U.S. technological leadership and for meeting the Nation's needs for advanced IT. The National Coordination Office (NCO) supports the NITRD Subcommittee and its Interagency Working Groups (IWGs) (https://www.nitrd.gov/about/).

About the Subcommittee on Machine Learning and Artificial Intelligence

The Machine Learning and Artificial Intelligence (MLAI) Subcommittee (MLAI-SC) monitors the state of the art in machine learning (ML) and AI within the federal government, the private sector, and internationally to watch for the arrival of important technology milestones in the development of AI, to coordinate the use of and foster the sharing of knowledge and best practices about ML and AI by the federal government, and to consult in the development of federal MLAI R&D priorities. The MLAI-SC reports to the NSTC Committee on Technology and the Select Committee on AI.

About This Document

This document is a supplement to the President's FY2025 Budget Request to Congress. Following Congressional mandate, the Supplement incorporates budgetary and programmatic information for member agencies of the NITRD Program and for the National Artificial Intelligence Initiative. This report covers FY2023 actual, FY2024 enacted, and FY2025 requested funding levels by agency and Program Component Area for all NITRD R&D programs. It also describes the key R&D programs and coordination activities planned for FY2025 by the federal agencies participating in NITRD. In addition, this document reports on the specific agency

investments for FYs2023–2025 for AI and the National AI Research Institutes and for advanced wireless.[1] It also includes a list of the existing and proposed R&D projects that address critical national cybersecurity needs.[2]

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[1] *National Artificial Intelligence Research Institutes:* Appendix B: https://www.nitrd.gov/pubs/FY25-National-AI-Institutes.pdf
[2] FY2025 *Federal Cybersecurity R&D Strategic Plan Implementation Roadmap*: Appendix A: https://www.nitrd.gov/pubs/FY25-Cybersecurity-Implementation-Roadmap.pdf

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These federal departments and agencies participate in NITRD programs/activities and have mission interests in advanced networking and IT R&D and applications, but they are not members of the NITRD Subcommittee.

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National Institute of Food and Agriculture (NIFA)

Department of Commerce (DOC)

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Air Force Work Project (AFWERX)

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Defense Threat Reduction Agency (DTRA)

Engineer Research and Development Center (Army-ERDC)

DOD (continued)

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Joint Services Transcript (JST)

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Office of Electricity (OE)

Office of Fossil Energy and Carbon Management (FECM)

Office of Nuclear Energy (NE)

Department of Health and Human Services (HHS)

Administration for Strategic Preparedness and Response (ASPR)

Advanced Research Projects Agency for Health (ARPA-H)

Biomedical Advanced Research and Development Authority (BARDA)

Centers for Disease Control and Prevention (CDC)

Centers for Medicare & Medicaid Services (CMS)

Food and Drug Administration (FDA)

National Cancer Institute (NCI)

National Center for Advancing Translational Sciences (NCATS)

National Heart, Lung, and Blood Institute (NHLBI)

National Institute of Biomedical Imaging and Bioengineering (NIBIB)

National Institute of Environmental Health Sciences (NIEHS)

National Institute of Mental Health (NIMH)

National Institute of Nursing Research (NINR)

National Institute on Aging (NIA)

National Institute on Deafness and Other Communication Disorders (NIDCD)

Office of Behavioral and Social Sciences Research (OBSSR)

Office of the Assistant Secretary for Health (OASH)

Office of the Assistant Secretary for Planning and Evaluation (ASPE)

Social Security Administration (SSA)

Department of Homeland Security (DHS)

Cybersecurity and Infrastructure Security Agency (CISA)

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Department of Justice (DOJ)

Federal Bureau of Investigation (FBI)

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Department of Transportation (DOT)

Federal Aviation Administration (FAA)

Federal Highway Administration (FHWA)

Federal Railroad Administration (FRA)

Federal Transit Administration (FTA)

National Highway Traffic Safety Administration (NHTSA)

Department of Treasury (Treasury)

Bureau of Engraving and Printing (BEP)

Financial Crimes Enforcement Network (FinCEN)

Environmental Protection Agency (EPA)

Federal Communications Commission (FCC)

Federal Trade Commission (FTC)

General Services Administration (GSA)

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Executive Summary

The Networking and Information Technology Research and Development (NITRD) Program is the Nation's primary source of federally funded research and development (R&D) in advanced information technologies (IT) in computing, networking, and software. Established through the High Performance Computing (HPC) Act of 1991, NITRD is among the oldest and largest of formal federal programs that coordinate the activities of multiple federal agencies to tackle multidisciplinary, multi-technology, and multisector R&D needs.

The NITRD Program consists of more than 100 member and participating agencies that now engage in and fund R&D programs that identify, develop, and transition to practical use the advanced networking and IT capabilities needed by the federal government and the nation. The proposed FY2025 budget for the NITRD Program is $11.2 billion, which represents an increase of 2.8 percent from the FY2024 President's Budget Request. Within the domain of artificial intelligence (AI) in particular, the $3.3 billion FY2025 request for AI R&D investment across the NITRD agencies represents an increase of 6.5 percent over the level originally requested for FY2024.

This Supplement to the President's FY2025 Budget serves as the Annual Report to Congress required by the HPC Act of 1991, and also meets the Congressional reporting requirements directed by the National Artificial Intelligence Initiative Act (NAIIA) of 2020. Accordingly, this report:

- Highlights examples of the significant impact of interagency coordination activities that have emerged from the collaborative efforts of representatives of all of the member and participating agencies, and supported by the NITRD National Coordination Office, including public-private partnership and community engagement, cross-organization activities that cut across multiple Subcommittees of the National Science and Technology Council, and coordinated, multi-agency programs and activities within the NITRD Program.

- Provides comprehensive financial reporting of agency NITRD investments (and an AI-specific subset of these investments) by agency, broken out by Program Component Area, and by year, covering FY2023 actual spend, current-year budgets enacted in FY2024 appropriations, and investment levels proposed in the FY2025 President's Budget Request.

- Presents the strategic alignment of programs and activities supported by NITRD and NAIIO investments in the context of Administration R&D Priorities[3], as well as against strategic priorities of the various interagency groups involved in interagency coordination activities.

- Contains an appendix that presents a detailed program inventory that identifies both interagency and individual agency programs supported by NITRD investments, mapped to interagency working group strategic priorities.

Now in its 33rd year, the NITRD Program continues to provide the R&D foundation that promotes enduring U.S. technological leadership to meet the Nation's needs for advanced information technologies. The interagency coordination activities surrounding the program serve as a catalyst and amplifier for the impact of these investments, and will help ensure that IT continues to be a major driving force for the Nation's economy and security, and the health and prosperity of its citizens.

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[3] https://www.whitehouse.gov/wp-content/uploads/2023/08/FY2025-OMB-OSTP-RD-Budget-Priorities-Memo.pdf

1.0 Introduction

The Networking and Information Technology Research and Development (NITRD) Program is the Nation's primary source of federally funded research and development (R&D) in advanced information technologies (IT) in computing, networking, and software. NITRD is among the oldest and largest of formal federal programs that coordinate the activities of multiple agencies to tackle multidisciplinary, multi-technology, and multisector R&D needs. The NITRD Program consists of more than 100 member and participating agencies that now invest approximately $11.2 billion annually in R&D programs that identify, develop, and transition to practical use the advanced networking and IT capabilities needed by the federal government and the Nation.

The High Performance Computing (HPC) Act of 1991 launched what is now called the NITRD Program. Congress has reauthorized and expanded the NITRD Program three times, most recently in the 2017 American Innovation and Competitiveness Act.[4] The HPC Act of 1991 calls for NITRD to provide an annual report to Congress, which is transmitted as a Supplement to the President's Budget. In this report, NITRD agencies describe their R&D budget requests, as well as their programs and activities for the coming fiscal year in HPC, IT, and networking. This report also addresses how the NITRD Program agencies plan to support the Science and Technology (S&T) priorities of the President.

This Supplement also meets the requirements of the National Artificial Intelligence Initiative Act (NAIIA) of 2020[5], calling for OSTP to submit NAIIA-related budget and program information to Congress as part of the President's annual budget request. This Supplement includes a summarized budget in support of the National AI Initiative for the preceding, current, and proposed fiscal years, and a breakdown of spending for the National AI Research Institutes. See Appendix B for additional details on the National AI Research Institutes.

1.1 NITRD Program Component Areas

NITRD's annual budget crosscut is organized by Program Component Areas (PCAs) to facilitate year-to-year budgetary and programmatic trend analysis. The PCAs are categories of technical R&D focus areas supported by agency investments, and are the technical areas under which agencies report their funding requests for their NITRD-related activities. The PCAs are reviewed annually to ensure that the NITRD Program actively addresses evolving IT R&D priorities and policy needs. The following are the FY2025 NITRD PCAs:

- Advanced Communication Networks and Systems (ACNS)
- Advanced Wireless R&D (AWRD) (ACNS sub-PCA)
- Artificial Intelligence (AI) R&D
- Computing-Enabled Human Interaction, Communication, and Augmentation (CHuman)
- Computing-Enabled Networked Physical Systems (CNPS)
- Cyber Security and Privacy (CSP)
- Education and Workforce (EdW)
- Electronics for Networking and Information Technology (ENIT)
- Enabling R&D for High-Capability Computing Systems (EHCS)
- High-Capability Computing Infrastructure and Applications (HCIA)
- Intelligent Robotics and Autonomous Systems (IRAS)
- Large-Scale Data Management and Analysis (LSDMA)
- Software Productivity, Sustainability, and Quality (SPSQ)

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[4]https://www.congress.gov/114/plaws/publ329/PLAW-114publ329.pdf; https://www.nitrd.gov/legislation/
[5]https://www.congress.gov/bill/116th-congress/house-bill/6216

1.2   NITRD Interagency Working Groups

NITRD's Interagency Working Groups (IWGs) coordinate the R&D planning, programs, and activities that support PCA investments. There is a close, though not strictly one-to-one, match between the PCAs and IWGs (see Figure 1 and Section 3.0). The NITRD IWGs, with rotating agency co-chairs and support from the NCO staff, strive to maximize interagency efficiency and effectiveness in conducting high-impact research, transferring discoveries to the marketplace, advancing the national IT R&D infrastructure, and strengthening community R&D alliances. Each IWG shares information and coordinates agency R&D activities via monthly coordination meetings, annual planning meetings, and the development of technical strategic plans. The NITRD IWGs are reviewed annually to ensure they align with the Administration's annual and ongoing priorities. The following are the FY2025 NITRD IWGs:

- Artificial Intelligence R&D (AI)
- Big Data (BD)
- Computing-Enabled Networked Physical Systems (CNPS)
- Cyber Security and Information Assurance (CSIA)
- Digital Health R&D (DHRD)

- High End Computing (HEC)
- Information Integrity R&D (IIRD)
- Intelligent Robotics and Autonomous Systems (IRAS)
- Large Scale Networking (LSN)
- Privacy R&D (Privacy)
- Wireless Spectrum R&D (WSRD)

Figure 1. Relationships Between the NITRD IWGs and PCAs for FY2025
Notes: The DHRD and IIRD IWGs are not affiliated with a PCA. The CHuman, EdW, ENIT, and SPSQ PCAs do not have coordinating IWGs. SPSQ was changed from an IWG to a Community of Practice.
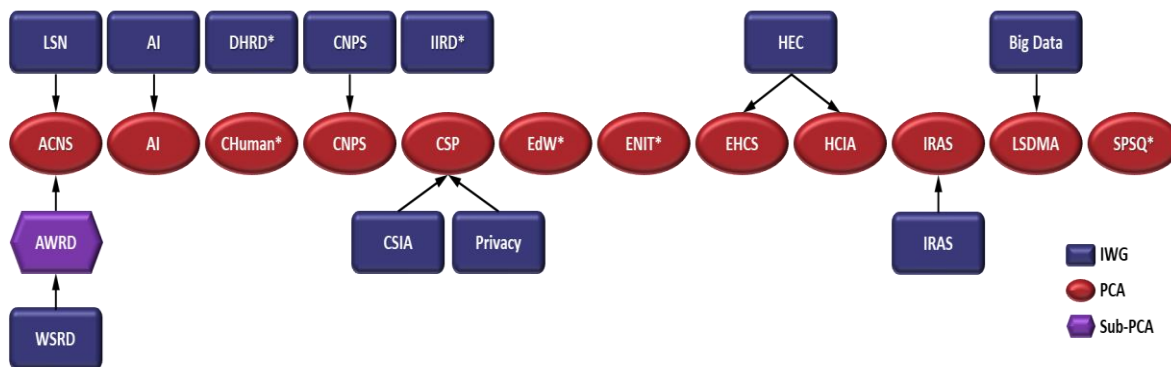
1.2.1 Community Engagement

The NITRD Program and National Coordination Office provide strategies and opportunities for community engagement and public access to information. The NITRD website includes the dissemination of national information technology topics from selected government publications such as: Federal Register announcements; NITRD and NAIIO Supplements to the President's Budget; current and historical documents, strategic plans, research agendas, roadmaps, and various other scientific and technical documents relating to NITRD activities.

NITRD is committed to public-private partnerships through various forms of community engagement and public outreach. This commitment to coordination, collaboration, and transparency has contributed to growing participation and increasing R&D investments in the program's pursuit of NITRD innovation and public access to it. This commitment is carried out through various activities including:

- NITRD recently reorganized its portfolio to include Communities of Practice (CoPs). The CoP meetings include two interagency working groups, Joint Engineering Team (JET) and Middleware and Grid Interagency Coordination (MAGIC), that hold standing public meetings, and SPSQ, which will periodically hold public meetings.
- NITRD proactively seeks to offer the community involvement in various ways, i.e., workshops, conferences, listening sessions, and speaker series as appropriate. In addition, NITRD solicits broad-based community inputs during the development of R&D strategic plans and implementation plans[6] through Federal Register Requests for Information (RFIs).
- NITRD also provides public information through its social media channels and with the NITRD News, a newsletter dedicated to sharing information from the NITRD NCO and the agencies it serves.

In addition, NITRD has developed the following public facing resource portals to support the research community and those with a desire to join the federal science, technology, engineering, and mathematics (STEM) workforce:

- AI Research Program Repository[7] to provide the AI research community with a directory of active federal AI R&D programs to raise awareness and accessibility of funding opportunities and potential collaborations.
- AI R&D Testbed Inventory[8] for researchers to locate federally supported testbeds and testing resources needed for their research.
- STEM Portal[9] that provides information on federal internships, fellowships, scholarships, and other training programs.
- High End Computing Information Portal[10] provides information about U.S. federal government high performance computing activities, including available computing resources.

1.2.2 NSTC S&T Collaborations

NITRD's multi-agency collaborations and interdisciplinary R&D agenda create natural synergies across the NSTC enterprise. Collaborations with the NSTC Committees and Subcommittees advance the national research ecosystem, bringing to fruition integrated data, computing, software, and education

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[6]See NITRD's Publication Library, https://www.nitrd.gov/publications/, publication types: *Federal Plan, Implementation Plan/Roadmap, Scientific and Technical Report,* and *Strategic Plan*.
[7]https://www.nitrd.gov/apps/ai-research-program-repository/
[8]https://www.nitrd.gov/apps/ai-rd-testbed-inventory/
[9]https://www.nitrd.gov/stem4all/
[10] https://www.nitrd.gov/apps/hecportal/

resources and an open data forum for the information technology and science communities. Several examples of these collaborations are:

- The NITRD Subcommittee, Artificial Intelligence R&D IWG, in collaboration with the Subcommittee on Machine Learning and Artificial Intelligence, and the Select Committee on Artificial Intelligence published two reports:
  - *National Artificial Intelligence Research and Development Strategic Plan 2023 Update*.[11]
  - *2020-2024 Progress Report: Advancing Trustworthy Artificial Intelligence Research and Development*.[12]
- The NITRD Subcommittee, Cyber Security Information Assurance IWG, in collaboration with the Subcommittee on Special Cyber Operations Research and Engineering published a *Federal Cybersecurity Research and Development Strategic Plan (2023)*[13] as required by the Cybersecurity Enhancement Act of 2014.
- The NITRD Subcommittee, High End Computing IWG, in collaboration with the Subcommittee on Future Advanced Computing Ecosystem, published the *FY2021-FY2023 Progress Report on Pioneering the Future Advance Computing Ecosystem: A Strategic Plan*.[14]
- The NITRD Subcommittee, Big Data IWG, in collaboration with the Subcommittee on Open Science published the 2024 Big Data Strategic Plan - Innovating the Data Ecosystem: An Update of The Federal Big Data Research and Development Strategic Plan.[15]
- The NITRD Subcommittee, in collaboration with the Subcommittee on Microelectronics Leadership, is collaborating on the recommendations outlined in the March 2024 report: *National Strategy on Microelectronics Research*.[16]

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[11] https://www.nitrd.gov/pubs/National-Artificial-Intelligence-Research-and-Development-Strategic-Plan-2023-Update.pdf
[12] https://www.nitrd.gov/pubs/AI-Research-and-Development-Progress-Report-2020-2024.pdf
[13] https://www.nitrd.gov/pubs/Federal-Cybersecurity-RD-Strategic-Plan-2023.pdf
[14] https://www.nitrd.gov/pubs/FY2021-2023-FACE-Progress-Report.pdf
[15] https://www.nitrd.gov/pubs/Big-Data-Strategic-Plan-2024.pdf
[16] https://www.nitrd.gov/pubs/National-Strategy-on-Microelectronics-Research-March-2024.pdf

