SPECIAL COMPETITIVE STUDIES PROJECT

Fueling Innovation: Insights into Federal AI R&D Investment

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The following analysis of **federal funding for artificial intelligence (AI) research and development (R&D)** over the last five years draws upon department and agency budget requests and various other sources. Tracking government AI R&D funding has significant challenges due to the absence of standardized, timely, and accurate reporting of government authorizations and appropriations. This difficulty is compounded by continuing resolutions and irregular appropriations cycles, which limits understanding of where funding is allocated and hinders adequate planning for the following fiscal years, particularly at the program level. Despite these obstacles, tracking federal spending remains crucial for developing a long-term national investment strategy that offers reliable, sustained support for the bedrock of American innovation – research and development.

Executive Summary

Amid intensifying global technological competition, maintaining U.S. leadership in artificial intelligence (AI) and other critical technologies demands strategic investment. While steps have been taken to bolster American competitiveness, federal funding for research and development (R&D) – the foundation of innovation – has stagnated. Bold government initiatives, such as the CHIPS & Science Act, remain underfunded, and federal AI R&D spending falls far short of the $32 billion target set by the National Security Commission on AI (NSCAI) three years ago. This gap between strategy and resourcing threatens America's technological dominance in an increasingly contested landscape. To cement its leadership in AI and AI-enabled technologies, the United States must strategically increase federal non-defense AI R&D spending.

This increased funding should build upon successful existing programs, fill critical gaps, and set audacious "moonshot" goals. Crucially, it should prioritize foundational research and critical R&D infrastructure to drive progress across the AI stack – encompassing talent, data, hardware, algorithms, applications, and integration. It's essential to support a wide array of programs and initiatives to foster a multifaceted, robust AI ecosystem. This analysis, though not exhaustive, examines funding trends for key federal AI R&D programs over the past five years. The conclusion is clear: by strategically investing in AI today, the United States can safeguard its future as a leader in scientific breakthroughs, enhance national security, and maintain its position at the forefront of technological progress.

Range of Funding for AI R&D Programs Across Department & Agencies for Fiscal Year 2019 and 2025

(in millions USD)

Funding for AI testbeds are not explicitly mention in budget requests. Fiscal Year 2025 represents requested funding.

Source: Data pulled from department and agency budget requests for Fiscal Year 2020 to Fiscal Year 2025.

Introduction

Today, the United States spends roughly $3 billion[1] on artificial intelligence (AI) research and development (R&D), still far from the $32 billion spending target established by the National Security Commission on Artificial Intelligence (NSCAI) three years ago.[2] This ambitious level of investment was established as a strategic spending *goal* – not a strategic *end* – and mirrors the amount the federal government spends on biomedical research, which has yielded life-saving pharmaceuticals, novel therapeutics, and groundbreaking advances like mRNA vaccines.[3] A similar, strategic investment in AI would serve a dual benefit: it would yield immediate national security advantages and lay the groundwork for sustained technological progress. Making up for this lost ground and reaching this $32 billion benchmark would cement America's technological leadership today, and secure dominance in the AI landscape of tomorrow.

R&D will play a pivotal and foundational role as nations race to develop novel and more powerful forms of artificial intelligence. The nation that effectively harnesses these next forms of AI will gain generational technological leadership with an unrivaled capacity to invent, adapt, and adopt new technologies – essentially, unparalleled **innovation power**.[4] The path toward future forms of AI demands significant research and resources across the AI stack, including in energy, compute, and microelectronics.[5] As a result, resource-rich, R&D-intensive, American firms, like OpenAI and Google, currently dominate the market, translating into a strong U.S. advantage.[6] However, the Chinese government is aggressively trying to close the gap by increasing public spending on R&D, subsidizing computing power, and even providing private companies with data to train models.[7] In the face of great power competition and as AI

[1] Artificial Intelligence R&D Investments, Fiscal Year 2019-Fiscal Year 2024, NITRD (last accessed 2024).

[2] Final Report, National Security Commission on Artificial Intelligence at 188 (2021); Funding for the Future: The Case for Federal R&D Spending, Special Competitive Studies Project (2024); Driving U.S. Innovation in Artificial Intelligence, The Bipartisan Senate AI Working Group (2024).

[3] Final Report, National Security Commission on Artificial Intelligence at 188 (2021); Hussain S. Lalani, et al., US Public Investment in Development of mRNA COVID-19 Vaccines: Retrospective Cohort Study, BMJ (2023); Peter L. Singer, Federally Supported Innovations: 22 Examples of Major Technology Advances that Stem From Federal Research Support, Information Technology and Innovation Foundation (2014).

[4] Eric Schmidt, Innovation Power: Why Technology Will Define the Future of Geopolitics, Foreign Affairs (2023).

[5] The range of elements that make up artificial intelligence can be described as a stack. The elements include: talent, data, hardware such as microelectronics and compute, algorithms, applications, and the integration of all of these pieces into a system. See Final Report, National Security Commission on Artificial Intelligence at 32 (2021); Generative AI: The Future of Innovation Power, Special Competitive Studies Project (2023). Artificial Intelligence Index Report 2024, Stanford Institute for Human-Centered Artificial Intelligence (2024); Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption, EPRI at 2 (2024).