2.0 Agency NITRD– and NAIIO–Related R&D Investments, FY 2023–FY2025

The Biden-Harris Administration's commitment to making historic investments in innovation and research is evident in the NITRD budget crosscut, with the President's overall FY2025 budget request for federal agencies' NITRD-related R&D (see Table 1) increasing 2.8 percent to $11.2 billion—compared to the $10.9 billion originally requested for FY2024.[17]

The overall increase in NITRD investment requests is bolstered by the increase of 6.5 percent in FY2025 AI R&D requested investment across the NITRD agencies to $3.3 billion (see Table 2), up from the $3.1 billion originally requested for FY2024.[17] The National AI Research Institutes' FY2025 budget request is an increase of 4.8 percent for a total request of $72.3 million (see Table 3), across five agencies: NSF, DOD, Department of Education Institute of Education Sciences (ED-IES), USDA-NIFA, and NIST. See Appendix B, *FY25 National AI Institutes*: https://www.nitrd.gov/pubs/FY25-National-AI-Institutes.pdf

Expanding R&D in Advanced Wireless Networking (AWN) focuses on building wireless connectivity that can bridge the digital divide and provide equal access to Internet resources. Agencies' budget requests for FY2025 AWN R&D (Table 4) total $394.2 million, an increase of approximately 33.4 percent compared to the $295.4 million originally requested for AWN R&D for FY2024.[17]

2.1 Budget Charts and Tables

Figure 2 shows the FY2025 Budget Request by PCA (a) and agency (b). See the NITRD Dashboard for investments and trends for FY 2003–FY2025.[18]
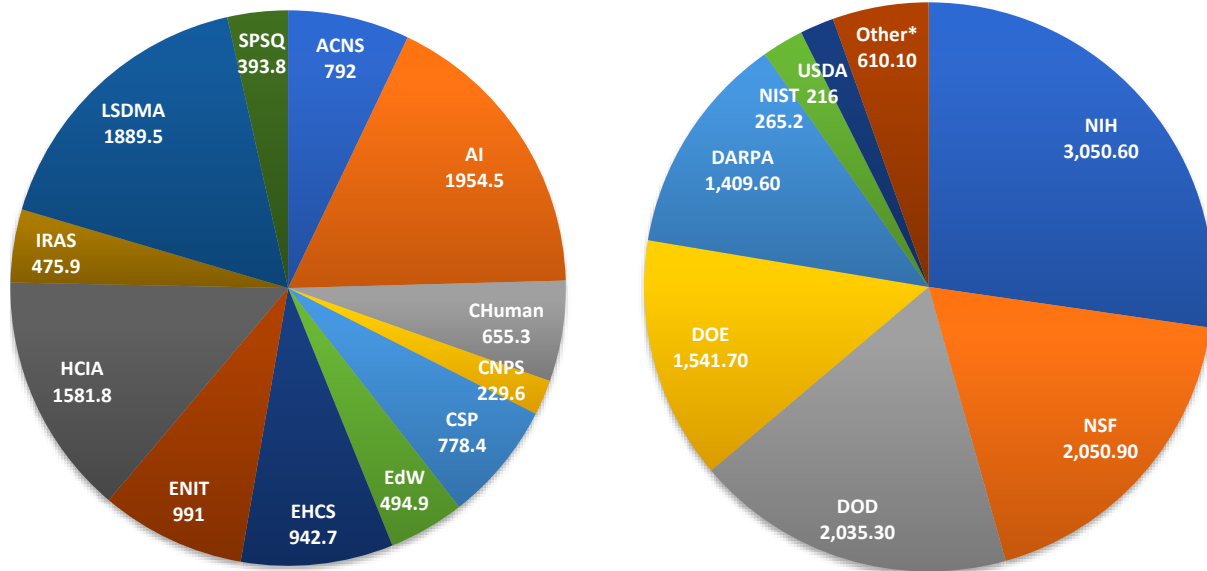
a. FY2025 Budget Request, in millions of dollars, of the total NITRD request, by PCA

b. FY2025 Budget Request, in millions, of the total NITRD request, by agency

*Other: AHRQ, ARPA-H, DHS, DOE/NNSA, DOI, DOT, ED-IES, EPA, FDA, NASA, NARA, NIJ, NIOSH, NOAA, Treas., VA

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[17] https://www.nitrd.gov/pubs/FY2024-NITRD-NAIIO-Supplement.pdf
[18] https://www.nitrd.gov/apps/itdashboard/dashboard/

Figure 2. FY2025 Budget Request as Percentages of the Total NITRD Request

Note: In the tables that follow, FY2023 refers to the final FY2023 budget authority available (actuals), FY2024 refers to activities funded under FY2024 enacted appropriations, and FY2025 refers to activities funded within the FY2025 President's budget request. Fiscal years with "-S" after them denote supplemental funding.

2.1.1 Agency Budgets by NITRD PCA

Table 1. Agency Budgets by NITRD PCA, FYs 2023–2025

Agency	FY	ACNS	AI	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	Totals
AHRQ	2023	-	-	16.3	-	-	-	-	-	-	-	-	-	16.3
	2024	-	-	16.3	-	-	-	-	-	-	-	-	-	16.3
	2025	-	-	16.3	-	-	-	-	-	-	-	-	-	16.3
ARPA-H	2023	-	87.5	-	-	-	-	-	-	-	-	-	-	87.5
	2024	-	50.6	-	-	-	-	-	-	-	-	-	-	50.6
	2025	-	62.7	-	-	-	-	-	-	-	-	-	-	62.7
DARPA	2023	65.1	334.9	-	-	222.4	-	700.9	5.1	-	-	30.4	-	1,358.7
	2024	59.6	346.6	-	-	207.5	-	641.7	5.1	-	-	31.0	-	1,291.5
	2025	13.4	313.8	-	-	294.4	-	772.9	5.1	-	-	10.0	-	1,409.6
DHS	2023	12.4	9.2	0.3	2.1	53.9	0.6	4.0	-	-	4.7	3.8	8.5	99.5
	2024	4.9	17.4	-	1.3	24.4	-	-	-	-	1.7	0.4	0.8	51.0
	2025	8.1	13.6	1.2	2.3	49.5	-	-	-	-	2.1	0.4	10.0	87.2
DOD	2023	491.0	241.4	181.1	16.2	155.6	123.6	59.6	24.2	262.9	318.7	205.2	35.0	2,114.5
	2023-S	27.0	0.6	-	-	15.0	24.6	-	30.0	-	1.5	-	-	98.7
	2024	370.2	263.4	187.2	26.3	187.6	140.2	62.0	32.5	274.7	327.3	220.5	38.7	2,130.5
	2024-S	53.5	1.5	-	-	14.5	8.0	-	41.0	-	-	-	-	118.5
	2025	408.0	233.2	203.6	26.3	165.4	130.1	50.7	18.4	256.1	298.3	209.3	36.1	2,035.3
DOE	2023	105.2	143.2	0.0	16.1	26.2	33.6	32.8	464.7	433.6	38.0	6.0	7.3	1,310.2
	2023-S	-	3.0	-	-	-	-	-	-	-	-	-	-	3.0
	2024	106.1	157.7	2.4	41.7	28.1	24.0	32.7	525.6	417.9	24.5	24.7	10.3	1,395.7
	2024-S	-	10.1	-	-	-	-	-	-	-	-	-	-	10.1
	2025	104.1	186.5	2.4	32.0	27.2	60.0	41.2	534.5	494.7	27.5	24.7	7.0	1,541.7
DOE/ NNSA	2023	0.4	33.9	-	-	0.4	-	-	16.0	-	3.1	-	-	53.8
	2024	-	28.0	-	-	-	2.0	-	20.0	-	2.8	-	-	52.8
	2025	-	58.0	-	-	-	2.0	-	28.0	-	3.5	-	-	91.5
DOI	2023	-	8.0	-	-	-	-	-	-	6.0	-	0.2	-	14.2
	2024	-	6.5	-	-	-	-	-	-	4.0	0.8	1.9	-	13.2
	2025	-	8.5	-	-	-	-	-	-	8.0	0.8	1.0	-	18.3
DOT	2023	2.7	6.6	-	0.1	6.8	-	-	-	-	5.0	0.3	-	21.5
	2024	1.8	2.5	1.0	1.0	5.7	-	-	-	-	-	1.4	-	13.4
	2025	0.2	2.8	0.3	1.0	6.9	-	-	-	-	-	0.4	-	11.6
ED-IES	2023	-	-	-	-	-	4.2	-	-	-	-	-	-	4.2

Agency	FY	12 NITRD Program Component Areas												Totals
		ACNS	AI	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
	2024	-	-	-	-	-	6.4	-	-	-	-	-	-	6.4
	2025	-	-	-	-	-	6.4	-	-	-	-	-	-	6.4
EPA	2023	-	-	-	-	-	-	-	3.8	3.1	-	-	-	6.9
	2024	-	-	-	-	-	-	-	4.5	3.2	-	-	-	7.7
	2025	-	-	-	-	-	-	-	4.5	3.2	-	-	-	7.7
FDA	2023	-	46.6	-	-	1.5	-	-	-	-	-	-	-	48.1
	2023-S	-	47.5	-	-	-	-	-	-	-	-	-	-	47.5
	2024	-	38.6	-	-	0.9	-	-	-	-	-	-	-	39.5
	2024-S	-	4.9	-	-	-	-	-	-	-	-	-	-	4.9
	2025	-	40.3	-	-	-	-	-	-	-	-	-	-	40.3
NARA	2023	-	0.2	-	-	-	-	-	-	-	-	-	-	0.2
	2024	-	0.3	-	-	-	-	-	-	-	-	-	-	0.3
	2025	-	0.3	-	-	-	-	-	-	-	-	-	-	0.3
NASA	2023	-	4.0	-	5.3	-	-	-	3.1	69.9	21.5	4.4	1.8	110.0
	2024	-	4.0	-	5.3	-	-	-	3.2	72.7	22.0	1.0	1.8	110.0
	2025	-	4.0	-	5.3	-	-	-	5.1	84.0	20.9	-	1.8	121.1
NIH	2023	27.9	296.6	313.2	11.1	18.7	82.2	19.4	150.8	391.2	24.4	1,332.5	258.4	2,926.5
	2024	27.8	293.3	312.1	10.9	18.8	82.4	19.4	150.7	393.4	24.4	1,310.6	251.9	2,895.7
	2025	28.3	309.3	332.9	11.0	20.0	86.5	19.8	158.5	420.6	24.8	1,385.1	253.7	3,050.6
NIJ	2023	-	5.9	-	-	-	0.6	-	-	-	-	-	-	6.5
	2024	-	8.0	-	-	-	1.5	-	-	-	-	0.3	-	9.8
	2025	-	8.0	-	-	-	1.5	-	-	-	-	0.3	-	9.8
NIOSH	2023	-	10.8	-	-	-	-	-	-	-	5.7	-	-	16.5
	2024	-	10.8	-	-	-	-	-	-	-	4.7	-	-	15.5
	2025	-	10.8	-	-	-	-	-	-	-	4.7	-	-	15.5
NIST	2023	9.5	25.1	8.7	8.8	92.6	7.8	-	9.5	9.9	11.5	14.2	2.9	200.5
	2024	13.6	41.3	8.4	9.0	93.0	15.4	-	9.2	11.4	11.6	15.2	3.0	231.1
	2025	10.7	84.8	8.4	8.4	91.4	11.4	-	9.1	11.2	11.6	15.2	3.0	265.2
NOAA	2023	4.3	6.5	0.2	-	-	-	-	-	93.4	-	-	5.7	110.1
	2024	4.3	6.5	0.2	-	-	-	-	-	70.2	-	-	5.7	86.9
	2025	4.3	6.5	0.2	-	-	-	-	-	88.8	-	-	5.7	105.5
NSF	2023	210.2	537.7	90.8	94.0	114.8	102.4	82.9	201.6	255.7	52.7	193.0	66.6	2,002.4
	2023-S	7.3	24.5	1.1	15.6	3.6	6.7	10.8	0.2	0.6	4.6	13.8	2.9	91.7
	2024	187.3	400.1	81.6	111.7	111.5	107.2	82.4	159.5	198.9	48.2	206.6	71.0	1,766.0
	2025	214.9	493.6	90.1	138.3	123.6	123.0	106.4	179.5	215.1	57.7	232.2	76.5	2,050.9
NTIA	2023	0.7	-	-	-	-	-	-	-	-	-	-	-	0.7
	2023-S	3.4	-	-	-	-	-	-	-	-	-	-	-	3.4
	2024	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2
	2024-S	9.1	-	-	-	-	-	-	-	-	-	-	-	9.1
Treas.	2023	-	0.4	-	-	-	-	-	-	-	-	-	-	0.4

Agency	FY	12 NITRD Program Component Areas												Totals
		ACNS	AI	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
	2024	-	1.4	-	-	-	-	-	-	-	-	-	-	1.4
	2025	-	5.9	-	-	-	-	-	-	-	-	-	-	5.9
USDA	2023	-	101.1	-	3.0	-	75.0	-	-	-	16.0	3.0	-	198.1
	2024	-	102.0	-	7.0	-	71.0	-	-	-	22.0	12.0	-	214.0
	2025	-	102.0	-	5.0	-	74.0	-	-	-	24.0	11.0	-	216.0
VA	2023	-	11.0	-	-	-	-	-	-	-	-	-	-	11.0
	2024	-	10.0	-	-	-	-	-	-	-	-	-	-	10.0
	2025	-	10.0	-	-	-	-	-	-	-	-	-	-	10.0
Totals	2023	929.4	1,914.2	610.7	156.8	692.9	429.9	899.5	878.8	1,525.7	501.3	1,793.0	386.2	10,718.4
	2023-S	37.7	75.6	1.1	15.6	18.6	31.3	10.8	30.2	0.6	6.1	13.8	2.9	244.3
	2024	775.9	1,789.0	609.2	214.2	677.4	450.1	838.2	910.3	1,446.4	489.9	1,825.6	383.2	10,409.4
	2024-S	62.6	16.5	-	-	14.5	8.0	-	41.0	-	-	-	-	142.6
	2025	792.0	1,954.5	655.3	229.6	778.4	494.9	991.0	942.7	1,581.8	475.9	1,889.5	393.8	11,179.4

Table 1 Notes:

- Fiscal years with "-S" after them denote supplemental funding.
- Amounts are in U.S. dollars in millions.
- Budget supplemental figures for FY2024 and FY2025 have not been used to calculate changes between the FY2024 and FY2025 budget numbers.
- Agency sub-departments and offices that reported budgets are as noted here (see the Abbreviations list at the end of this document): DHS: CG, CWMD, S&T, TSA, and USSS; DOD: CWP, DTRA, MDA, Military Services' research organizations (including Space Force), and OSD; DOE: ARPA-E, CESER, EERE, FECM, NE, OE, and SC; DOE/NNSA: Defense Nuclear Nonproliferation and Weapons Activities; DOI: BSEE, USBR, and USGS; DOT: FAA, FHWA, FRA, and FTA; NASA Mission Directorates: Aeronautics, Science, and Space Technology; NOAA: ORF and PAC; NSF: Education and Human Resources and Research and Related Activities; TREAS: BEP, Departmental Offices, and FinCEN; USDA: ARS, FS, and NIFA.
- The AI budget reported under the AI PCA is not the complete AI budget; refer also to Tables 2 and 3 and the Budget Analysis.
- Totals might not sum exactly as a result of rounding.
- DARPA is a DoD research organization, but it reports its budgets separately from the DoD Services research organizations and the OSD.
- The DOE/NNSA budget is listed separately from that of other DOE offices.