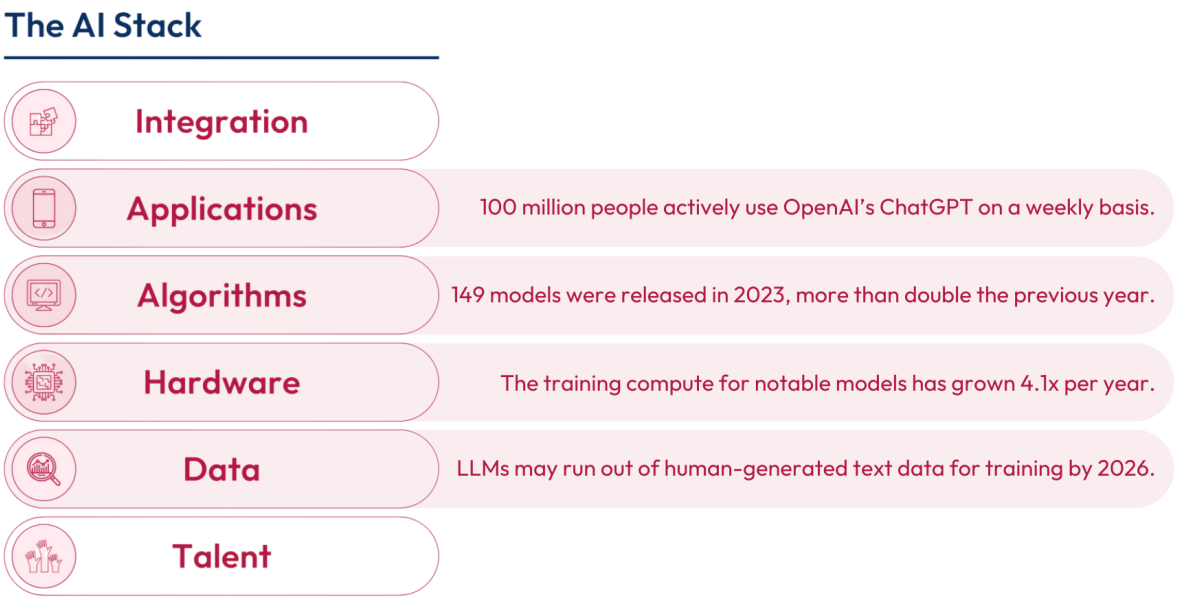
[6] Artificial Intelligence Index Report 2024, Stanford Institute for Human-Centered Artificial Intelligence (2024).

[7] Sujai Shivajumar, et al., Investing in Science and Technology: The United States Needs to Up its Game, Center for Strategic and International Studies at 26 (2024); Liza Lin, China Puts Power of State Behind AI–and Risks Strangling It, The Wall Street Journal (2024).

advances, relying on the U.S. private sector alone to generate this essential form of 21st-century power will not be enough. Instead, guaranteeing future U.S. technological leadership will require significant and strategic federal investment.

A Strategy for Investing in Artificial Intelligence

As the field progresses, the demand for the building blocks of artificial intelligence – the AI stack – increases exponentially.[8] Future AI models are projected to cost more than $1 billion in hardware, computing, data, and talent by 2027.[9] Increased R&D investment across these areas is therefore necessary to keep pace.



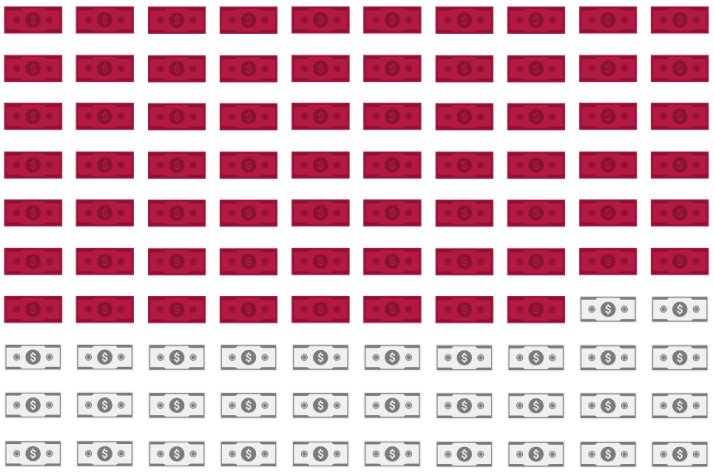
[8] Final Report, National Security Commission on Artificial Intelligence at 32 (2021); Generative AI: The Future of Innovation Power, Special Competitive Studies Project (2023).

[9] How Much Does It Cost to Train Frontier AI Models?, Epoch AI (2024);

47-67

percent

of the total development costs for AI models are for the hardware.



$1,000,000,000

is the estimated total cost for frontier models by 2027.

Sources: Generative AI: The Future of Innovation Power, Special Competitive Studies Project (2023); How Much Does It Cost to Train Frontier AI Models?, Epoch AI (2024); Machine Learning Trends, Epoch AI (last accessed 2024); Belle Lin, OpenAI's Not-So-Secret Weapon in Winning Business Customers? ChatGPT, The Wall Street Journal (2024).

However, greater investment must also be strategic, moving past blanket increases in dollar amounts. Instead, AI progress requires the U.S. government to actively forge a path forward, by:

- **Building Upon What Works.** The federal government has been a steward of science and technology for decades, championing the development of general-purpose technologies from electrification to digitization. For example, the National Science Foundation's (NSF) early investments into reinforcement learning in the 1980s paved the way for the many AI chatbots that exist today, like ChatGPT.[10] When certain strategies and approaches work, sometimes there's no reason to reinvent the wheel. Instead, existing, effective programs like NSF's AI research and related activities can be empowered, expanded, and properly resourced to realize their full potential.
- **Filling Critical Gaps.** Federal investments should target areas crucial for future technological advancement but may be overlooked by private sector funding. These

[10] Impacts From Investments in Artificial Intelligence, U.S. National Science Foundation (2024).

areas often require significant scientific breakthroughs or substantial capital investments to reach commercialization and widespread adoption.[11] Federal investment cannot and should not replace private capital, but by providing longer-term, patient investment, the U.S. government can support R&D in fields that may not offer immediate returns but are vital for the public good and national security.

- **Setting Audacious Goals.** The United States government should embrace a "moonshot mindset" and fund ambitious, AI-enabled, whole-of-nation efforts to push the boundaries of what is technologically possible. National endeavors, like the Apollo Program, are sometimes necessary in the face of global technological competition, and by taking calculated risks and pursuing bold technical goals that surpass the private sector's capabilities alone, the government can translate strategic technological visions into tangible, groundbreaking results.[12]

One example of a moonshot is a federal-level program to build a 24/7 **national medical "shield"** that significantly fortifies America's capacity to prevent, detect, and respond to global biothreats.[1] The COVID-19 pandemic illustrated the need for rapid and coordinated responses to medical crises. Rather than reactively forming ad hoc efforts like Operation Warp Speed in response to the next emergency, a national MedShield would serve as a permanent, proactive system.[1] This comprehensive shield would integrate advanced AI-enabled modeling with rapid vaccine production capabilities and a global pathogen radar system to swiftly develop, test, and deliver medical solutions to citizens at speed and scale whenever needed.[1] Such an ambitious, large-scale initiative would require oversight from the Department of Health and Human Services and necessitate billions of dollars in sustained investment. However, the potential benefits of establishing a MedShield in terms of lives saved and enhanced national security far outweigh the costs.

[11] Andrew J. Fieldhouse & Karel Mertens, The Returns to Government R&D: Evidence from U.S. Appropriations Shocks, Federal Reserve Bank of Dallas (2023); Benjamin F. Jones & Lawrence H. Summers, A Calculation of the Social Returns to Innovation, National Bureau of Economic Research (2020); Mariana Mazzucato, The Entrepreneurial State: Overlooking the Key Role of the State in Promoting Innovation is One of the Biggest Mistakes of Market Fundamentalism, Soundings (2011); Ben Purser & Paveneet Singh, Unlocking U.S. Technological Competitiveness: Public-Private Misalignments in Biotechnology, Energy, and Quantum Sectors, Institute for Security and Technology (2024).

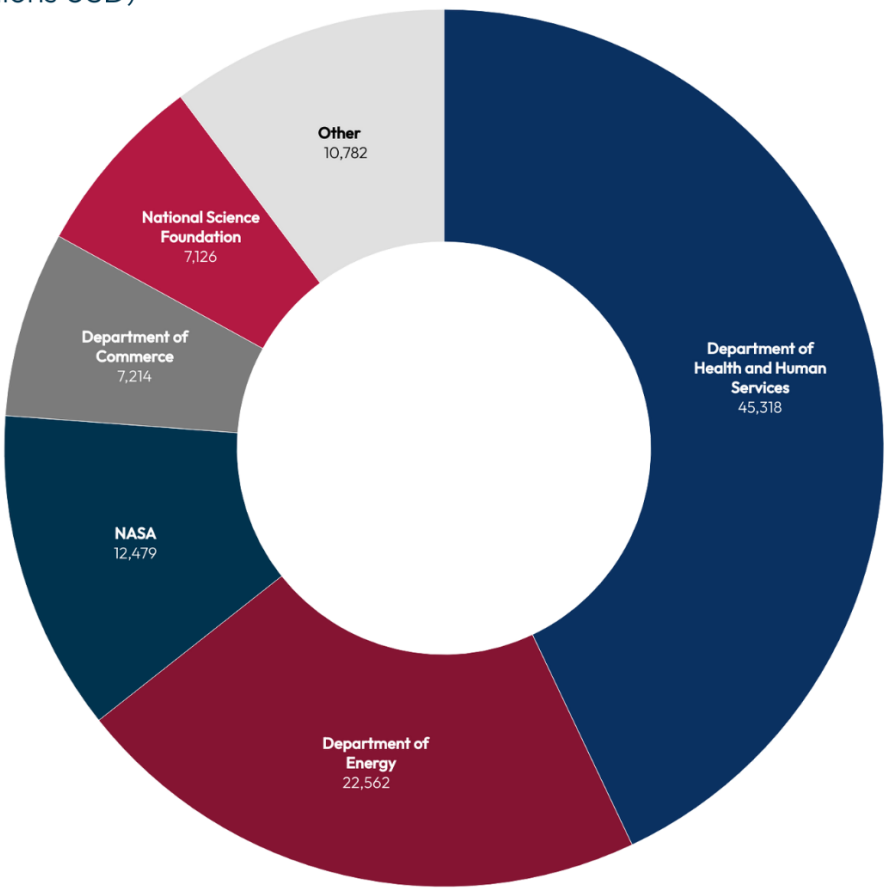
[12] Vision for Competitiveness: Mid-Decade Opportunities for Strategic Victory, Special Competitive Studies Project at 33 (2024).

As a result, the federal government can ensure that greater funding for AI not only meets today's pivotal moment but has a lasting impact past tomorrow.

Spending Priorities

While there are over 200 AI R&D programs and 40 AI testbeds carried out and overseen by various departments and agencies, five key organizations have emerged as AI pioneers, consistently making the largest R&D investments across the federal government: the Department of Energy (DOE), the National Science Foundation (NSF), the Department of Commerce (including its National Institute for Standards and Technology (NIST), the Department of Health and Human Services' National Institutes of Health (NIH), and the National Aeronautics and Space Administration (NASA).[13]

Fiscal Year 2022 Actual R&D Funding by Departments & Agencies
(in millions USD)



Source: Federal Research and Development (R&D) Funding: FY 2024, Congressional Research Service (2023).