2.1.2 Agency Budgets by NITRD PCA for AI R&D

Table 2. Agency Budgets by NITRD PCA for AI R&D, FYs 2023–2025

Agency	FY	Agencies' AI Budgets												Totals
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
AHRQ	2023	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0
	2024	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0
	2025	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0

Agency	FY	Agencies' AI Budgets												Totals
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
ARPA-H	2023	87.5	-	-	-	-	-	-	-	-	-	-	-	87.5
	2024	50.6	-	-	-	-	-	-	-	-	-	-	-	50.6
	2025	62.7	-	-	-	-	-	-	-	-	-	-	-	62.7
DARPA	2023	334.9	-	-	-	-	-	-	-	-	-	-	-	334.9
	2024	346.6	-	-	-	-	-	-	-	-	-	-	-	346.6
	2025	313.8	-	-	-	-	-	-	-	-	-	-	-	313.8
DHS/ Coast Guard	2023	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2
	2025	0.1	-	-	-	-	-	-	-	-	-	-	-	0.1
DHS/ CWMD	2023	1.0	0.2	-	-	-	-	-	-	-	-	2.2	-	3.4
	2024	2.4	0.1	-	-	-	-	-	-	-	-	-	-	2.5
	2025	0.0	0.1	-	-	-	-	-	-	-	-	-	-	0.1
DHS/ S&T	2023	2.2	0.6	-	-	35.2	-	-	-	-	0.5	-	4.9	43.4
	2024	11.9	1.0	-	-	16.0	-	-	-	-	-	-	0.0	28.9
	2025	7.1	2.1	-	-	32.2	-	-	-	-	-	-	5.0	46.3
DHS/ TSA	2023	5.8	-	-	-	-	-	-	-	-	-	-	-	5.8
	2024	3.0	-	-	-	-	-	-	-	-	-	-	-	3.0
	2025	6.4	-	-	-	-	-	-	-	-	-	-	-	6.4
DOD/ Army	2023	95.8	-	-	-	-	-	-	-	-	-	-	-	95.8
	2024	114.6	-	-	-	-	-	-	-	-	-	-	-	114.6
	2025	100.7	-	-	-	-	-	-	-	-	-	-	-	100.7
DOD/ CWP	2023	0.8	-	-	-	-	-	-	-	-	-	-	-	0.8
	2024	1.5	-	-	-	-	-	-	-	-	-	-	-	1.5
	2025	1.2	-	-	-	-	-	-	-	-	-	-	-	1.2
DOD/ DAF	2023	45.5	7.7	8.9	0.7	15.1	2.5	-	1.4	-	6.2	7.8	-	95.8
	2023-S	-	5.4	-	-	3.8	-	-	-	-	-	-	-	9.2
	2024	52.3	7.3	17.6	1.1	33.0	5.1	-	1.3	-	6.9	10.4	-	135.1
	2024-S	-	13.4	-	-	5.8	-	-	-	-	-	-	-	19.2
	2025	41.2	11.4	20.4	1.5	29.8	6.5	-	0.3	-	7.2	8.0	-	126.3
DOD/ DTRA	2023	2.8	-	-	-	-	-	-	-	-	-	-	-	2.8
	2024	2.8	-	-	-	-	-	-	-	-	-	-	-	2.8
	2025	2.9	-	-	-	-	-	-	-	-	-	-	-	2.9
DOD/ MDA	2023	2.7	-	-	-	-	-	-	-	-	-	-	-	2.7
	2024	11.9	-	-	-	-	-	-	-	-	-	-	-	11.9
	2025	12.1	-	-	-	-	-	-	-	-	-	-	-	12.1
	2023	72.0	-	11.7	-	-	-	-	-	-	2.0	-	-	85.7

Agency	FY	Agencies' AI Budgets												Totals
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
DOD/ Navy	2024	58.8	-	12.2	-	-	-	-	-	-	2.3	-	-	73.3
	2025	52.5	-	12.3	-	-	-	-	-	-	1.8	-	-	66.5
DOD/ OSD	2023	15.1	-	-	-	4.3	-	-	-	-	6.2	-	-	25.6
	2024	14.9	-	-	-	4.0	-	-	-	-	3.2	-	-	22.1
	2025	15.9	28.2	-	-	1.7	-	-	-	-	-	-	-	45.9
DOD/ Space Force	2023	6.8	-	-	-	-	-	-	-	-	-	-	-	6.8
	2024	6.6	-	-	-	-	-	-	-	-	-	-	-	6.6
	2025	6.7	-	-	-	-	-	-	-	-	-	-	-	6.7
DOE/ EERE	2023	53.3	-	-	-	-	-	-	-	-	-	-	-	53.3
	2024	70.0	-	-	-	-	-	-	-	-	-	-	-	70.0
	2025	62.5	-	-	28.0	-	-	4.9	2.5	2.5	8.3	7.4	3.5	119.6
DOE/ FECM	2023	10.3	-	-	-	-	-	-	-	-	-	-	-	10.3
	2023-S	3.0	-	-	-	-	-	-	-	-	-	-	-	3.0
	2024	11.9	-	-	-	-	-	-	-	-	-	-	-	11.9
	2025	12.2	-	-	-	-	-	-	-	-	-	-	-	12.2
DOE/ NE	2023	3.5	-	-	-	-	-	-	-	-	-	-	-	3.5
	2024	6.0	-	-	-	-	-	-	-	-	-	-	-	6.0
	2025	6.3	-	-	-	-	-	-	-	-	-	-	-	6.3
DOE/ NNSA	2023	33.9	-	-	-	-	-	-	-	-	-	-	-	33.9
	2024	28.0	-	-	-	-	-	-	-	-	-	-	-	28.0
	2025	58.0	-	-	-	-	-	-	5.6	-	-	-	-	63.6
DOE/ SC	2023	79.6	-	-	-	-	16.9	-	15.0	-	-	-	-	111.5
	2024	69.9	-	-	-	-	10.1	-	15.5	-	-	-	-	95.4
	2025	105.6	-	-	-	-	31.2	-	21.1	-	-	-	-	157.8
DOI/ BSEE	2024	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5
	2025	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5
DOI/ USBR	2024	0.0	-	-	-	-	-	-	-	-	-	1.9	-	1.9
	2025	0.0	-	-	-	-	-	-	-	-	-	0.8	-	0.8
DOI/ USGS	2023	8.0	-	-	-	-	-	-	-	1.5	-	-	-	9.5
	2024	6.0	-	-	-	-	-	-	-	1.0	-	-	-	7.0
	2025	8.0	-	-	-	-	-	-	-	2.0	-	-	-	10.0
DOT/ FAA	2023	2.7	-	-	-	-	-	-	-	-	-	-	-	2.7
	2024	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5
	2025	0.8	-	-	-	-	-	-	-	-	-	-	-	0.8

Agency	FY	Agencies' AI Budgets												Totals
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
DOT/ FHWA	2023	3.9	-	-	-	-	-	-	-	-	-	-	-	3.9
	2024	2.0	-	-	-	-	-	-	-	-	-	-	-	2.0
	2025	2.0	-	-	-	-	-	-	-	-	-	-	-	2.0
DOT/ FTA	2023	-	-	-	-	2.0	-	-	-	-	5.0	-	-	7.0
ED-IES	2023	-	-	-	-	-	4.2	-	-	-	-	-	-	4.2
	2024	-	-	-	-	-	6.4	-	-	-	-	-	-	6.4
	2025	-	-	-	-	-	6.4	-	-	-	-	-	-	6.4
FDA	2023	46.6	-	-	-	-	-	-	-	-	-	-	-	46.6
	2023-S	47.5	-	-	-	-	-	-	-	-	-	-	-	47.5
	2024	38.6	-	-	-	-	-	-	-	-	-	-	-	38.6
	2024-S	4.9	-	-	-	-	-	-	-	-	-	-	-	4.9
	2025	40.3	-	-	-	-	-	-	-	-	-	-	-	40.3
NARA	2023	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2
	2024	0.3	-	-	-	-	-	-	-	-	-	-	-	0.3
	2025	0.3	-	-	-	-	-	-	-	-	-	-	-	0.3
NASA/ AERO.	2023	4.0	-	-	-	-	-	-	-	-	-	-	-	4.0
	2024	4.0	-	-	-	-	-	-	-	-	-	-	-	4.0
	2025	4.0	-	-	-	-	-	-	-	-	-	-	-	4.0
NASA/ SCIENCE	2023	-	-	-	-	-	-	-	0.5	2.1	-	-	-	2.6
	2024	-	-	-	-	-	-	-	0.5	7.3	-	-	-	7.8
	2025	-	-	-	-	-	-	-	0.5	10.1	-	-	-	10.6
NIH	2023	296.6	10.2	111.2	3.7	3.7	27.0	6.2	50.1	79.8	7.5	406.4	69.5	1,071.9
	2024	293.3	10.2	110.8	3.7	3.7	27.1	6.2	50.0	80.2	7.5	399.7	67.7	1,060.2
	2025	309.3	10.3	118.2	3.7	3.9	28.5	6.3	52.6	85.8	7.6	422.5	68.3	1,117.0
NIJ	2023	5.9	-	-	-	-	-	-	-	-	-	-	-	5.9
	2024	8.0	-	-	-	-	-	-	-	-	-	-	-	8.0
	2025	8.0	-	-	-	-	-	-	-	-	-	-	-	8.0
NIOSH	2023	10.8	-	-	-	-	-	-	-	-	0.7	-	-	11.5
	2024	10.8	-	-	-	-	-	-	-	-	0.9	-	-	11.7
	2025	10.8	-	-	-	-	-	-	-	-	0.9	-	-	11.7
NIST	2023	25.1	0.2	0.9	-	-	-	-	1.9	0.1	4.7	2.1	-	35.0
	2024	41.3	0.1	0.1	-	-	-	-	1.8	0.1	5.8	2.4	-	51.7
	2025	84.8	0.1	0.1	-	-	-	-	1.8	0.1	5.5	2.4	-	94.8

Agency	FY	Agencies' AI Budgets												Totals
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
NOAA/ ORF	2023	1.5	-	-	-	-	-	-	-	1.0	-	-	0.5	3.0
	2024	1.5	-	-	-	-	-	-	-	1.0	-	-	0.5	3.0
	2025	1.5	-	-	-	-	-	-	-	1.0	-	-	0.5	3.0
NOAA/ PAC	2023	5.0	-	-	-	-	-	-	-	1.4	-	-	3.5	9.9
	2024	5.0	-	-	-	-	-	-	-	1.5	-	-	3.5	10.0
	2025	5.0	-	-	-	-	-	-	-	1.5	-	-	3.5	10.0
NSF	2023	537.7	31.5	29.1	22.6	24.1	9.2	3.3	12.1	23.0	27.4	46.3	6.7	773.0
	2023-S	24.5	-	-	-	-	-	-	-	-	-	-	-	24.5
	2024	400.1	18.7	26.1	20.1	22.3	6.8	2.5	12.8	17.9	25.5	43.4	6.4	602.6
	2025	493.6	17.2	28.8	22.1	26.0	7.9	0.0	5.4	10.8	27.7	44.1	6.9	690.5
TREAS/ BEP	2025	0.5	-	-	-	-	-	-	-	-	-	-	-	0.5
TREAS/ Depart. Offices	2024	1.0	-	-	-	-	-	-	-	-	-	-	-	1.0
	2025	5.0	-	-	-	-	-	-	-	-	-	-	-	5.0
TREAS/ FinCEN	2023	0.4	-	-	-	-	-	-	-	-	-	-	-	0.4
	2024	0.4	-	-	-	-	-	-	-	-	-	-	-	0.4
	2025	0.4	-	-	-	-	-	-	-	-	-	-	-	0.4
USDA/ ARS	2023	32.0	-	-	-	-	-	-	-	-	-	-	-	32.0
	2024	32.0	-	-	-	-	-	-	-	-	-	-	-	32.0
	2025	32.0	-	-	-	-	-	-	-	-	-	-	-	32.0
USDA/ FS	2023	2.1	-	-	-	-	-	-	-	-	-	-	-	2.1
	2024	3.0	-	-	-	-	-	-	-	-	-	-	-	3.0
	2025	3.0	-	-	-	-	-	-	-	-	-	-	-	3.0
USDA/ NIFA	2023	67.0	-	-	2.0	-	3.8	-	-	-	6.1	1.9	-	80.6
	2024	67.0	-	-	5.5	-	5.0	-	-	-	16.9	8.6	-	103.1
	2025	67.0	-	-	4.0	-	5.2	-	-	-	18.5	7.9	-	102.5
VA	2023	11.0	-	-	-	-	-	-	-	-	-	-	-	11.0
	2024	10.0	-	-	-	-	-	-	-	-	-	-	-	10.0
	2025	10.0	-	-	-	-	-	-	-	-	-	-	-	10.0

| Agency | FY | Agencies' AI Budgets | | | | | | | | | | | | Totals |
		AI	ACNS	CHuman	CNPS	CSP	EdW	ENIT	EHCS	HCIA	IRAS	LSDMA	SPSQ	
Totals	2023	1,914.2	50.5	162.7	29.0	84.4	63.6	9.5	81.0	109.0	66.2	466.8	85.1	3,121.9
	2023-S	75.6	5.4	-	-	3.8	-	-	-	-	-	-	-	84.7
	2024	1,789.0	37.4	167.8	30.4	78.9	60.5	8.7	81.9	109.1	69.1	466.5	78.2	2,977.5
	2024-S	16.5	13.4	-	-	5.8	-	-	-	-	-	-	-	35.7
	2025	1,954.5	69.5	180.8	59.3	93.5	85.7	11.2	89.8	113.8	77.4	493.0	87.7	3,316.1

Table 2 Notes:
- Fiscal years with "-S" after them denote supplemental funding.
- Amounts are in U.S. dollars in millions.
- Budget supplemental figures for FY2024 and FY2025 have not been used to calculate changes between the FY2024 and FY2025 budget numbers.
- Totals might not sum exactly as a result of rounding.
- (1) Examples of AI R&D investments reported under the AI PCA are R&D on general methods for machine vision; (primarily) machine learning; cybersecurity challenges unique to AI (e.g., ability to exploit flaws in an AI system's goals); algorithms for computational linguistics; and neuromorphic computing architectures or chips optimized for neural nets.
(2) Examples of AI investments reported in other PCAs are R&D on robots (reported in IRAS); the data analysis and management ecosystem (reported in LSDMA); broad issues of human-machine interaction (reported in CHuman) and cybersecurity research (reported in CSP); and general neuromorphic computing (reported in EHCS).

2.1.3 Agency Budgets for NSF–led National AI Research Institutes

Table 3. Agency Budgets for NSF-Led National AI Research Institutes, FYs 2023–2025

| FY | Agencies | | | | | Totals |
	NSF	DOD	ED-IES	USDA-NIFA	NIST	
2023	64.4	7.2	2.2	40	4.7	118.5
2024	52.3	3	4.4	8	1.3	69
2025	61.9	2	4.4	4	-	72.3

2.1.4 NITRD Agency Budgets for Advanced Wireless Networking R&D

Table 4. NITRD Agency Budgets for AWN R&D, FYs 2023–2025

| FY | Agencies | | | | | | | | | Totals |
	DARPA	DHS S&T	DOD/Navy	DOD/OSD	DOE/OE	NIH	NIST	NSF	NTIA	
2023	39.0	6.1	28.9	240.9	-	9.7	4.6	161.9	0.7	491.7
2023-S	-	-	-	-	-	-	-	7.3	3.4	10.7
2024	34.6	-	33.9	139.5	0.5	9.6	8.8	142.3	0.2	369.5
2024-S	-	-	-	-	-	-	-	-	9.1	9.1
2025	7.2	6.5	25.9	169.4	1.0	9.8	6.8	167.6	-	394.2

2.2 Changes in Overall Agency Budgets, FY2024 to FY2025

Table 5 shows changes of investment greater than $10 million, by agency and PCA, between the FY2024 enacted budgets and the FY2025 budget requests.

Table 5. Changes of >$10 Million in Investment

Agency	Description
ARPA-H	The increase of $12.1 million is a result of an increase in AI, which in turn is a result of the launch of two programs, the Digital Health Security Initiative (DIGIHEALS) and the Biomedical Data Fabric (BDF) Toolbox.
DARPA	The increase of $118.1 million is due to increases of $131.2 million in ENIT which reflects the initiation of several thrusts: Emerging Opportunities in Electronic Sciences, Supply Chain & Logistics in Electronic Technology, and Warfighting Performance in Electronic Technology and $86.9 million in CSP which reflects the initiation of Making and Maintaining in Cyber Security and Access in Cyber Systems programs as well as the ramping up of the Constellation program. These are partially offset by decreases of $46.2 million in ACNS which reflects the completion of Data Privacy in Virtual Environments (DPRIVE) program and a shift from design and development to demonstration and transition activities in the Mission Integrated Network Control (MINC) and Space-Based Adaptive Communications Node (Space-BACN) programs; $32.8 million in AI, which reflects completion of Artificial Social Intelligence for Successful Teams (ASIST), Guaranteeing AI Robustness against Deception (GARD), Automated Rapid Certification Of Software (ARCOS), Assured Autonomy, and Machine Common Sense (MCS) programs; $21.0 million in LSDMA reflects completion of ASIST, GARD, ARCOS, MCS programs.
DHS	The increase of $36.2 million is the result of an increase of $25.1 million in CSP at DHS S&T due to a $16 million increase in advanced research and development in AI security and assurance, software assurance, data security and privacy enhancement and a $9 million increase in foundational research focused on communications and cyber resiliency, data sciences, and digital identity and trust, with smaller increases and decreases in other programs and PCAs.
DOD	The decrease of $95.2 million is due to decreases of $30.2 million in AI, $29.0 million in IRAS, $22.2 million in CSP, $18.6 million in HCIA, $14.1 million in EHCS, $11.2 million in LSDMA, and $10.1 million in EdW. Decreases in IRAS and CSP are partially due to OSD's Historical Black Colleges and Universities/Minority Institutions dollars that are not continuing in FY2024 and FY2025. These decreases are partially offset by increases of $37.8 million in ACNS which is partially due to an oversight in OSD reporting during data collection, $16.4 million in CHuman, with smaller decreases in other programs and PCAs.
DOE	The increase of $146.0 million is a result of increases of $76.8 million in HCIA foundational AI investments, as well as investments in Energy Earthshots that support shifting some efforts, previously supported by the Exascale Computing Project, to address the research needs of the Energy Earthshots; $28.8 million in AI for core research for trustworthy AI, increases for privacy preserving technologies, increases in AI for computational science efforts across the Office of Science, and increases for the Computational Science Graduate Fellowship (CSGF) to train more applied mathematicians and computer scientist focused on the challenge of AI at the exascale, and beyond; and $36.0 million in EdW for increased workforce investments including the CSGF, Reaching a New Energy Sciences Workforce (RENEW) and Funding for Accelerated, Inclusive Research (FAIR) - including investments in Established Program to Stimulate Competitive Research (EPSCOR) states. These are partially offset by smaller increases and decreases in other programs and PCAs.
DOE/NNSA	The increase of $38.7 million is a result of an increase of $30.0 million at NNSA's Office of Defense Nuclear Nonproliferation (DNN) to support initial development of on-premises and cloud compute infrastructure to support blue/red-teaming of a wide range of state-of-the-art open source and industry AI systems for new safety impacting use cases under the kinetic force, critical infrastructure, physical security, insider threat, and export control categories, with smaller increases in EHCS and IRAS.

Agency	Description
NASA	The increase of $11.1 million is a result of small increases in EHCS and HCIA, partially offset by small decreases in IRAS and LSDMA.
NIH	The increase of $154.9 million is a result of increases of $74.5 million in LSDMA to support new priorities in medical imaging and digital pathology data management and analysis and in data platform interoperability; $27.2 million in HCIA to support expanding the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) initiative for new methods to characterize and model brainstem function and a new program in Nutrition for Precision Health; $20.8 million in CHuman for the ability to develop and deploy digital prosthetic interface technologies and implant technologies; $16.0 million in AI that includes growth in the AI programs in Alzheimer's, dementia and cognitive decline as well as new research in foundational models for health and vision, and smaller increases in other PCAs.
NIST	The increase of $34.1 million is a result of an increase of $43.5 million in AI due to AI initiative requested in President's budget. This increase is offset by smaller decreases in other PCAs.
NOAA	The increase of $18.6 million is a result of an increase in HCIA for Research Supercomputing at NOAA's Oceanic and Atmospheric Research (OAR).
NSF	The increase of $284.9 million across all PCAs is related to the overall increase for Research and Related Activities at the FY2025 Request level to enhance fundamental research and development and strengthen U.S. leadership in emerging technologies. Increased investments in the National AI Research Institutes and the Technology, Innovation and Partnerships Directorate contributed to larger than average increases in the AI, CNPS, ENIT, and IRAS PCAs.

3.0 Key Activities of the NITRD IWGs

Member and participating agencies coordinate and collaborate on R&D programs through the NITRD IWGs. The call-out boxes under each IWG highlight the programs and activities that support the Administration's Multi-Agency Research and Development Priorities for FY2025.[19] For a complete list of the R&D programs and activities that support the IWGs' priorities, *FY2025 IWG Priorities and Associated R&D Programs and Activities.* See Appendix C: https://www.nitrd.gov/pubs/FY25-IWG-Priorities-Programs-Activities.pdf.

Note: The IWGs are listed in alphabetical order, with the programs/activities with the greatest number of participating agencies, and then by agency (in alphabetical order).

Education and workforce development investments reported within relevant PCAs are also reported within the EdW PCA (Section 3.6) to provide a more holistic picture of agency efforts in this administration priority. In addition, international coordination is called out in each PCA as appropriate, and key coordination activities are included, sorted by the number of agencies involved in that activity.

3.1 Advanced Communication Networks and Systems (ACNS) PCA

ACNS R&D advances and validates communication networks and systems, including wireless, optical, or quantum communication technologies and services; this includes R&D in networking architectures, programmability, security, measurement, performance, robustness, resilience, and interoperability, along with techniques for advancing spectrum efficiency.

3.1.1 Large Scale Networking (LSN) IWG

The LSN IWG coordinates federal R&D in networking technologies and services, including network architectures, wired and wireless network infrastructures, grid and cloud middleware research, and communication protocols, to enable robust transfer of data among ground, sea, air, and space systems.

Agencies: AFRL, Army/C5ISR, DAF, DHS, DOC (NIST, NOAA, NTIA), DOD (DARPA, HPCMP, NSA), DOE/SC, DOI, DOJ, DOT, FCC, GSA, HHS/NIH, NASA, Navy & NSF

The LSN IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: LSN Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Convergent Networks:** Incorporates ML/AI aspects of feedback-based reinforcement learning techniques for better adaptation to the communications layer. **Navy**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Cryptographic Protocol Analysis and Verification:** Provides formal verification of the security properties of network security protocols providing authentication, confidentiality, and integrity. **NSA**
   - **Tactical 5G Implementation:** Develops technologies for end user equipment to authenticate base station and improve transmission security. **Navy**

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[19] https://www.whitehouse.gov/wp-content/uploads/2023/08/FY2025-OMB-OSTP-RD-Budget-Priorities-Memo.pdf

3. **Achieve better health outcomes for every person**
   - **Delivering Evidence-Based Parenting Services to Families in Child Welfare using Telehealth:** Addresses the degree to which families in Child Protective Services have the technology needed to use telehealth. **NIH**
   - **Predictive Analytics via Networked Distributed Algorithms for Multi-System Diseases:** Develops data integration methods to create predictive models of multi-system diseases. **NIH**

4. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **Next Generation Wireless:** Researches and develops the measurement science and standards necessary to foster future generation wireless systems. **NIST**
   - **Resilient & Intelligent NextG Systems:** Accelerates research to increase U.S competitiveness in NextG networking and computing technologies. **NSF**

5. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Advanced Wireless for Scientific Applications:** Designs and optimizes scientific infrastructure and the experiments and services enabled by advanced wireless technologies. **DOE/SC**
   - **CloudBank:** Helps the computer and information science and engineering research community access public compute clouds where appropriate. **NSF**

3.1.1.1 LSN IWG Strategic Priorities

1. Promote long-term research in concepts, techniques, architectures, and protocols for future networks.
2. Enable cloud infrastructure enhancements from enterprise to tactical edge including standards and guidance for the adoption of cloud computing.
3. Scale data-intensive workload and management capabilities to meet the requirements of applications such as data modeling and analytics.
4. Achieve new levels of security and resilience for emerging wireless networks and multidomain internets and to protect core infrastructure.
5. Advance wireless networks through innovations such as the use of nontraditional waveforms and the deployment of nationwide testbeds.

3.1.1.2 Key Coordination Activities

- **Federal IPv6 Task Force:** Coordinates the implementation of IPv6-only initiative. **DHS, DOD, DOJ, GSA & NIST**
- **Joint Engineering & Technical Interchange:** Holds an annual series of technical workshops for network engineers and technical staff. **DAF, DOD, DOI, NIST & NOAA**
- **DC Quantum Network Testbed:** Develops regional quantum network for interagency experiments. **DOD, NASA & NIST**
- **Network Security Guidance:** Coordinates NIST and DHS network security programs in several areas, TIC, zero trust, IPv6, DNS. **DHS & NIST**

3.1.2 Advanced Wireless R&D (AWRD) Sub–PCA and Wireless Spectrum R&D (WSRD) IWG

AWRD includes federal spectrum-related R&D investments that promote the efficient use of wireless spectrum through advanced technologies and systems. Investments under this sub-PCA are coordinated by and reported under the WSRD IWG.

The WSRD IWG coordinates federal spectrum-related R&D activities to facilitate efficient, effective R&D investments that promote efficient use of wireless spectrum through advanced technologies and systems.

Agencies: Army (DEVCOM, C5ISR), DAF/AFRL, DOD (DARPA, OUSD(R&E)), DOC (NIST, NOAA), DOE, DOI, DOT, FDA, NASA, Navy, NSF & NTIA

The WSRD IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: WSRD Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Next Generation Wireless/Spectrum Sharing and Sensing:** Develops AI-driven channel models, curated datasets, and ML/AI methodologies for RF/wireless systems; creates simulation platforms for integrating ML tools; and develops statistical methods for complex, large-scale systems. **NIST**
   - **NSF AI Institute for Future Edge Networks and Distributed Intelligence (AI-EDGE):** Develops new AI-technologies for future edge networks (6G and beyond) ensuring private, high-speed communications with minimal delays. **NSF**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **INL 5G Connectivity and Cybersecurity:** Improves the security and reliability of control systems for next generation nuclear reactors. **DOE**
   - **Public Safety Communication Innovation Laboratory:** Focuses on next-generation communication capabilities for first responders. **NIST**

3. **Reduce barriers and inequities**
   - **Spectrum Innovation Center SpectrumX:** Conducts strategic research and workforce development projects to transform spectrum management, including developing a workforce of diverse, civic-minded, and globally engaged scientists, technicians, engineers, economists, and policymakers. **NSF**
   - **Spectrum Education Awareness initiative:** Builds on an effective and well-trained spectrum workforce. **NASA**
   - **Spectrum Workforce Development Forum:** Fosters collaboration to develop spectrum materials and training. **DOD, DOI, DOT, NASA, NSF & NTIA**

4. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **Next Era of Wireless and Spectrum:** Supports fundamental research to develop intellectual capital enabling the smooth/quick transition to effective ways of using/managing the radio and optical spectrum after the end of the current spectrum era. **NSF**
   - **Spectrum Innovation Research Incubator:** Improves the interagency coordination process and accelerates deployment of commercial wireless technologies. **NTIA**

5. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Communications Research and Innovation Network:** Evaluates the reality of open Radio Access Network and subsequent open, disaggregated, and software-centric network products and solutions. **NTIA**
   - **Open Centralized Unit-Distributed Unit:** Supports innovation efforts that accelerate the domestic development of 5G and Future G technologies. **DOD OUSD(R&E)**

3.1.3.1 Strategic Priorities

1. Improve capability of spectrum-dependent federal and private sector systems to operate in shared, congested, and new/higher frequency spectrum bands.
2. Improve capability of future generation federal and private sector wireless systems to simultaneously meet competing requirements (e.g., security, privacy, capacity, latency, energy consumption, spectrum coexistence, and efficiency).
3. Promote unprecedented spectrum access through better spectrum management processes, systems, tools, and data. Contribute to the National Spectrum R&D Roadmap.
4. Promote development of trustworthy measurement. evidence-based data-driven algorithms, analytics, and models to inform system design, spectrum policy, and management.
5. Accelerate assessment of spectrum innovations and their translation into practice through better capabilities and facilities for modeling, simulation, and testing.
6. Grow the spectrum workforce, increase policymaker and public understanding of spectrum considerations, and raise awareness of spectrum's importance to the country through enhancing education, workforce development, and public outreach on spectrum-related topics. Contribute to the National Spectrum Workforce Plan.

3.1.3.2 Key Coordination Activities

- **NASCTN:** Coordinates a national network of test facilities to provide testing, modeling, and analysis for developing and deploying spectrum-sharing technologies and shaping future spectrum policy. **NIST, DOD, NASA, NOAA, NSF & NTIA**
- **RINGS:** Supports dynamically varying demands for data processing, dissemination, and storage, often in a distributed user-to-edge-to-cloud continuum context. **NSF, NIST & DOD**

3.2 Artificial Intelligence (AI) PCA

AI R&D advances responsible research in AI and associated AI topics; this includes research directly related to AI into: fundamental AI approaches; developing more effective human-AI collaboration; addressing ethical, legal, and societal implications; ensuring safety and security; developing training datasets and testing environments; and evaluating AI systems and creating standards and benchmarks.

3.2.1 Artificial Intelligence R&D IWG

The AI R&D IWG coordinates federal AI R&D and supports activities tasked by the Subcommittee on Machine Learning and Artificial Intelligence and the NAIIO. This vital work promotes U.S. leadership and global competitiveness in AI R&D and its applications.

Agencies: Army, DAF (ACC, AFIT, AFOTEC, AFRL, AFTC, SAF/AQ, Space Force), DHS, DOC (NIST, NOAA, NTIA, USPTO), DOD (CDAO, DARPA, DTRA, OUSD(R&E), TRMC), DOE/NNSA, DOE/SC, DOI (USGS), DOJ (FBI, NIJ), DOT (FAA, FHWA, NTSB), ED, HHS (ONC), IARPA, Marines, NAIIO, NASA, Navy, NIH (NCI, NIBIB, OBSSR), NSF, OPM, State, USAID & USDA-NIFA

The AI IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: AI Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **AI Risk Assessments in Critical Infrastructure Sector:** Nine agencies submitted their risk assessments to DHS for continued federal action to ensure that the U.S. is integrating AI safely into vital aspects of society, such as the electric grid. **DHS and partnering agencies**
   - **Developing Guidelines, Best Practices, and Evaluations for Trustworthy AI:** Develops an AI Risk Management Framework for generative AI, including secure software development, evaluation guidelines, synthetic content authentication, differential privacy protections, and a plan for global AI standards engagement. **NIST and partnering agencies**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Reducing Risk at the Intersection of AI and Chemical, Biological, Radiological, and Nuclear (CBRN) Threats:** An HHS AI Task Force has been established and is dedicated to biosafety and biosecurity (chemical, biological, radiological, and nuclear) or CBRN defense. **HHS & NIST**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - The NSF Regional Innovation Engines (Engines)[20] program supports the application of AI to a wide range of societal and economic challenges. **NSF**

4. **Achieve better health outcomes for every person.**
   - **Science Collaborative for Health disparities and Artificial intelligence bias REduction Think-a-Thons series:** Targets underrepresented populations, such as women and health disparity populations, in data science to gain and upskill AI and cloud computing. **NIH**

5. **Reduce barriers and inequities.**
   - **DOD HPC Internship Program:** Supports and expands computing research opportunities through R&E HBCU which provides undergraduate & graduate students with HEC experience. **OUSD(R&E)**
   - **Expanding AI Innovation through Capacity Building and Partnerships (ExpandAI):** Supports capacity-development projects and partnerships within the National AI Research Institutes ecosystem that help broaden participation in artificial intelligence research, education and workforce development. **DHS, DOD, NIST, NSF & USDA-NIFA**
   - **Minority University Research and Education Project:** Engages underrepresented populations through a wide variety of initiatives. **NASA**

6. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness from the bottom up and middle out.**
   - Seven of the 10 inaugural NSF Engines focus on application of AI and 15 NSF Engines development awards made in 2023 involved AI. **NSF**
   - **Resources for AI:** The National AI Research Resource (NAIRR) is a concept for a shared national research infrastructure to connect U.S. researchers to responsible and trustworthy AI resources. **NSF and partnering agencies**

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[20] https://new.nsf.gov/funding/initiatives/regional-innovation-engines

> 7. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
>   - **The Building the Prototype Open Knowledge Network (Proto-OKN)[21] program:** Supports open access to shared information for the development and evolution of AI and AI-powered solutions. **NSF**
>   - **AI in the Federal Space:** On March 28, 2024, the Office of Management and Budget (OMB) published a policy[22] for the use of AI by the U.S. government. **OMB**
>   - **Accelerating Discovery and Innovation through strong foundational R&D:** DOE/SC investments develop robust, interpretable, and domain-aware foundations for the use of AI for science.[23] **DOE/SC**

3.2.1.1 Strategic Priorities

1. Make long-term investments in fundamental and responsible AI research.
2. Develop effective methods for human-AI collaboration.
3. Understand and address the ethical, legal, and societal implications of AI.
4. Ensure the safety and security of AI systems.
5. Develop shared public datasets and environments for AI training and testing.
6. Measure and evaluate AI technologies through standards and benchmarks.
7. Better understand the national AI R&D workforce needs: Grow the AI R&D workforce to ensure America leads the AI innovation of the future. *See EdW PCA Priority 6.*
8. Expand PPPs to accelerate advances in AI and strengthen the Nation's R&D ecosystem. See also Key Coordination Activities and Section 5.0 on the National AI Research Institutes.
9. Establish a principled and coordinated approach to international collaboration in AI research.