[13] AI Research Program Repository, NITRD (last accessed 2024); AI R&D Testbed Inventory, NITRD (last accessed 2024); Artificial Intelligence R&D Investments, Fiscal Year 2019-Fiscal Year 2024, NITRD (last accessed 2024).

Yet, many of these departments and agencies are not appropriated to levels authorized by the CHIPS and Science Act or other relevant statutes, and now face budget cuts due to the Fiscal Responsibility Act.[14] While increased funding for all scientific domains is critical in the long-term, the current moment presents an opportunity to increase federal funding for AI R&D specifically, as artificial intelligence quickly converges with other fields, accelerates science and tech development, and evolves into an even more powerful form with profound implications for society, the economy, and national security.

Increased investment should be allocated primarily to these five leading departments and agencies, focusing on the foundational research and critical R&D infrastructure needed to spur progress across the AI stack, and ultimately, the next generation of AI itself. Increased federal funding for research yields higher numbers of patent grants, STEM doctoral recipients, active researchers, and technological publications.[15] Critical R&D infrastructure encompasses the initiatives, centers, laboratories, institutions, and systems that create the space for this research.[16] It is also crucial to implement robust safeguards to prevent the exploitation of this federally funded research in ways that could jeopardize national security, especially as the United States faces technological rivals.[17] By bolstering fundamental research, fortifying critical R&D infrastructure, and implementing comprehensive safeguards, the United States will accelerate AI development. While not an exhaustive list, here is an analysis of key federal non-defense AI R&D programs over the past five years:

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[14] Funding for the Future: The Case for Federal R&D Spending, Special Competitive Studies Project (2024); Matt Hourihan & Andy Gordon, CHIPS and Science Funding Gaps Continues to Stifle Scientific Competitiveness, Federation of American Scientists (2024); Alessandra Zimmerman, Presidential Budget Request 2025: A Summary of R&D Funding, American Association for the Advancement of Science (2024); Alessandra Zimmerman, The Final FY 2024 Budget: A Summary of How R&D Fared, American Association for the Advancement of Science (2024). Alessandra Zimmerman, What the Fiscal Responsibility Act Means for R&D Funding, American Association for the Advancement of Science (2023).

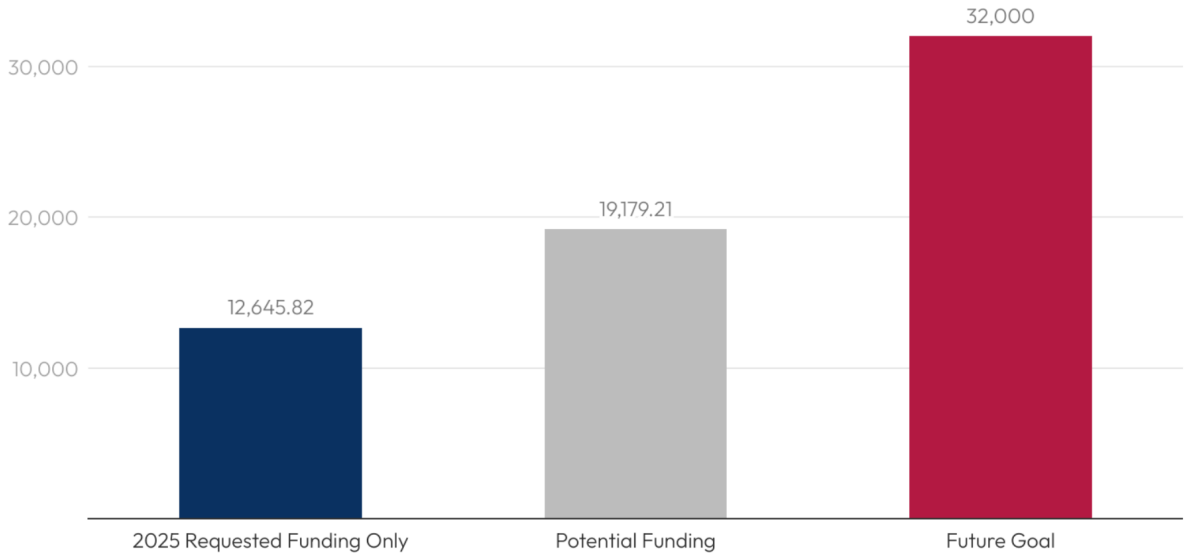
[15] Andrew J. Fieldhouse & Karel Mertens, The Returns to Government R&D: Evidence from U.S. Appropriations Shocks, Federal Reserve Bank of Dallas (2023).

[16] While critical R&D infrastructure across the United States are facing growing deficiencies, there's also a need for increased investment into "traditional" infrastructure to enable the widespread adoption of AI, like data centers and electrical transmission lines, spending should focus on supporting pre-commercialization research and development. See U.S. Federal Research and Development Infrastructure: A Foundation of the Nation's Global Scientific Leadership and Economic and National Security, Office of Science and Technology Policy (2024); Nate Rattner, Breaking Down the Tech Giant's AI Spending Surge, The Wall Street Journal (2024); Sviat Dulianinov, The Future is Now: Building the Infrastructure to Power AI's Promise, Forbes (2024); National Action Plan for U.S. Leadership in Next-Generation Energy, Special Competitive Studies Project at 10 (2024).

[17] Research Security: Strengthening Interagency Collaboration Could Help Agencies Safeguard Federal Funding from Foreign Threats, U.S. Government Accountability Office (2024).

Scenarios of Total Funding For Non-Defense AI R&D Compared to the $32 Billion NSCAI Benchmark

(in millions USD)



Potential Funding includes the 2025 Request plus full CHIPS & Science authorizations and proposed funding levels for new initiatives.

Department of Energy (DOE)

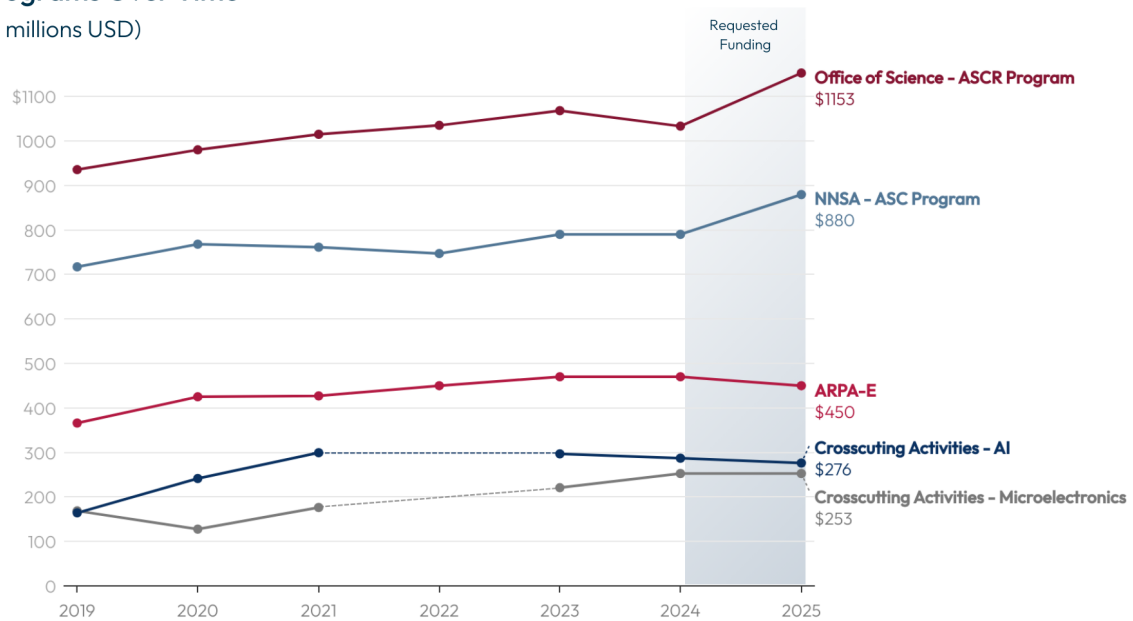
Funding for Department of Energy (DOE) Programs
(in millions USD)

Funding Account	Program Name	2019	2020	2021	2022	2023	2024*	2025 R
Crosscutting Activities	AI	$ 164.19	$ 241.45	$ 299.31	-*	$ 296.84	$ 287.00	$ 455.10
Crosscutting Activities	Microelectronics	$ 168.62	$ 127.58	$ 176.26	-*	$ 220.67	$ 252.67	$ 276.15
Office of Science	Advanced Scientific Computing Research Program (ASCR)	$ 935.50	$ 980.00	$ 1,015.00	$ 1,035.00	$ 1,068.00	$ 1,033.11	$ 1,152.68
Stockpile Research, Technology, and Engineering (SRT&E)	Advanced Simulation and Computing Program (ASC)	$ 717.12	$ 767.849	$ 761.21	$ 747.01	$ 790.00	$ 790.00	$ 879.50
Crosscutting Activities	Frontiers in Artificial Intelligence for Security, Science, and Technology (FASST) Program	-	-	-	-	-	-	-
Office of Science	Microelectronics Science Research Centers (MSRCs	-	-	-	-	-	$ 40.00	-
ARPA-E		$ 366.00	$ 425.00	$ 427.00	$ 450.00	$ 470.00	$ 470.00	$ 450.00
Crosscutting Activities	AI Testbeds*	-	-	-	-	-	-	-

* Fiscal Year 2022 funding for crosscutting activities in AI and microelectronics is not listed explicitly in the Department's budget requests. The Funding for AI testbeds is not explicitly reported in the budget requests either. Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding. "R" represents requested funding.

Source: Data pulled from the Department of Energy's budget requests for Fiscal Years 2021 to 2025 and recent announcements.