3.2.1.2 Key Coordination Activities

- **Cyber-Physical Systems:** Funds projects to effectively leverage and enhance sub-projects within the AI Institutes. **DHS, DOT, NIBIB, NCI, NCATS, NSF, OBSSR & USDA-NIFA**
- **National AI Research Resource Pilot:** Strengthens partnerships for the development of AI applications, fostering economic growth by creating new markets and revenue streams. **DARPA, DOE, DOD, NIH, NASA, NIST, NOAA, NSF, academic & industry partners**
- **Video and Image Analytics:** A forum for government computer vision experts to coordinate R&D on video and image analytics, covering data collection, annotation, security, privacy, and synthetic data effects. **DHS, FBI, FHWA, IARPA, NIJ, NIST & NSF**
- **Measurement and Evaluation Projects:** Coordinates AI technology evaluations. **DHS, DOJ, IARPA, NIST & State**
- **National Advanced Spectrum and Communications Test Network**: Provides a forum for addressing spectrum-sharing challenges to accelerate the deployment of wireless technologies among users. **DOD, NASA, NIST, NOAA, NSF & NTIA**
- **National AI Research Institutes:** Advances foundational and use-inspired research. **DHS, DOD, ED, NIST, NSF & USDA-NIFA**

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[21] https://new.nsf.gov/funding/opportunities/building-prototype-open-knowledge-network-proto
[22] https://www.whitehouse.gov/wp-content/uploads/2024/03/M-24-10-Advancing-Governance-Innovation-and-Risk-Management-for-Agency-Use-of-Artificial-Intelligence.pdf
[23] https://science.osti.gov/ascr/Research/Artificial-Intelligence-AI

- **AUKUS:** Develops an AI Passport, a federated AI architecture that emphasizes interoperability, operates at scale, and minimizes cost for the Joint Services and Coalition partners. **Army, DAF, Navy, OUSD(R&E) & international partners**
- **Hackathons:** Encourages innovation and collaboration to solve some of the department's greatest challenges. **Army, DAF, Navy, Marines & Space Force**
- **National AI Research Institutes:** Advances foundational and use-inspired research. **DHS, DOD, ED, NIST, NSF, & USDA-NIFA**
- **Aviation Safety Information Analysis and Sharing:** Actives commercial flight-recorded data and safety reports, analyzed for safety incidents. **FAA, NASA, NTSB & industry partners**
- **Global AI Research Agenda:** Develops a Global AI Research Agenda to guide the objectives and implementation of AI-related research beyond U.S. borders, as per the AI EO 14110. **DOE/SC, NSF, State & USAID**
- **Foundation Models for Scientific Discovery and Innovation:** Funds a National Academies fast track study on potential applications and fundamental limitations of AI: **DOE/SC, DOE/NNSA, NASA & NSF**
- **National AI Research Institutes. International supplements for six NSF-funded AI Institutes:** TILOS (UCSD), IAIFI (MIT), AI-EDGE (Ohio State), Athena (Duke), AI2ES (U Oklahoma), AI-CARING (Georgia Tech). Additional opportunities through AI Virtual Organization. **NSF, academic & international partners**
- **NSF RINGS - Virtual Organization:** Enhances NextG wireless and mobile systems to improve the resilience of global-scale networks and services. **NSF, NIST & industry partners**
- **Trustworthy AI:** Develops testbeds and testing environments for the development of secure and trustworthy AI technologies, and the design, development, and deployment of privacy-enhancing technologies (PETs). **DOC, DOE & NSF**
- **AUKUS AI & Autonomy WG - Demonstration/Experimentation Campaign:** Fosters trilateral participation in capstone event and associated de-risking events. **OSD & international partners**
- **Collaboration Summit:** Collaborates on AI and Autonomy activities across DOD. **DAF & DOD agencies**
- **Framework Development:** Participates in federal initiatives for the development of AI workforce framework. **NIST & OPM**
- **HHS AI Community of Practice:** Brings together professionals across HHS collectively learn, share, grow, and create knowledge around AI and to leverage AI to accomplish its missions. **ONC & HHS agencies**
- **HHS AI Council:** Advances the HHS AI strategy, supports AI governance, strategy execution, and development of strategic AI priorities across the enterprise. **ONC & HHS agencies**
- **Global intellectual property offices (IP5) New Emerging Technologies/AI Task Force:** Develops a comprehensive roadmap that includes NET and AI for possible projects and initiatives. **USPTO & international partners**
- **Measurement Science:** Develops AI approaches for analyzing 3D, 3D+t, and 5D images. **NCI & NIST**
- **NCI-DOE Collaboration AI/ML Resources:** Fosters collaborative biomedical research by providing models, algorithms, datasets, software, and other resources to the research community. **NIH & DOE**
- **Summit for AI Institutes Leadership Conference:** Promotes interactions, discussions, and connections among institutes' researchers and staff. **USDA-NIFA & industry partners**
- **Training Programs:** Supports a pilot program to enhance existing successful training programs for scientists, with the goal of training 500 new researchers by 2025, as per the AI EO 14110. **NSF & DOE**
- **TrojAI:** Develops technology to detect Trojan attacks in AI systems. **IARPA & NIST**

- **Bilateral discussions with foreign Intellectual Property Offices:** Collaborates on policies on AI-related examination practices and considerations when leveraging AI. **USPTO**

3.2.1.3 International Collaborations

- **AUKUS Partnership:** Accelerates adoption, and improving interoperability, scalability, and resilience of, autonomous and AI-enabled systems in contested environments. **Army, DAF, Navy, OUSD(R&E) & international partners**
- **AUKUS:** Develops an AUKUS AI Passport, a federated AI architecture that emphasizes interoperability, operates at scale, and minimizes cost for the Joint Services and Coalition partners. **Army, DAF, Navy, OUSD(R&E) & international partners**
- **Bilateral Engagements:** Collaborates with UK on AI evaluation, AI technical standards, AI security, and privacy-preserving prize challenges including the PETs Challenge in a US-UK collaboration to foster privacy-preserving data access and use. **NIST, DOE/SC, NAIIO, NSF & international partners**
- **AI for Multi-environment Situational Awareness:** Advances multi-sensor fusion, multi-object tracking, and multi-platform collaborative data collection in a multi-domain environment. **Army, Navy, OUSD(R&E) & international partners**
- **Collaborative Research in Computational Neuroscience:** Supports collaborative international research and data-sharing research in AI that will advance the understanding of nervous system structure and function. **NSF, NIH, DOE & international partners**
- **Education Cooperation**: Memorandum of Understanding with Japan Ministry of Education, Culture, Sports, Science and Technology. **DOE/SC, DOE/NNSA & international partner**
- **Multi-modal Active Perception System:** Develops and use AI-enabled assessment of building damage and human casualty presence from fused sensor data collected from heterogeneous uncrewed systems in a humanitarian assistance disaster response scenario. **Army, OUSD(R&E) & international partners**
- **National AI Research Institutes. International supplements for four NIFA-funded AI Institutes:** AIFS (UC-Davis), AG-Aid (WSU), AIFarms (UIUC), AIIRA (Iowa State U). **NIFA, academic & international partners**
- **National AI Research Institutes. International supplements for six NSF-funded AI Institutes**: TILOS (UCSD), IAIFI (MIT), AI-EDGE (Ohio State), Athena (Duke), AI2ES (U Oklahoma), AI-CARING (Georgia Tech). Additional opportunities through AI Virtual Organization. **NSF, academic & international partners**
- **Accelerated Data Analytics and Computing Institute:** Explores research in computing and data through a Memorandum of Understanding among DOE and international high-performance computing organizations. **DOE/SC & international partners**
- **AI Policy Contributions:** Convenes national and international stakeholders to ensure two-way communication on select AI-related issues. **NIST & international partners**
- **AUKUS AI & Autonomy WG - Demonstration/Experimentation Campaign:** Fosters trilateral participation in capstone event and associated de-risking events. **OSD & international partners**
- **Bilateral Engagements:** Promotes research collaboration on diverse topics in AI with Australia, Canada, Czech Republic, Finland, France, Israel and Italy. **NSF & international partners**

- **Harnessing Data Science for Health Discovery and Innovation in Africa:** Advances data science health research and innovation in Africa and supports new African and global partnerships that enhance the impact of data science health research. **NIH & international partners**
- **IP5 New Emerging Technologies/AI Task Force:** Develops comprehensive roadmaps that include NET and AI for possible projects and initiatives. **USPTO & international partners**
- **Responsible and Equitable AI under the U.S. National Science Foundation (NSF) and the Australian Commonwealth Scientific and Industrial Research Organisation:** Brings together U.S. and Australian researchers on responsible and Equitable AI through the transmittal of a Dear Colleague Letter. **NSF & international partner**
- **Towards Autonomous Discovery in Science and Engineering:** Develops methods, algorithms, and software for enabling autonomous scientific discovery. **DOE/SC & international partners**
- **Trillion Parameter Consortium:** Improves large-scale generative AI models aimed at tackling complex scientific challenges. **DOE & international partners**
- **UtiliZing health Information for Meaningful impact in East Africa through Data Science:** Creates a platform to apply novel approaches to data assimilation and advanced AI/ML-based methods to serve as early warning systems to address critical health issues impacting young Africans. **NIH & international partners**

3.3 Computing–Enabled Human Interaction, Communication, and Augmentation (CHuman) PCA

CHuman R&D advances the ability of individuals to interact with one another and with computing, communication, and information technologies; this includes R&D of human-to-human and human-to-machine interactions and collaborations, and the impacts on society.

Reporting Agencies: DOC/NIST, HHS (NIH, NIOSH) & NSF

The CHuman PCA highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: CHuman Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Explainable AI and Bias in AI Systems programs:** Conducts foundational research to build trust in AI systems by improving explainability and transparency, avoiding bias, and preventing discrimination. **NIST**
   - **Robotics Research Needs:** Studies safety and interface features of collaborative robots and exoskeletons to prevent human injuries from contact, collision, or vibration. **NIOSH**
2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Secure and Trustworthy Cyberspace**: Protects and defends cyberspace against harmful actions by determined adversaries, and to assess their effectiveness. **NSF**
3. **Achieve better health outcomes for every person**
   - **Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science:** Supports interdisciplinary research to address issues in health, including improving patient access, reducing health disparities, and enhancing health tools and information. **NIH & NSF**

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4. **Reduce barriers and inequities**
   - **Disability and Rehabilitation Engineering:** Supports fundamental engineering research that improves the quality of life of persons with disabilities. **NSF**

5. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **Trustworthy Artificial Intelligence Evaluation:** Supports the development of an innovative evaluation testbed that measures and mitigates potential harms using the concepts of responsible AI that emphasizes human centricity, social responsibility, and sustainability. **NIST**

6. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Center for Occupational Robotics Research (CORR):** Studies safe, intuitive, and useful robot technologies, and engineering features of collaborative and co-existing robot systems for hazard exposure assessments, pathogen exposure control, field inspect, and incident investigations. **NIOSH**
   - **Human-Centered Computing:** Supports interdisciplinary research in human-computer interaction to design technologies that amplify human capabilities and to study how human, technical and contextual aspects of computing and communication systems shape their benefits, effects and risks. **NSF**

3.3.1 Strategic Priorities

1. Develop cohesive sociotechnical systems that support collaboration and innovation, including systems that help people manage, verify, and disseminate information online; systems that help teams, crowds, and organizations coordinate productively; and systems that integrate diverse human teams having knowledge of both constructive and malicious human behaviors with ubiquitous computing, networking, data analytic, and knowledge representation systems.

2. Improve interfaces between humans and intelligent systems including robots, virtual and conversational agents, autonomous vehicles, machine-learning systems, and other systems that exhibit intelligence and autonomy.

3.4 Computing–Enabled Networked Physical Systems (CNPS) PCA

CNPS R&D advances systems that are complex, highly-reliable, real-time, networked, and/or hybrid; this includes R&D in cyber-physical systems and the Internet of Things.

3.4.1 Computing–Enabled Networked Physical Systems IWG

The CNPS IWG coordinates federal R&D to advance and ensure integrated IT-enabled cyber, physical, and human systems. This spans complex, high-reliability, safety-security-critical, real-time computing and engineered systems with varying degrees of autonomy and human-system interaction in such uses as automated vehicles, smart grids, manufacturing, intelligent defense systems, and smart cities.

Agencies: Army (JST), DHS, DOC (ITA, NIST, USPTO), DOD (DARPA, NSA), DOE, DOT (FHWA, NHTSA), FDA (CDRH, OSEL), HHS/NIH, OSHA, NASA, NSF, State & USDA-NIFA

The CNPS IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: CNPS Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **AI/ML-Based Medical Devices Program:** Conducts regulatory science research to ensure patient access to safe and effective medical devices using AI/ML. **CDRH & OSEL**
   - **Internet of Things (Cyber-Physical Systems) Devices/Infrastructure Research:** Implements IoT CPS engineering-based systems, measurement and testing solutions, standards, and implementation practices for scalable, interoperable, and trustworthy IoT CPS solutions. **NIST**
   - **Raising the Resilience of Collaborative Adaptive AI-Enabled Complex Systems:** Raises the resilience and performance threshold of AI/ML. **NSA**
   - **Securing AI/ML Models at the edge including model updates, model learning, and persistent parameters:** Supports a Global Reference Framework for enhanced AI/ML-enabled sensor fusion. **NSA**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Planning for AI-Ready Test Beds:** Seeks new approaches to develop and evaluate novel artificial intelligence (AI) methods in real-world settings, including the assessment of safety and security. **NSF**
   - **Smart Connected Systems:** Enables innovation in IoT systems operations, agility, resilience, reliability, safety, security, and privacy in critical infrastructures including Trustworthy Control Systems, Smart Manufacturing, Automated Vehicles, and Transformational Networks. **NIST**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - **Artificial Intelligence Institutes:** Addresses challenges in methods, data, privacy, and fairness that simultaneously advance foundational AI research and agriculture and food systems. **NSF & USDA-NIFA**
   - **Cyber-Physical Systems for Agriculture:** Encourages projects that advance science and technology applied to Smart & Connected Communities (S&CC) (both rural and urban), real-time agricultural data analytics and control. **NSF & USDA-NIFA**
   - **Smart & Connected Communities:** Accelerates the creation of the scientific and engineering foundations that will enable smart and connected communities to bring economic opportunity and growth, safety and security, health & wellness, and accessibility and inclusivity. **DOT, NSF & USDA-NIFA**

4. **Achieve better health outcomes for every person**
   - **Advancing Clinical and Translational Science through Accelerating the Decentralization of Clinical Trials:** Enables research and approaches to ensure resilience and future impact of decentralized clinical trials including connected systems, digital health technologies, and other infrastructure. **NIH**
   - **Clinical and Translational Science Awards Program:** Develops innovative solutions that will improve the efficiency, quality, and impact of the process for turning observations in the laboratory, clinic, and community into interventions that improve the health of individuals. **NIH**
   - **Foundations for Digital Twins as Catalyzers of Biomedical Technological Innovation:** Supports research that underpin the mathematical and engineering foundations behind the development and use of digital twins and synthetic data in biomedical and healthcare applications. **CDRH, NIH, NSF & OSEL**

5. **Reduce barriers and inequities**
   - **CISE Minority-Serving Institutions (MSI) Program:** Broadens participation by increasing the number of CISE-funded research projects from MSIs and to develop research capacity toward successful submissions to core NSF CISE programs. **NSF**
   - **Science, Technology, Engineering and Mathematics AI/ML-Pipeline Enrichment:** Provides AI/ML-relevant summer internships, tours and experiences for students while also promoting collaborative student experiences. **NSA**

6. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **U.S. National Standards Strategy for Critical and Emerging Technology**: Promotes technologically sound standards that help American industry compete internationally on a level playing field and is intended to support and complement existing private sector-led activities. **ITA, NIST & USPTO**

7. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Foundational Research Gaps and Future Directions for Digital Twins**: Identifies needs and opportunities to advance the mathematical, statistical, and computational foundations of digital twins in applications across science, medicine, engineering, and society. **DOD, NIH & NSF**
   - **Humans, Disasters, and the Built Environment:** Supports fundamental, convergent research on how human activities and behaviors interact with the built environment to reduce or exacerbate the effects of natural hazards and disasters. **NSF**
   - **IoT-Enabled Smart Infrastructures:** Supports research of best practices and collaborative multidisciplinary/multisector research partnerships to enable IoT at scale in interconnected smart infrastructures and multiple smart communities. **NIST**

3.4.1.1 Strategic Priorities

1. Develop core science and engineering for CNPS technologies including unified foundations, models and analysis tools, system capabilities, interoperability standards, assurance approaches, and architectures.
2. Catalyze research and innovation of new and emerging ideas for CNPS to enable safety, security, resilience, and robustness spanning system design, development, assurance, verification, and maintenance of systems. Example innovations include applications of AI, digital twins, formal methods, and other concepts emerging from CNPS and related NITRD IWGs. Innovations and research will span multiple time horizons leading to new capabilities for complex intelligent systems, including equitable societal resilience and robustness to climate change.
3. Promote inclusive education, training, and career development through curricula that integrates CNPS and by providing venues for communication and collaboration among scientists and researchers. See the EdW PCA for education, training, and career development related activities. Also see EdW PCA Priority 8.

3.4.1.2 Key Coordination Activities

- **CPS Program Principal Investigator Meeting:** Brings together grantees from the program and government agencies supporting the research. **DARPA, DHS, DOT, NIH, NSF & USDA-NIFA**
- **CIVIC Innovation Challenge:** Conducts multiple outreaches across multiple federal agencies and non-governmental organizations. **DHS, DOE, DOT, NSF & USDA-NIFA**
- **Smart and Connected Community PI Meeting:** Brings together grantees from the program and government agencies supporting the research. **DOT, JST, NSF, State & USDA-NIFA**

- **Smart Cities and Communities (Global Community Technology Challenge):** Collaborates to advance smart cities, including through public-private partnerships. **ITA, NIST, State & international & industry partners**
- **Automated Vehicles:** Coordinates ongoing interactions on metrics and measurements to support development and testing of automated vehicles. **FHWA, NHTSA & NIST**

3.4.1.3 International Collaboration

- **Smart Cities and Communities (Global Community Technology Challenge):** Collaborates to advance smart cities, including through public-private partnerships (Global Community Technology Challenge, previously Global City Teams Challenge). **ITA, NIST, State, industry & international partners**

3.5 Cyber Security and Privacy (CSP) PCA

CSP R&D advances the security, resilience, trustworthiness, and privacy of computing, communication, and information technologies; this includes R&D on how human behavior and usability interact with technical aspects of cybersecurity and privacy.

3.5.1 Cyber Security and Information Assurance (CSIA) IWG

The CSIA IWG coordinates federal R&D to protect information, information systems, and people from cyber threats. This R&D supports the security and safety of U.S. information systems that underpin a vast array of capabilities and technologies in many sectors, including power generation, transportation, finance, healthcare, manufacturing, and national security.