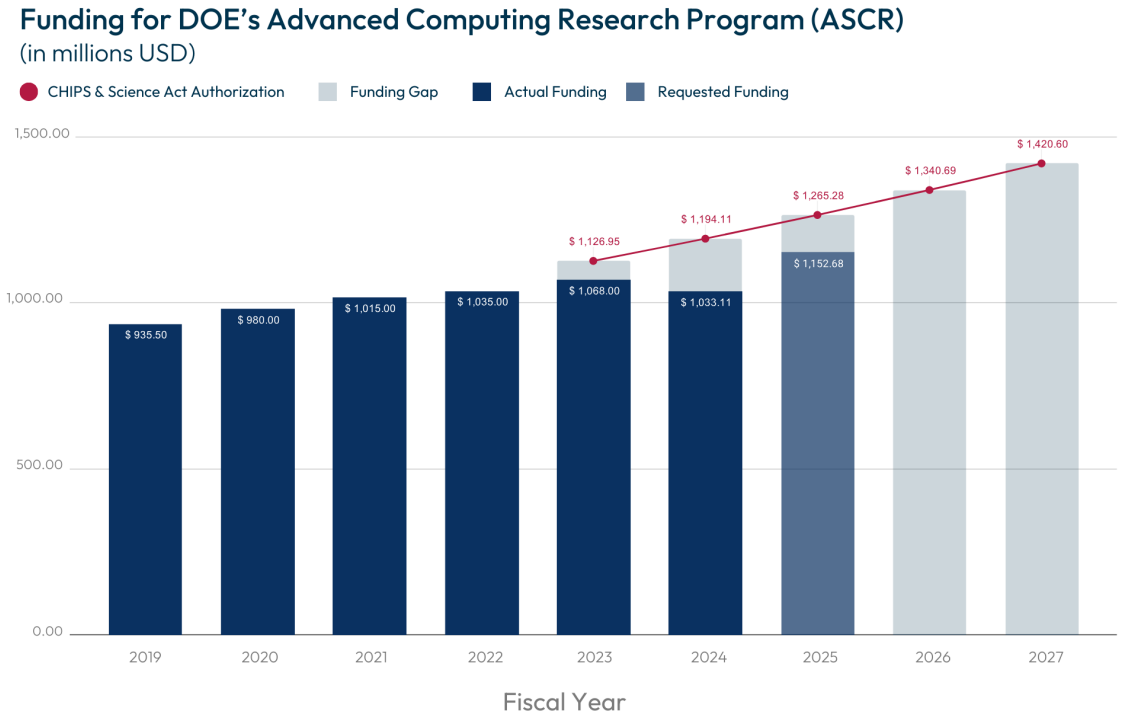
Funding for the Department of Energy's Programs Over Time
(in millions USD)



Fiscal Year 2022 funding for crosscutting activities in AI and microelectronics is not listed explicitly in the Department's budget requests. Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding and 2025 numbers are requested funding.

Source: Data pulled from the Department of Energy's budget requests for Fiscal Years 2021 to 2025 .

The Department of Energy enables groundbreaking R&D across the AI stack. Overall, funding for the Department's various AI-related activities has increased incrementally, but many initiatives remain under-resourced. Funding for the Advanced Research Projects Agency for Energy (ARPA-E) is comparatively lower than the budgets of some of its sister agencies, ARPA-H, and DARPA.[18] Spending for critical programs like the Office of Science's Advanced Scientific Computing Research (ASCR) Program has fallen short of the levels laid out in the CHIPS and Science Act.[19] Additionally, two new initiatives, Microelectronics Research Centers and the Frontiers in Artificial Intelligence for Security, Science, and Technology (FASST) Program, have not been fully funded, limiting their ability to drive transformative AI advancements.



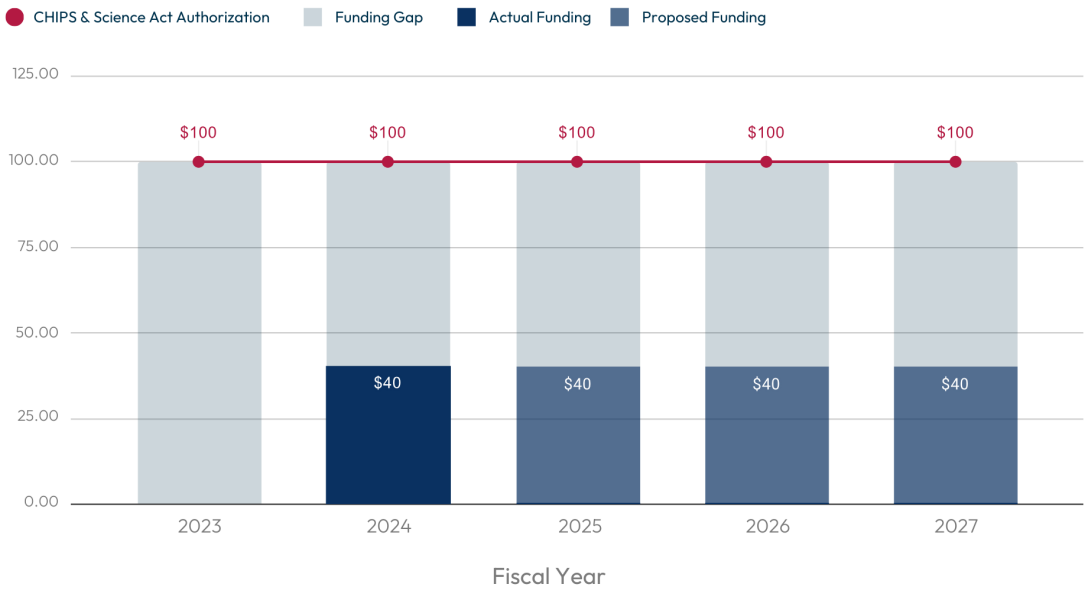
Source: Calculations derived from Public Law 117-169, CHIPS and Science Act (2022) and data from the Department of Energy's budget requests for Fiscal Years 2021 to 2025.

[18] In 2023, funding for ARPA-H was $1.5 billion and funding for DARPA was $4 billion. In comparison, funding for ARPA-E in 2023 was $470 million. See Kavya Sekar, National Institutes of Health (NIH) Funding: FY1996-FY2025, Congressional Research Service (2024); Department of Defense Budget Fiscal Year 2025: RDT&E Programs (R-1), U.S. Department of Defense (2024), Department of Energy FY2025 Congressional Justification: Volume 2, U.S. Department of Energy (2024).