Agencies: Army (ARL, ARO, C5ISR), DAF/AFRL, DHS, DOC/NIST, DOD (DARPA, HPCMP, NSA, OUSD(R&E), USCYBERCOM), DOE, DOJ/NIJ, DOT, GSA, HHS/NIH, Navy (NRL, ONR) & NSF

The CSIA IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: CSIA Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **AI Security Center:** Promotes the secure development, integration, and adoption of AI capabilities within national security systems and the defense industrial base. **NSA**
   - **AI-enabled and Autonomous Active Cyber Defense:** Establishing new scientific understandings in robust learning under adversarial conditions. Develop techniques to autonomously defend both enterprise platforms and cyber physical systems. **ARO, ARL & ONR**
   - **Bridge2AI:** Develops trustworthy AI/ML applications for clinical decision support in healthcare. **NIH**
   - **NSF Secure and Trustworthy Cyberspace:** Security, privacy, and trust in data science and AI/ML, with respect to transparency and interpretability/explainability of models and algorithms, and associated issues of fairness and bias. **NSF**

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2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Cybersecurity best practices:** Developing guidelines in areas such as mitigating cyber supply chain risks, managing the security of mobile devices, automated secure configuration for operating systems, and in advancing digital forensic investigation techniques. **NIST**
   - **Cybersecurity Collaboration Center:** Performs cybersecurity threat analysis and publish cybersecurity advisories. **NSA**
   - **Risk Frameworks and Tools:** Develops systematic risk analytic processes that provide timely, pragmatic, rigorous, and defensible assessments of cyber risks to critical infrastructure. **DHS**

3. **Achieve better health outcomes for every person**
   - **Modeling Cyber Attack Impacts on Patient Outcomes:** Model cyber-attacks where the integrity of patient data and the availability of critical healthcare systems have been compromised. **NIH**

4. **Reduce barriers and inequities**
   - **Advancing education for the future AI workforce (EducateAI):** Support educators to make state-of-the-art, inclusive AI educational experiences available nationwide. **NSF**
   - **National Initiative for Cybersecurity Education:** Promotes a robust community working together to advance an integrated ecosystem of cybersecurity education, training, and workforce development. **NIST**
   - **The Pacific Intelligence and Innovation Initiative:** Creates a local skilled workforce to meet the demand within the DOD for intelligence, IT, cyber, electronic warfare, and data science professionals in Hawaii. **OUSD(R&E)**

5. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **Ecosystem for Cyber Analytics:** Leverages high-performance computing to explore cybersecurity analytical capabilities. **HPCMP, ONR, OUSD(R&E) & USCYBERCOM**
   - **National Centers of Academic Excellence in Cybersecurity:** Reduces vulnerability in national information infrastructure by promoting higher education and expertise in cybersecurity. **DHS, NIST, NSA, NSF & USCYBERCOM**
   - **National Vulnerability Database (NVD):** Maintains NVD to provide standards-based vulnerability management data on a broad range of security-related software flaws. **NIST**

6. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Counterfeit Mitigation in Microelectronics Supply Chain:** Designs an end-to-end capability for establishing supply chain integrity, provenance of electronic chips, and hardware assurance to mitigate counterfeits in semiconductor supply chain. **DHS, NIST, NSA, NSF & ONR**
   - **Energy Cyber Sense Program:** A consortium of National Labs, manufacturers, and asset owners to discover, mitigate, and engineer out cyber vulnerabilities in digital components in energy sector industrial base critical supply chains. **DOE**

3.5.1.1 Strategic Priorities & Associated Key Programs: Research Priorities (1–9) & Federal Priority Application Scenarios (10–12)[24]

This section provides the main lines of research pursued by those programs, mapped against the CSIA strategic priorities. The programs are listed in the accompanying FY2025 Federal Cybersecurity R&D Strategic Plan Implementation Roadmap.[25] The following are the CSIA IWG's strategic priorities and relevant programs.

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[24] See federal cybersecurity R&D strategic priorities in https://www.nitrd.gov/pubs/Federal-Cybersecurity-RD-Strategic-Plan-2023.pdf

[25] https://www.nitrd.gov/pubs/FY25-Cybersecurity-Implementation-Roadmap.pdf

1. **Cybersecurity Through Human-centered Approaches:** Develop capabilities to effectively incorporate human and societal values, needs, and abilities into the design, development, operation, and evaluation of information systems and cybersecurity solutions.
2. **Empower Organizations to Tackle Cybersecurity Threats:** Develop methods, techniques to understand, analyze, and manage cyber security, cyber resilience, and privacy risks. Advance methods and techniques to understand how markets, liabilities, incentives, insurance, and regulation could ensure better cyber security and cyber resilience outcomes.
3. **Cybersecurity Education and Workforce Development:** Advance programs in cybersecurity education, training, professional development, and public awareness. Develop capabilities to improve the productivity of the cybersecurity workforce.
4. **Establish and Negotiate Trust:** Develop capabilities to establish, enforce, and verify the desired level of trust at all layers of computing (e.g., hardware, operating systems, applications, networking, information exchanges). Develop capabilities to establish and ensure trust for identity, access, and interoperation.
5. **Cyber Resilience by Design:** Develop methods and approaches for designing, developing, and validating systems that can withstand and recover from cyberattacks and continue to deliver vital functions even when compromised. Advance science and engineering of cyber resilience.
6. **Deter:** Develop capabilities to efficiently discourage malicious cyber activities by increasing costs, diminishing the spoils of, and increasing risks and uncertainty for potential adversaries.
7. **Protect:** Develop technologies to limit system vulnerabilities through design, construction, and verification, where components, systems, users, and critical infrastructure can efficiently resist malicious cyber activities, and can ensure confidentiality, integrity, availability, and accountability.
8. **Detect:** Develop technologies to ensure that system owners and users have situational awareness and understanding of ongoing activities and can reliably detect malicious cyber activities.
9. **Respond:** Develop technologies to provide real-time assessments of system anomalies, provide adaptive response to disruptions, sustain critical functions, and enable automated recovery.
10. **Protect Software and Hardware Supply Chain:** Develop capabilities to attest to Software and Hardware supply chain integrity through design and development, and to verify and maintain ongoing supply chain integrity throughout operations.
11. **Realize Secure and Trustworthy Artificial Intelligence:** Develop capabilities to realize AI that is verifiably safe, secure, and resilient. Provide capabilities that improve trusted collaboration between humans and AI.
12. **Secure Clean Energy Future:** Develop capabilities to ensure that clean energy technologies and systems are inherently secure and resilient to cyber or cyber-physical threats.

3.5.1.2 Key Coordination Activities

- **DOD Cyber Community of Interest:** Provides oversight and coordination among DOD cyber S&T programs. **AFRL, ARL, C5ISR, DARPA, NSA, ONR, OUSD(R&E) & USCYBERCOM**
- **National Centers of Academic Excellence in Cybersecurity:** Establishes curriculum and promote higher education and expertise in cybersecurity. **DHS, NIST, NSA, NSF & USCYBERCOM**
- **Cyber technology demonstrations:** Supports national security challenges to ensure the integrity of the data upon which critical decisions are made. **DARPA, NIST, NSA & OUSD(R&E)**
- **DOD/NNSA Software Assurance Community of Practice:** Coordinates programs and activities in software assurance. **DHS, DOE/NNSA, NSA & OUSD(R&E)**
- **Cryptographic standards development:** Endeavors to promote the federal government's cryptographic guidance through inclusive and transparent development processes. **NIST & NSA**

- **Cyber-physical security public working groups:** Addresses the challenges of CPS and understanding of the roles of timing and cybersecurity. **NIST, academic & industry partners**
- **Federal Cybersecurity R&D Strategic Plan Implementation Roadmap:** Publishes annually as directed by Cybersecurity Enhancement Act of 2014. **All CSIA IWG agencies**
- **NICE and annual NICE Conference and Expo:** Leads multisector ecosystem for cybersecurity education and training. **NIST, community and interagency councils**
- **National Cybersecurity Center of Excellence:** Brings together experts from industry, government, and academia to address real-world needs of securing complex IT systems. **NIST, other state and local government partners, and academic & industry partners**
- **NSA AI Security Center:** Advances AI-based cybersecurity capabilities. **NSA & industry partners**
- **Standards development:** Engages with national and international bodies in developing and setting cybersecurity standards. **NIST & NSA**

3.5.1.3 International Collaborations

- **Cyber Research, Prototyping, and Transition of Capability Steering Group:** Supports bilateral efforts to identify, coordinate, and evaluate wider cyber capability development to advance joint research. **AFRL, ARL, NRL, NSA, OUSD(R&E), USCYBERCOM & UK Defense Science and Technology Laboratory**
- **The Technical Cooperation Program:** Provides a collaborative five-nation (Australia, Canada, New Zealand, United Kingdom, and the United States) forum for the sharing of ideas and the harmonization of programs that gives member nations the potential to extend their research and development capabilities at minimal cost, to avoid duplication and to improve interoperability. **AFRL, ARL, C5ISR, NSA, ONR, OUSD(R&E) & international partners**
- **Binational Industrial R&D Cyber:** Enhances the cyber resilience of critical infrastructure in the United States and Israel by developing advanced cybersecurity applications for mission-critical homeland security needs. **DHS & Israel National Cyber Directorate**
- **NSF SaTC program:** Foundational cybersecurity research with international partners. **NSF & international partners**

3.5.2 Privacy Research and Development IWG

The Privacy R&D IWG coordinates federal R&D aimed at preventing adverse privacy effects arising from information processing, including R&D of privacy-preserving information systems and standards. This R&D supports advances in large-scale data analytics that can improve healthcare, eliminate barriers to education and employment, and increase efficiencies in the transportation and financial sectors while minimizing risks to individual privacy and possible harms such as discrimination, loss of autonomy, and economic losses.

Agencies: DHS, DOD, DOE, DOT/FHWA, NIH (Common Fund, ODSS, OSP), NIST & NSF

The Privacy IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: Privacy Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **US PETs Lab:** Create a sandbox for implementing Privacy Enhancing Technologies. **Census/NIST**
   - **Bridge2AI:** Advances new ground in the use of AI/ML in biomedical and behavioral research. **NIH/Common Fund**
   - **National Human Genome Research Institute's Centers of Excellence in Ethical, Legal and Social Implications (ELSI) Research (CEER):** Support transdisciplinary research in genomics, healthcare, policy, and law; and facilitating the development of research, health and public policies and practices to train the next generation of ELSI researchers. **NIH**

2. **Achieve better health outcomes for every person**
   - ***All of Us* Research Program Center for Linkage and Acquisition of Data (CLAD):** Supports privacy-preserving linkage of participants across data sources implementing secure data linkages, acquiring, and linking new high-quality health, environmental, SDoH, and geographically based data, from participating Health Care Provider Organizations. **NIH**

3. **Reduce barriers and inequities**
   - **Disability and Rehabilitation Engineering:** Supports fundamental engineering research that improves the quality of life of persons with disabilities. **NSF**
   - **Evaluating Generative AI Technologies:** Supports the development of an evaluation series that will support research in generative AI to better understand the risk, harms, and impacts posed by synthetic content. **NIST**
   - **Privacy frameworks for research on pedestrian behavior including image, location, and other data:** Supports research on common frameworks for research study enrollment, participation, and data use that highlight public benefit & targets approaches focused on higher-risk and understudied groups. **DOT**
   - **Data Autonomy:** Supports innovation around user-driven privacy controls. **DHS**

4. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Accelerate transition of PETs to practice:** Research investment in privacy enhancing technologies to enhance the ability to privately share and analyze data for a range of use cases and applications. **NSF**
   - **Data compression and Trusted Execution Environments:** Improves memory efficiency in cryptographic protocols through data compression, compressed data processing, and sketching, aiding researchers in genotype-phenotype studies, genomic imputation, & clinical trials. **NIH**

3.5.2.1 Strategic Priorities and Associated Key Programs/Activities

1. Understand Privacy Desires and Impacts.
2. Develop System Design Methods that Incorporate Privacy Requirements and Controls.
3. Develop techniques to ensure that information use is consistent with privacy rules.
4. Develop solutions to enable user-driven controls and actions over data collection, use, and deletion.
5. Develop solutions for minimizing privacy risks while maximizing utility of data analytics.
6. Develop solutions for recovery from privacy violations.

3.5.2.2   Key Coordination Activities

- **Supercomputing workshop:** Participates in a series of Federated & Privacy-Preserving AI for High-Performance Computing. **DOE National Laboratories & other federal agencies**

3.6   Education and Workforce (EdW) PCA

EdW R&D advances the use of computing, communication, and information technologies to enhance education and workforce training at all levels; this includes the recruitment, preparation, and retention of a diverse population of researchers, entrepreneurs, and users; and support for learning, teaching, assessment, standards, and virtual education and training.

Reporting Agencies: DOC (NIST, NOAA, USPTO), DOD (DARPA), DOE/NNSA, DOE/SC, DOJ/NIJ, ED/IES, NASA, HHS (NIH, NIOSH), NSF, USDA-NIFA & VA

The EdW PCA highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

> ### FY25 Administration Priorities: EdW Examples
>
> 1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
>   - **ExpandAI:** Supports capacity-development projects and partnerships within the National AI Research Institutes ecosystem that help broaden participation in artificial intelligence research, education, and workforce development. **DHS, DOD, NIST, NSF & USDA-NIFA**
>   - **NAIRR Pilot**: Shows the value of NAIRR by providing access to computing resources, data infrastructure, AI datasets, models, tools, and training for advancing AI research and education. **DARPA, DOD, DOE, NASA, NIH, NIST, NOAA, NSF, USDA-NIFA, USPTO & VA**
>
> 2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
>   - **Training-based Workforce Development for Advanced Cyberinfrastructure**: Supports increasing cyberinfrastructure adoption and integrating core skills and methods into undergraduate and graduate education. **NSF**
>
> 3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
>   - **NSF Regional Innovation Engines:** Fosters innovation ecosystems across the U.S. to advance technologies like semiconductors, AI, advanced wireless, and biotechnology while addressing national, societal, and geostrategic challenges and cultivating economic growth. **NSF**
>
> 4. **Achieve better health outcomes for every person**
>   - **Center for Occupational Robotics Research:** Evaluates training for operating advanced robots in complex environments and explores robotics education for disadvantaged populations, focusing on safety, health equity and demographic factors. **NIOSH**
>
> 5. **Reduce barriers and inequities**
>   - **Computer Science for All:** Supports partnerships and research needed to bring computer science and computational thinking to all schools. **NSF**
>   - **Innovative Technology Experiences for Students and Teachers (ITEST):** Supports foundational STEM education to advance equitable and inclusive technology integration from pre-K through high school. **NSF**
>   - **Broadening Participation in Computing:** Supports increasing the participation of people from groups that are underrepresented in computing disciplines through alliances, demonstration projects, and supplements. **NSF**

6. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **CISE Minority-Serving Institutions (MSI) Research Expansion Program:** Supports efforts to broadens participation by increasing number of CISE-funded research projects from MSIs and develop research capacity toward successful submissions to core CISE programs. **NSF**
   - **Research Experiences for Teachers in Engineering and Computer Science (RET):** Supports summer research experiences for K-14 educators that foster long-term collaborations between universities, community colleges, school districts and industry partners. **NSF**
7. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great**
   - **CyberCorps Scholarship for Service (SFS):** Increases quantity of entrants to the government cyber workforce; increase national capacity for education of cybersecurity professionals; and increase R&D capabilities in critical information infrastructure protection. **NSF**

3.6.1 Strategic Priorities

Note: Investments for some of these programs are reported under other PCAs but are collected here to emphasize the importance of STEM education and workforce development.

1. Ensure a consistent flow of skilled workers capable of using the tools and methods of the economy of the future by creating opportunities to teach and learn computational literacy and computational thinking at all educational levels. Opportunities must span multiple STEM and IT domains; actively support diversity and inclusion; and include internships, fellowships, and early-career research opportunities.
2. Prepare all Americans, through computational thinking and literacy lifelong learning programs in the workplace and community, to successfully participate in the economy and society of the future.
3. Promote coordination and collaboration among federal agencies and business, educational, and nonprofit communities to develop a persistent and robust U.S. IT education ecosystem including educational programs, tools, and technologies.
4. Develop the current and future HEC workforce for both R&D and infrastructure and application. See also the EHCS PCA.
5. Build a diverse multigeneration workforce necessary to develop, support, and use all aspects of big data. See also the LSDMA PCA.
6. Better understand the national AI R&D workforce needs: Grow the AI R&D workforce to ensure America leads the AI innovation of the future. See also the AI R&D PCA.
7. Develop the current and future SPSQ workforce by supporting STEM education and training; by supplying and sustaining the necessary resources such as software libraries, tools, and platforms to support teaching and research; and by advancing software proficiency and development capabilities in government organizations and government-led projects. See also the SPSQ PCA.
8. Promote inclusive education, training, and career development through curricula that integrates CNPS and by providing venues for communication and collaboration among scientists and researchers. See also the CNPS PCA.
9. Promote education and workforce development in human-IT interactions. In conjunction with investments in the EdW PCA, develop new instructional materials and teacher professional development models based on evolving educational and technological practices.
10. Develop the future micro- and nanoelectronics workforce, including across all parts of the research and innovation ecosystem. See the ENIT PCA.

3.7 Electronics for Networking and Information Technology (ENIT) PCA

ENIT R&D advances micro- and nanoelectronics design, architecture, validation, and testing across the networking and information technology hardware design stack; this includes methodologies for scalable and energy-efficient systems, silicon and/or non-silicon technologies, and implementations in computing and communication architectures.