[19] Public Law 117-169, CHIPS and Science Act (2022); Department of Energy FY2025 Congressional Justification: Volume 5, U.S. Department of Energy (2024); Department of Energy FY2024 Congressional Request: Science, U.S. Department of Energy (2023); Department of Energy FY2023 Congressional Budget Request: Science, U.S. Department of Energy (2022).

- **Microelectronics Research Centers (MSRCs)**, established by the CHIPS and Science Act, directly contribute to the creation of novel forms of efficient microelectronics that power current and future AI systems.[20] However, funding for these MSRCs currently falls below what is authorized.[21] As the world nears the end of Moore's Law and the demand for AI rapidly accelerates, these MSRCs will prompt the scientific breakthroughs needed for technological leadership, but without proper resourcing, the number of centers themselves and their capabilities are limited.

Funding for DOE's Microelectronics Science Research Centers (MSCRs)
(in millions USD)



Source: Calculations derived from Public Law 117-169, CHIPS and Science Act (2022); Department of Energy Announces $160 Million for Research to Form Microelectronics Science Research Centers, U.S. Department of Energy (2024).

- **The Frontiers in Artificial Intelligence for Security, Science, and Technology (FASST) Program** aims to build the most powerful and integrated scientific AI systems in the world to solve national security problems, address energy challenges, and accelerate scientific

[20] Public Law 117-169, CHIPSs and Science Act (2022); Department of Energy Announces $160 Million for Research to Form Microelectronics Science Research Centers, U.S. Department of Energy (2024); National Action Plan for U.S. Leadership in Advanced Compute and Microelectronics, Special Competitive Studies Project (2023).

[21] The CHIPS and Science Act authorized the establishment of up to four Microelectronics Science Research Centers, each allocated $25 million annually. However, the current funding proposal envisions $160 million distributed over four years, falling short of the Act's original provisions.See Public Law 117-169, CHIPS and Science Act (2022); Department of Energy Announces $160 Million for Research to Form Microelectronics Science Research Centers, U.S. Department of Energy (2024).

discovery.[22] This program is a moonshot-like endeavor that requires an estimated $2.4 billion per year for the hardware, software, and talent needed to build proprietary foundational AI models.[23]

National Science Foundation (NSF)

Funding for National Science Foundation (NSF) Programs
(in millions USD)

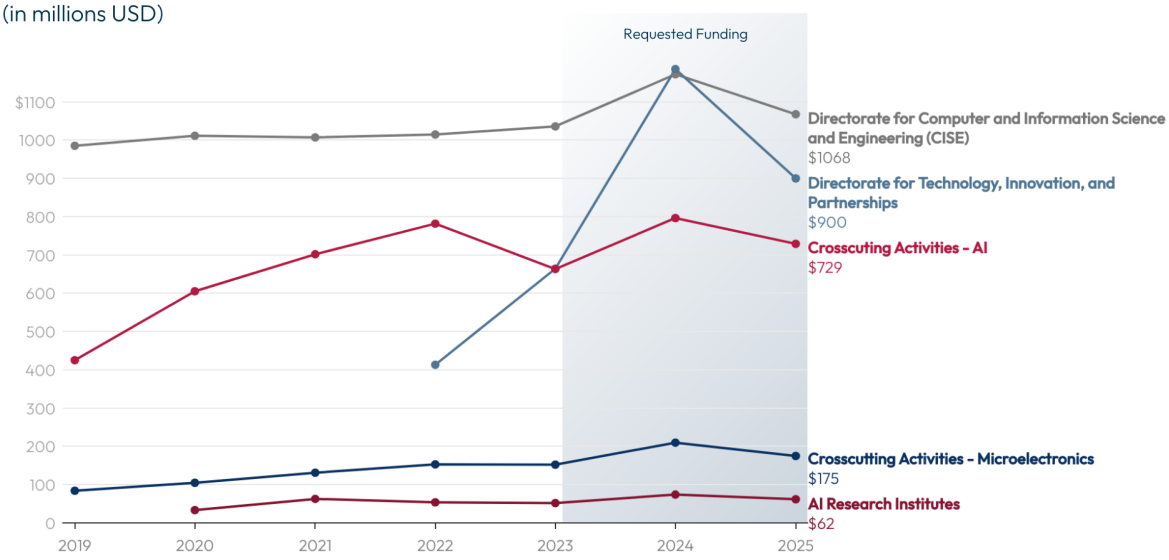
Funding Account	Program Name	2019	2020	2021	2022	2023	2024 R	2025 R
Crosscutting Activities	AI	$ 425.11	$ 605.15	$ 701.78	$ 781.79	$ 663.22	$ 796.48	$ 729.16
Crosscutting Activities	Microelectronics	$ 84.16	$ 104.67	$ 131.11	$ 152.96	$ 152.25	$ 209.68	$ 174.97
Research & Related Activities	National AI Research Resource (NAIRR)	-	-	-	-	-	-	$ 30.00
Crosscutting Activities	AI Research Institutes	-	$ 33.58	$ 62.70	$ 53.88	$ 51.83	$ 73.98	$ 61.86
Research & Related Activities	Directorate for Technology, Innovation and Partnerships (TIP)	-	-	-	$ 413.09	$ 664.15	$ 1,185.63	$ 900.00
Research & Related Activities	Directorate for Computer and Information Science and Engineering (CISE)	$ 985.12	$ 1,011.40	$ 1,007.13	$ 1,014.73	$ 1,035.90	$ 1,172.14	$ 1,067.58
Research & Related Activities	CISE Graduate Fellowships (CSGrad4US)	-	-	-	-	$ 8.50	$ 12.50	$ 10.50
Crosscutting Activities	AI Testbeds*	-	-	-	-	-	-	-

*Funding for AI testbeds is not explicitly reported within the budget requests. Fiscal Years 2019-2023 represent actual funding. "R" represents requested funding.
Source: Data pulled from National Science Foundation's budget requests for Fiscal Years 2021 to 2025.