Reporting Agencies: Army (ARL, ARO), DAF (AFRL), DHS, DOC (NIST, USPTO), DOD (DARPA, NSA, OUSD(R&D)), DOE/EERE, DOE/NNSA, DOE/SC, FBI, Navy (NRL, ONR), NASA, NSF, ODNI & State

The ENIT PCA highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: ENIT Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Electronics Research Initiative (ERI):** Includes over two dozen programs across seven areas such as enhancing processing density, accelerating AI hardware innovation, developing 3D microsystems, optimizing design and testing for circuits, and securing communications. **DARPA**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Future of Semiconductors:** Support researchers to enable rapid progress in new semiconductor technologies. **NSF**
   - **Secure and Trustworthy Cyberspace:** Protects and preserves growing social and economic benefits of cyber systems while ensuring security and privacy. **NSF**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - **NSF Regional Innovation Engines:** Fosters innovation ecosystems in the U.S. to advance technologies like semiconductors, AI, advanced wireless, and biotechnology while addressing challenges and promoting economic growth, workforce development, and collaboration across sectors. **NSF**

4. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness**
   - **Partnership for Innovation:** Assists researchers and innovators from academia, nonprofit and public organizations in accelerating the development of breakthrough technologies and speeding solutions forward. **NSF, academic & industry partners**

5. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations**
   - **Joint University Microelectronics Program 2.0:** Funds seven microelectronics research centers across 39 universities, involving hundreds of graduate students and collaborations with semiconductor and defense industries. **DARPA, academic & industry partners**
   - **Subcommittee on Microelectronics Leadership:** Coordinates federal activities in support of the CHIPS and Science Act of 2022 and other microelectronics R&D. **AFRL, ARL, DARPA, DHS, DOE/EERE, DOE/NNSA, DOE/SC, FBI, NASA, NIST, NRL, NSA, NSF, ODNI & State**

3.7.1 Strategic Priorities

1. Foster innovative micro- and nanoelectronics designs, architectures, and methodologies that advance novel, scalable, and energy-efficient computing and communication technologies and systems.
2. Improve hardware integrity and security for next-generation secure computing and communications technologies and systems.
3. Develop the future micro- and nanoelectronics workforce, including across all parts of the research and innovation ecosystem. See EdW PCA Priority 10.
4. Facilitate technology transfer and commercialization.

3.7.2 Key Coordination Activities

- **Electronics Resurgence Initiative (ERI):** Coordinates across the DOD and government on its dual-use electronics development activities. **AFRL, ARL, ARO, DARPA, DOE, NIST, NRL, NSF, ONR & OUSD(R&E)**

3.8 Enabling R&D for High–Capability Computing Systems (EHCS) PCA

EHCS R&D advances and translates new approaches in high-capability computing; this includes R&D in novel computing paradigms, hardware, algorithms, software, and data analytics that enable extreme data- and computation-intensive workloads while addressing challenges such as system performance, reliability, trust, transparency, energy efficiency, and other methods.

3.8.1 High End Computing (HEC) IWG

The HEC IWG coordinates federal R&D to enhance U.S. advanced computing capabilities and explore fundamentally new approaches to computing, focused on bolstering U.S. dominance in high-capability computing (HCC). Advancements in HCC are essential drivers of technological progress, scientific discovery, and innovation across various sectors and endeavors vital to the nation such as exascale computing and other advanced data center and edge computing technologies to meet needs for modeling and simulation, data storage and analysis, and AI training and inference. The rapidly evolving technology landscape and user needs along with energy efficiency needs drive transformational and incremental advancements in all areas of HCC to meet capability goals and productivity requirements needed to enhance scientific insight, accelerate discoveries, and prepare for the next computing evolution.

Agencies: Army, DOC/NIST, DOD/NSA, DOE/NNSA, DOE/SC, HHS/NIH, NASA, Navy, NIH/NCI & NSF

The HEC IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

> **FY25 Administration Priorities: HEC Examples**
>
> 1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
>   - **AI-enabled high-performance modeling and simulation**: Research and develop AI-enabled high-performance modeling and simulations and computing technologies to support agency missions. **DOE/NNSA, DOE/SC, NASA**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Device supply chain:** Assure the supply chain of older and current-generation devices. **NIST**
   - **Expanding Capacity in Quantum Information Science and Engineering:** Support research and training that will lead to scientific and engineering breakthroughs in quantum information science and engineering. **NSF**
   - **Future of Semiconductors:** Support researchers to enable rapid progress in new semiconductor technologies. **NSF**
   - **Logic and memory devices:** Invest in leading-edge manufacturing of logic and memory devices via grants and cooperative agreements. **NIST**
   - **Microelectronics Research:** Develop new materials and leverage them for computing following a co-design methodology targeting extreme scales and extreme operating environments, including neuromorphic materials for advanced memory and AI. **DOE/SC**
   - **Quantum Artificial Intelligence Laboratory:** Utilizes public-private and interagency partnerships to broaden the scope of research and evaluate and utilize new experimental devices and systems. **NASA & industry partners**
   - **Quantum Computing and Network Research:** Continue basic research in quantum algorithms, applications, networking, and testbeds. **DOE/SC**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures.**
   - **CISE Core Program:** Support transformative research to develop the next generation of highly performant, power-efficient, environmentally sustainable, and secure computer systems. **NSF**
   - **Design for Sustainability in Computing:** Researches and develops transformative, cross-disciplinary and potentially clean slate approaches to enable sustainability across all levels of the entire computing stack. **NSF**

4. **Achieve better health outcomes for every person.**
   - **Joint Design of Advanced Computing Solutions for Cancer:** Accelerates advances in precision oncology and scientific computing. **DOE/NNSA, DOE/SC & NIH/NCI**
   - **Reignited the Cancer Moonshot:** Supports the reignited Cancer Moonshot to reduce the death rate from cancer and improve the lives of individuals living with and surviving cancer. **NIH**

5. **Reduce barriers and inequities.**
   - **Funding for Accelerated, Inclusive Research:** Provides focused investment on enhancing research on clean energy, climate, & related topics at MSIs. **DOE/SC**
   - **Minority University Research and Education Project (MUREP):** Create and support research opportunities in support of HEC through programs like MUREP. **NASA**

6. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
   - **Cloud Computing:** Fosters collaborative environments and open science to accelerate scientific discovery utilizing hybrid solutions of cloud and on-prem resources. **NASA**
   - **STRIDES Cloud Lab:** Provides NIH-funded researchers access to a cloud sandbox to become more efficient and comfortable in leveraging the cloud for their research purposes. **NIH**

3.8.1.1 Strategic Priorities

1. Research and develop innovative approaches and technologies critical to delivering extreme-scale computing systems to enhance scientific insight, accelerate discoveries, and reinforce decision-making in support of national priorities.
2. Research and develop technologies to make breakthroughs in HCC's most pressing challenges and pioneer new frontiers in computing, fueling innovations and discoveries that will shape the future computing ecosystem – both inside and outside the data center – and strengthen technological competitiveness.
3. Research and develop new approaches and techniques aimed at improving the programmability, portability, reliability, and usability of high-capability computing, broadening the impact and applicability of the HCC.
4. Develop, foster, and broaden a diverse and inclusive HEC workforce for computing R&D to bolster technological competitiveness.

3.8.1.2 Key Coordination Activities

- **Washington Metropolitan Quantum Network Research Consortium:** Supports multiagency efforts for a quantum network as a regional test bed. **Army, NASA, Navy, NIST & NSA**
- **Quantum Economic Development Consortium:** Identifies gaps in technology, standards, and workforce to address those gaps through collaboration. **NIST, other federal agencies, academic, industry & technology partners**
- **Collaborative Research in Computational Neuroscience:** Supports collaborative research in computational neuroscience. **DOE/SC, NIH & NSF**

3.8.1.3 International Collaboration

- **Post-exascale effort:** Supports hardware and software research, development, and demonstration. **DOE/NNSA, other federal agencies & international partners**

3.9 High–Capability Computing Infrastructure and Applications (HCIA) PCA

HCIA provides high-capability computing systems, application software, and infrastructure; this includes computing, software and services, communications, storage, and data infrastructure, coordination services, and other necessary resources for the effective use of high-capability computing.

3.9.1 High End Computing (HEC) IWG

In addition to coordinating EHCS R&D, the HEC IWG coordinates federal activities to provide high-capability computing (HCC) systems and infrastructure (including expertise necessary to use the HCC systems effectively) and develop algorithms and applications to support agency missions and accelerate scientific discoveries and technological innovations. Specific areas include materials discovery and design, energy research and exploration, Earth and space science, early-stage research of advanced technologies, understanding of human body for detection and treatment of diseases, advanced weapons design, forecasting and hazard response planning, climate science, and many other Science and Engineering (S&E) applications. HCIA provides capabilities that are vital in shaping the future of research, industry, and society and is a key enabler in addressing some of the most pressing issues the Nation faces today.

Agencies: Army, DOC/NIST, DOD, DOE/NNSA, DOE/SC, DOI/USGS, NASA, NIH & NSF

The HEC IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: HEC Examples

1. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Software development kits**: Provides software development kits with mathematical libraries, high-performance data-management and software-development technologies with turnkey installation and interoperability, including the Extreme-scale Scientific Software Stack. **DOE/SC**

2. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - **Advanced Research Computing:** Expands HCC capabilities to support mission priorities such as climate change and adaptation, water resources, and natural hazard research and response. **USGS**
   - **National Discovery Cloud for Climate (NDC-C):** Develops NDC-C, which will federate advanced computing, data, software and networking resources, democratizing access to a cyberinfrastructure ecosystem that is increasingly necessary to further climate-related S&E. **NSF**

3. **Achieve better health outcomes for every person.**
   - **Development of pandemic readiness models:** Develops models for pandemic readiness and best-practice guidelines for deployment of secure, high-performance software-defined networks. **NIST**
   - **Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science:** Supports high-risk, high-reward advances in computer and information science, engineering, mathematics, and cognitive research to address pressing biomedical and public health questions. **NIH & NSF**

4. **Reduce barriers and inequities.**
   - **Mobile Health (mHealth): Technology and Outcomes in Low- and Middle-Income Countries:** Explores applications that study innovative mHealth interventions or tools specifically suited for low- and middle-income countries. **NIH**

5. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness from the bottom up and middle out.**
   - **Computational and Data-Enabled Science and Engineering:** Supports research in computational and data analysis to enable major S&E breakthroughs and discoveries. **NSF**
   - **Pathways to Enable Open-Source Ecosystems:** Supports the facilitation, creation, and growth of open-source ecosystems for the creation of new technology solutions. **NSF**

6. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
   - **Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support program:** Provides a suite of advanced CI coordination services, to support a broad, diverse requirements, users, and usage modes for all areas of S&E research and education. **NSF**
   - **Cloud Platform Interoperability Program:** Creates a federated genomic data ecosystem to improve researchers' access to all types of data. **NIH**
   - **Scientific Discovery Through Advanced Computing (SciDAC) program:** Addresses interdisciplinary HCC problems that cannot be addressed by single or small groups of investigators, tackling some of the most challenging scientific problems. **DOE/SC**

3.9.1.1 Strategic Priorities

1. Acquire, operate, and provide leadership-class and production-quality HCC systems required to meet critical national needs, including AI, and support research and education across all S&E areas.
2. Develop, improve, and maintain algorithms, applications, and supporting software to advance capabilities vital to the Nation's security, economy, and individual well-being.
3. Develop resources and tools to lower barriers to HCC access, improve usability, and support collaborations to promote community-engaged R&D.
4. Develop, enhance, and provide an HCC ecosystem to a diverse user community needed for effective use of advanced computing to support U.S. leadership in S&E, enable open science and community-engaged R&D, and strengthen U.S. competitiveness.

3.9.1.2 Key Coordination Activities

- **Exascale Computing Project (ECP) software usage:** Leverages tools and software developed under the ECP for application development, scaling and porting. **DOD, DOE/NNSA, DOE/SC, NASA & other federal agencies**
- **NIH HPC pilot with NSF supported TACC:** Supports the NIH partnership with TACC on a pilot program to allow NIH intramural researchers access to TACC. **NIH & NSF**

3.10 Intelligent Robotics and Autonomous Systems (IRAS) PCA

IRAS R&D advances intelligent robotic systems that are increasingly autonomous; this includes R&D in robotics hardware and software design and application, machine perception, cognition and adaptation, mobility and manipulation, safe human-robot interaction, and distributed and networked robotics.

3.10.1 Intelligent Robotics and Autonomous Systems IWG

The IRAS IWG coordinates federal R&D in accelerating the development and use of IRAS in workplaces, hospitals, communities, and homes. IRAS targets R&D for robust, safe, ethical, resilient, and efficient robots and robotics systems that assist people in their work and everyday lives.

Agencies: Army (AI2C, ARL, C5ISR, DEVCOM, ERDC, GVSC), DAF (AFOSR, AFRL, AFWERX, AFTC, Space Force), DHS, DOD (CDAO, NRO, OUSD(R&E), SOCOM), DOE (NRC), DOI, DOT/FAA, HHS (NIH, NIOSH), Marines, NASA (JPL), Navy, NIST, NSF, ONR, OSHA & USDA-NIFA

The IRAS IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: IRAS Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Trust and Influence Program:** Elucidates the social and cognitive principles in the establishment, maintenance, and repair of trust between humans and emergent technologies. **DAF**

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2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Australia, United Kingdon, & United States Resilient Autonomy & Artificial Intelligent Technology:** Enhances the ability to perform operations with trust in using Autonomous and AI Systems in complex settings. **AFRL, ARL, DEVCOM, ONR, OUSD (R&E) & international partners**
   - **Science of Information, Computation, Learning, and Fusion Program:** Extracts and derives needed "information" from vast amounts of data collected through various modes at various times. **DAF**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - **Extension, Education and USDA-NIFA Climate Hubs Partnership:** Supports projects that provide approaches to address climate change through regional partnerships. **USDA-NIFA**
   - **Soil Health:** Development of tools, practices, techniques and/or innovations for sequestering soil carbon, improving soil health and resilience of agricultural production systems. **USDA-NIFA**

4. **Achieve better health outcomes for every person.**
   - **Disability and Rehabilitation Engineering:** Conducts research to improve the quality of life of persons with disabilities through development of new technologies, devices, or software. **NSF**
   - **PostureCheck:** Enhances performance of the BURT® upper-extremity stroke-therapy device to encourage the correct performance of therapeutic exercises without requiring constant therapist supervision. **NIH**

5. **Reduce barriers and inequities.**
   - **Data Science Corps (DSC):** Supports education and workforce development by focusing on building capacity for harnessing the data revolution at the local, state, and national levels. **NSF & USDA-NIFA**
   - **ExpandAI:** Supports capacity-development projects and partnerships within the National AI Research Institutes ecosystem that help broaden participation in artificial intelligence research, education and workforce development. **DHS, DOD, NIST, NSF & USDA-NIFA**
   - **CISE-MSI Program:** Grows research capacity at MSIs and encourages intra- and inter-organizational collaborations. **NSF**

6. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness from the bottom up and middle out.**
   - **Foundational Research in Robotics:** Supports research on robotic systems that exhibit significant levels of both computational capability and physical complexity. **NSF & USDA-NIFA**

7. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
   - **Emerging Frontiers in Research and Innovation - Brain-Inspired Dynamics for Engineering Energy-Efficient Circuits and Artificial Intelligence:** Supports interdisciplinary research to create a new engineering science of BRAIN-inspired engineered learning systems. **AFOSR, NASA & NSF**
   - **Enabling Technology for Safe Robot-assisted Surgical Micromanipulation:** Develops enabling technology and systems that address fundamental limitations in microsurgery with a specific focus on vitreoretinal surgery. **NIH**
   - **Modeling and Simulation for MUM-T:** Develops tools for virtually prototyping, testing and evaluation of autonomous systems, decreasing the development time and amount of physical testing needed. **Army**

3.10.1.1 Strategic Priorities

1. Advance safe, efficient human-robot teaming and interactions to increase performance and enable new capabilities.
2. Improve robots and autonomous systems to robustly sense, model, plan, learn, and act appropriately to perform the required tasks including in complex and uncertain situations.
3. Increase investment in innovative R&D and the implementation of intelligent autonomous robots and enabling technologies.
4. Advance the role of robotics in improving the resilience of critical infrastructure: (a) to respond to failures, incomplete or corrupted information and unknown environments; (b) to assist in national response to critical and emergent events including national disasters and emergencies; and (c) to help with the physical acquisition, understanding, analyzing and processing digital information in more robust and efficient ways.
5. Develop and promote test and evaluation in standards to address responsible, ethical, and safe use of robotics, and increase broader and equitable participation in robotics.

3.10.1.2 Key Coordination Activities

- **Drone Safety Standards:** Participates in American National Standards Institute (ANSI) and addition of worker safety considerations to the ANSI Standardization Roadmap for Unmanned Aircraft Systems. **DHS, DOI, FAA, NASA, NIOSH & NIST**
- **Exoskeleton Standards:** Develops Terminology, Safety, and Performance Standards within ASTM International Technical Committee on Exoskeletons & Exosuits. **DHS, DOD, NIH, NIOSH, NIST, NRC & A3**
- **Robot Safety Standards:** Supports standards/revisions of ISO TC299 and ANSI/RIA R15.06 to include standards for collaborative robotic applications; & development of mobile robot safety standard (ANSI/A3 R15.08). **NIOSH, NIST & A3**
- **Space Trusted Autonomy:** Identifies and prioritizes the development of self-sustaining and reliable technologies that are certified for mission use. **NASA, NRO & Space Force**
- **Institute of Electrical and Electronics Engineers Standard Terminology for Human-Robot Interaction (P3107):** Defines terms relevant to human-robot interaction in service, social, education, industrial, and research robotic applications. **ARL, NASA & NIST**
- **OSHA-NIOSH-A3 Alliance:** Continues the alliance with the Occupational Safety and Health Administration and the Association for Advancing Automation. **NIOSH, OSHA & A3**
- **NASA Jet Propulsion Laboratory (JPL):** Builds on the collaborations with the DARPA Subterranean Challenge, to advance robotics technologies for search and rescue in underground environments. **JPL & NIOSH**
- **Mine Automation and Emerging Technologies Health and Safety Partnership:** Hosts annual partnership meetings in automation, robotics, and other emerging technologies. **NIOSH & industry partners**

3.11 Large-Scale Data Management and Analysis (LSDMA) PCA

LSDMA R&D advances the ecosystem needed for extraction of knowledge and insights from data; this includes R&D in the capture, curation, provenance, privacy preservation, management, governance, access, analysis, reusability, and presentation of large-scale and diverse data.

3.11.1 Big Data (BD) IWG

The BD IWG coordinates federal R&D to enable timely and effective analysis, decision-making, and discovery based on large, diverse data. LSDMA R&D expands big data and data science capabilities, providing the foundation for algorithm-driven businesses and catalyzing innovations critical to the Nation.

Agencies: DARPA, DHS, DOC (NIST, NOAA), DOD, DOE/NNSA, DOE/SC, DOI/USGS, HHS/NIH, NASA, NRO, NSF, & USDA-NIFA

The BD IWG highlights the following programs and activities that most directly support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: BD Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **Foundational Research in Federated Learning:** Supports research focused on basic algorithms for scientific machine learning on distributed datasets, including privacy-sensitive data. **DOE/SC**
   - **Safe Learning-Enabled Systems:** Supports research that leads to the design and implementation of learning-enabled systems in which safety is ensured with high levels of confidence. **NSF**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Accelerate Innovations in Emerging Technologies:** Supports integrated research teams to accelerate the discovery, creation, production, and commercialization of new technologies to form the basis of future industries with public and economic impact. **DOE/SC**

3. **Step up to the global challenge of meeting the climate crisis by reimagining our infrastructures, renewing our relationship with nature, and securing environmental justice.**
   - **Energy Earthshots Initiatives:** Supports breakthrough research in key R&D gaps that are needed to realize new approaches and solutions. **DOE/SC**
   - **National Discovery Cloud for Climate (NDC-C):** Provides access to a CI ecosystem that is increasingly necessary to further climate-related S&E, enabling equitable access to an NDC. **NSF**

4. **Achieve better health outcomes for every person.**
   - **Smart Health and Biomedical Research in the Era of AI and Advanced Data Science:** Supports the development of formative high-risk, high-reward advances in computer and information science, engineering, mathematics, statistics, behavioral and/or cognitive research. **NIH & NSF**

5. **Reduce barriers and inequities.**
   - **Data Science Corps:** Builds capacity at the local, state, national, and international levels by providing practical experiences, teaching new skills, and offering teaching opportunities to data scientists and data science students. **NIH**
   - **ExpandAI:** Supports continued growth of a broad & diverse interdisciplinary research community for advancement of AI-powered innovation, focused on MSIs. **DOD, DHS, NIST, NSF & USDA-NIFA**

6. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness from the bottom up and middle out.**
   - **International standards:** Supports standard development activities, including the development of proposals for and associated prototypes of new standardized functionalities. **DOE/SC**
   - **Proto-OKN:** Develops a Proto-OKN, an essential public-data infrastructure empowering government and non-government users. **NSF**

> 7. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
>   - **AIST Program:** Develops a coastal zone digital twin to understand and assess the impact of climate change on coastal zones. **NASA & NOAA**

3.11.1.1 Strategic Priorities

1. Support the foundational research, innovative tools, and methodologies that maximize the use of large-scale data resources to solve priority challenges in areas such as U.S. security, economy, health, and climate change.
2. Supports ethics, security, and privacy in innovation by advancing the reliability, accuracy, performance, generalizability, and transparency of data-driven discovery and decision making.
3. Facilitates the sharing, discoverability, interoperability, and reusability of diverse data that are scalable and agile enough to meet the needs of innovation and support open science and community-engaged R&D.
4. Enables time-sensitive data-driven decision making through scalable high-performance analytics ecosystems and large-scale data resources.
5. Builds a diverse multigeneration workforce necessary to develop, support, and use all aspects of big data.
6. Transitions R&D to community practice through innovative partnerships.

3.11.1.2 Key Coordination Activities

- **Trillion Pixel Challenge:** Collaborates on the future of geospatial systems. **DOE, NASA, NRO & USGS**
- **Community Input for Ethical Use of AI in Scientific Investigations:** Develops broad community input relevant to the ethical use of AI in scientific investigations. **NASA, NOAA & NSF**
- **National Artificial Intelligence Research Resource:** Supports the pilot development that involves discussions on strategies and implementations for large-scale data resources. **DOE, NIH & NSF**
- **Subcommittee on Open Science:** Participates in interagency coordination of policy around data management and open science. **BD IWG agencies & other federal agencies**

3.12 Software Productivity, Sustainability, and Quality (SPSQ) PCA

SPSQ R&D advances timely and affordable development and sustainability of low-defect, low-vulnerability software; this includes R&D to improve software development productivity, quality, measurement, assurance, and adaptability while also providing essential characteristics such as security, privacy, usability, and reliability.

3.12.1 Software Productivity, Sustainability, and Quality Community of Practice (CoP)

The SPSQ CoP coordinates federal R&D to achieve orders-of-magnitude reduction in software defects and the time and cost of developing and sustaining software. The U.S. Government and the national economy depend on increasingly complex software; improved software development technology is essential to U.S. innovation, to leadership in emerging technologies, and to security and prosperity.

Agencies: CDC, DAF (AFRL), DHS (CISA), DOC (Census, NIST), DOD (DARPA, NSA, ONR, OUSD(R&E)), DOJ/NIJ, DOT (FAA), HHS (NIH, ONC), FBI, IARPA, NASA, NRC & NSF

The SPSQ CoP highlights the following programs and activities that support the Administration's FY2025 R&D Priorities. The priorities are numbered in the call-out box with supported programs and activities bulleted underneath.

FY25 Administration Priorities: SPSQ Examples

1. **Advance trustworthy artificial intelligence (AI) technology that protects people's rights and safety, and harness it to accelerate the Nation's progress.**
   - **AI for Bug Finding:** Develops a modular and expandable test bed for evaluating AI-based methods for finding bugs in source code and develops source code datasets and metrics for enhancing AI-based bug-finding tools. **DHS & NIST**
   - **NASA Earth Science Advanced Information Systems Technology:** Submitted an Open solicitation for R&D of information systems for Earth Science, heavily focused on AI (Earth Science digital twins, intelligent distributed sensing, software systems for agile science). **NASA**
   - **Trojans in Artificial Intelligence:** Supports research applying Data Science approaches to identify foundational principles for Trojan detection. **IARPA & NIST**

2. **Lead the world in maintaining global security and stability in the face of immense geopolitical changes and evolving risks.**
   - **Bugs Framework:** Enables a structured orthogonal classification of software bugs to allow descriptions of vulnerabilities that exploit them, and defines language independent taxonomies to chain descriptions of bugs towards security failures. **CISA, NIST & international partners**
   - **Quantum Software security engineering:** Detects and mitigates software vulnerabilities and malware through analysis and testing; promotes security and privacy by design in programming environments; and enhances security in ubiquitous computing. **NSF**

3. **Achieve better health outcomes for every person.**
   - **Brain Research Through Advancing Innovative Neurotechnologies Initiative:** Supports an Open-Source Quality Management System to disseminate education and resources through workshops and a web-based library of regulatory documents, and software. **NIH**
   - **Semantic Interoperability of Medical Devices:** Advances information modeling, terminology, test methods, and interoperability of communicating medical devices. **NIST**

4. **Reduce barriers and inequities.**
   - **DOD HPC Internship Program:** Supports and expands DOD computing research opportunities through R&E HBCU office and other initiatives which provides undergraduate and graduate students with High End Computing experience. **OUSD(R&E)**
   - **Minority University Research and Education Project:** Engages underrepresented populations through a wide variety of initiatives. Multiyear grants are awarded to assist Minority Institution faculty and students in research of pertinent missions. **NASA**

5. **Bolster the R&D and industrial innovation that will build the Nation's future economic competitiveness from the bottom up and middle out.**
   - **DOD Software Factory ecosystem for embedded software:** Coordinates work across the Department to improve the speed at which software capabilities can be delivered to the warfighter without accepting inappropriate operational risk. **OUSD(R&E)**

6. **Strengthen, advance, and use America's unparalleled research to achieve our Nation's great aspirations.**
   - **Quantum Artificial Intelligence Laboratory:** Determines the potential for quantum computation to enable more ambitious and safer NASA missions in the future, and achieves quantum supremacy from quantum annealing to quantum bits. **DOD & NASA**

3.12.1.1 Strategic Priorities

1. Advance timely, affordable development and sustainment of low-defect, low-vulnerability software through transformative research in design, production and evolution, verification, operation, utilization, and evaluation of computer software.
2. Advance software productivity, sustainability, and quality in high-priority areas such as AI, computational science and engineering, cybersecurity, and future software-defined networking.
3. Develop the current and future SPSQ workforce by supporting STEM education and training; by supplying and sustaining the necessary resources such as software libraries, tools, and platforms to support teaching and research; and by advancing software proficiency and development capabilities in government organizations and government-led projects. *Also see EdW PCA Priority 7*.

3.12.1.2 Key Coordination Activities

- **New NIH-FDA-NSF Partnership in digital twins and synthetic data for biomedical applications:** Researches mathematical and statistical foundations for digital twins and synthetic data in biomedicine, emphasizing their relevance in regulatory sciences. **FDA, NIH & NSF**

3.12.1.3 International Collaboration

- **Bugs Framework:** Creates a structured, complete, orthogonal classification of software bugs and weaknesses to allow precise descriptions of vulnerabilities that exploit them, and defines language independent class taxonomies allowing to chain causal descriptions of bugs/weaknesses towards eventual security failures. **CISA, NIST & international partners**

4.0 Other NITRD Interagency Coordination Activities

4.1 Cyber–Physical Systems Resilience (CPSR) Fast–Track Action Committee (FTAC)

In May 2024, the NITRD Subcommittee established a CPSR FTAC in response to a recommendation by the President's Council of Advisors on Science and Technology (PCAST) in their February 2024 report, Strategy for Cyber-Physical Resilience to develop a National Plan for Cyber-Physical Resilience Research Partner across federal agencies to define priorities and support research in those areas. The goal is to create focused research across programs that increase the likelihood of successful research results, but more importantly, to help ensure that such results will transition into actual use.

4.2 Digital Health R&D (DHRD) IWG

The Digital Health Interagency Working Group coordinates R&D to improve the health of Americans by advancing technologies that support personalized health screening, monitoring, diagnosis, treatment, and prevention. The DHRD also facilitates broad access to healthcare information and resources and the building and sustainment of a diverse and highly skilled digital health workforce.

Agencies: DHS, DOC (NIST, NOAA), DOD, DOI/USGS, DOJ (FTC, NIJ), DOT, FCC, HHS (AHRQ, ASPE, ASPR, BARDA, CDC, CMS, FDA, NIOSH, OASH, ONC, SSA), NASA, NIH (Common Fund, NCI & NIDA), NSF, OPM, USDA-NIFA, USG & VA

The DHRD IWG highlights the following programs and activities that support the Administration's FY2025 R&D Priority (Achieve better health outcomes for every person).

> *FY25 Administration Priorities: DHRD Examples*
>
> **Achieve better health outcomes for every person.**
> - **Digital Twins for Health:** Explores the next generation of digital twins for biomedical research. **FDA, NIH & NSF**
> - **Incorporating Human Behavior in Epidemiological Models:** Provides more reliable modeling tools to inform decision making and to evaluate public health policies during pandemics and other public health crises. **NIH & NSF**
> - **Smart Health & Biomedical Research in the Era of AI & Advanced Data Science:** Accelerates next-generation healthcare solutions, including robotics to enhance health, extend lifespan, reduce illnesses, improve social connectedness, and decrease disabilities. **NIH & NSF**

4.2.1 Strategic Priorities & Associated Key Programs/Activities

1. Accelerate the R&D and implementation of next-generation accessible, interoperable, reconfigurable digital health tools, devices, and services, and enable faster patient and provider access to novel technology and point-of-care services.
2. Promote innovation and workforce development in digital health to reduce health disparities, enhance equity, and achieve better health outcomes for all.
3. Promote findable, accessible, interoperable, reusable health data with appropriate metadata to develop new healthcare-related insights supported by advanced technologies such as AI.
4. Support the integration and use of digital health technologies within healthcare and public health systems to understand and mitigate the impacts of changes in climate and the environment on health.

6. Develop appropriate privacy-preserving methods, strategies, and standards to enhance trust and confidence in digital health technologies.

4.2.2   Key Coordination Activities

- **ONC Federal Health IT Coordinating Council:** Facilitates meetings for 25 agencies to discuss strategies and collaboration on the national health IT agenda. **DOC, DOD, DOJ, FCC, FTC, HHS, NASA, NIST, NSF, ONC, OPM, SSA & VA**
- **BIO+AI Working Group:** Facilitates working group meetings on how to enhance biomedical AI-ready data into the research community. **DOC, DOD, DOE, NIH, NIST, NOAA, NSF & USDA-NIFA**
- **CDSiC:** Facilitates meetings with multiple working groups all focused on advancing interoperable, patient-centered CDS in real-world settings. **AHRQ & other non-federal partners**
- **Health Information Technology Advisory Committee:** Meets monthly to recommend policies, standards, and certification criteria for advancing national and local health IT infrastructure and information exchange. **FDA, NIH, NIST, ONC & VA**
- **Public Patient-centered CDS Connect Work Group:** Meets monthly to gather input from CDS Connect users on desired features for CDS repositories and standards-based tools. Entities involved: **AHRQ, other federal agencies, academic & industry partners**

4.2.3   International Collaboration

- **The Veterans Cardiac Health and AI Model Predictions challenge:** Promotes a better understanding of AI/ML models, synthetic data, and improving outcomes for heart failure patients in the Veteran Population Challenge to use synthetic data representation of real-world data to develop AI/ML models. **FDA, NIH, NIST, VA, industry & international partners**

4.3   Digital Twins (DT) R&D Fast–Track Action Committee (FTAC)

In April 2024, the NITRD Subcommittee established a DT FTAC in response to the 2024 National Academies Report: Foundational Research Gaps and Future Directions for Digital Twins. This FTAC will develop a Digital Twins Research and Development (R&D) Strategic Plan, focusing on the fundamental and cross-cutting research and development challenges and opportunities that span digital twin applications.

4.4   Information Integrity R&D (IIRD) IWG

The IIRD IWG provides a forum for interagency coordination on R&D investments in information integrity. Specifically, agencies in the IIRD IWG focus on developing S&T to detect information manipulation, identify sources, causes, and harms to individuals and society; to identify evidence-based strategies to prevent and mitigate information manipulation; to develop system design for resilience to information manipulation; and to support pedagogical methods to enable critical thinking and informed citizens.

4.5   National Strategic Computing Reserve (NSCR) Pilot Program Office

The National Strategic Computing Reserve (NSCR) Pilot Program Office was created in 2023 as a multi-agency collaboration, following the NSTC Report titled National Strategic Computing Reserve: A

Blueprint[26]. The NSCR is taking lessons learned from the COVID-19 *High Performance Computing Consortium (HPCC)*[27] whose mission was to bring together the federal government, industry, and academia to provide access to the world's most powerful high-performance computing resources in support of COVID-19 research. The HPCC served the research community well to help the nation during the COVID-19 pandemic, but there were many limitations due to the ad hoc nature of its creation. The NSCR will create a strategic reserve that will provide computing resources and bring research expertise to bear in times of crisis to help save lives, property, public health, and safety or to lessen or avert a catastrophe. The Pilot Program Office is working to ensure that the proper mechanisms are in place so that when the next crisis comes, the NSCR is prepared to be called into action efficiently and effectively to serve the nation for whatever the disaster may be.

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[26] https://www.whitehouse.gov/wp-content/uploads/2021/10/National-Strategic-Computing-Reserve-Blueprint-Oct2021.pdf

[27] https://covid19-hpc-consortium.org/

5.0   Appendices

Appendix A: FY25 Cybersecurity Implementation Roadmap, https://www.nitrd.gov/pubs/FY25-Cybersecurity-Implementation-Roadmap.pdf

Appendix B: FY25 National AI Institutes, https://www.nitrd.gov/pubs/FY25-National-AI-Institutes.pdf

Appendix C: FY25 IWG Priorities, Programs, and Activities, https://www.nitrd.gov/pubs/FY25-IWG-Priorities-Programs-Activities.pdf

Appendix D: FY25 Acronyms, https://www.nitrd.gov/pubs/FY25-Acronyms.pdf

National Science and Technology Council

Subcommittee on Networking and Information Technology
Research and Development

Machine Learning and Artificial Intelligence Subcommittee