[22] Frontiers in Artificial Intelligence for Science, Security and Technology (FASST), U.S. Department of Energy (2024). Frontiers in Artificial Intelligence in for Science, Security and Technology (FASST), U.S. Department of Energy (last accessed 2024).

[23] The estimated FASST funding level is derived from engagements with staff of two national laboratories and the proposed funding levels in pending legislation, S.4664, Department of Energy AI Act (2024). See also Alison Snyder, DOE Aims to Move "FASST" on AI with Sweeping New Initiative, AXIOS (2024); Ben Wodecki, Energy Department Unveils Plan to Boost AI Research Capacity, AI Business (2024).

Funding for the National Science Foundation's Programs Over Time
(in millions USD)



Fiscal Years 2019-2023 represent actual funding. 2024 and 2025 numbers are requested funding.
Source: Data pulled from National Science Foundation's budget requests for Fiscal Years 2021 to 2025.

As a leading federal AI R&D funder for over 70 years, the National Science Foundation drives innovation in areas such as machine learning, human-AI interfaces, and robotics while growing future AI talent through initiatives like the Computer and Information Science and Engineering Graduate Fellowships.[24] Still, recent budget requests for NSF's various programs have shown a slight downward trend in funding. The requested $62 million budget for AI Research Institutes falls short of fully funding 30 institutes at $4 million each.[25] Plus, without increased investment, NSF's newly established programs risk not meeting their intended objectives.

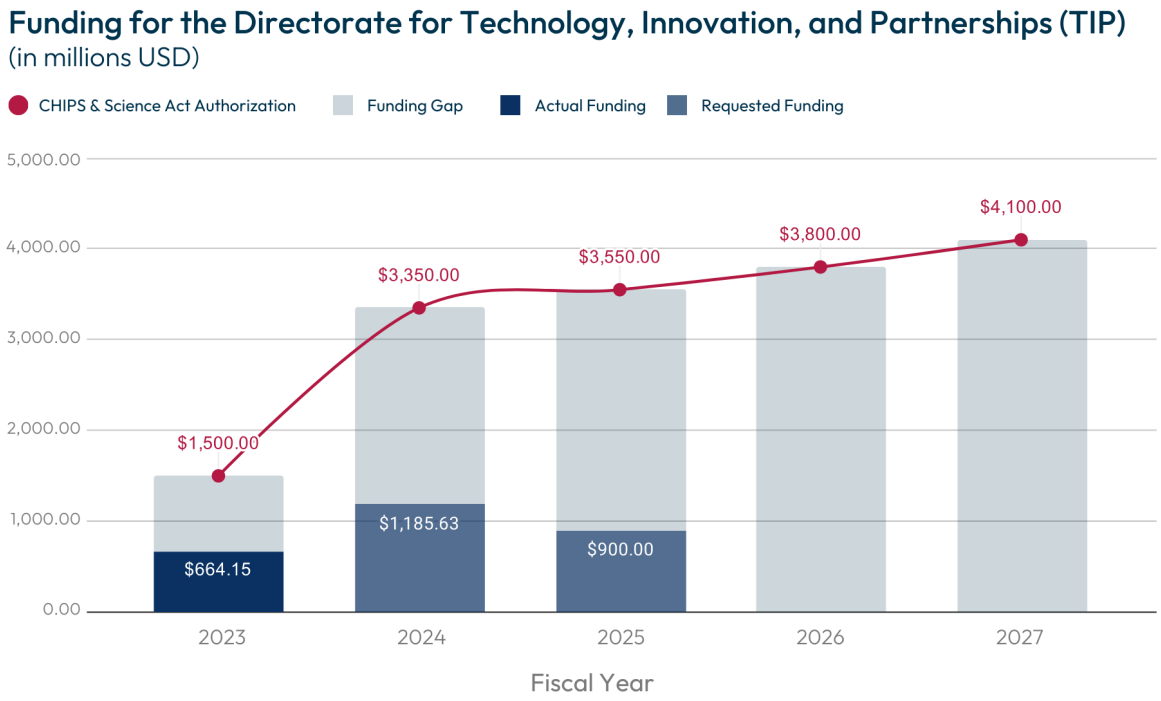
- **The Directorate for Technology, Innovation, and Partnerships (TIP)** advances the development of strategic technologies, including AI, grows the tech talent base and workforce, and strengthens the U.S. innovation ecosystem through initiatives such as the NSF Regional Innovation Engines program and the Accelerating Research Transition (ART) program.[26] Despite its potential to catalyze transformative advancements, TIP is

[24] Expanding the Frontiers of AI, U.S. National Science Foundation (2023); CISE Graduate Fellowships, U.S. National Science Foundation (last accessed 2024).

[25] FY 2025 Budget Request to Congress, U.S. National Science Foundation at Emerging Industries 17 (2024); National Artificial Intelligence Research Institutes, U.S. National Science Foundation (last accessed 2024); National Artificial Intelligence (AI) Research Institutes Active Awards, U.S. National Science Foundation (last accessed 2024).

[26] TIP Roadmap, U.S. National Science Foundation (2024); FY 2025 Budget Request to Congress, U.S. National Science Foundation at TIP 1-6 (2024).

under-resourced by billions of dollars compared to CHIPS and Science Act authorizations.[27]



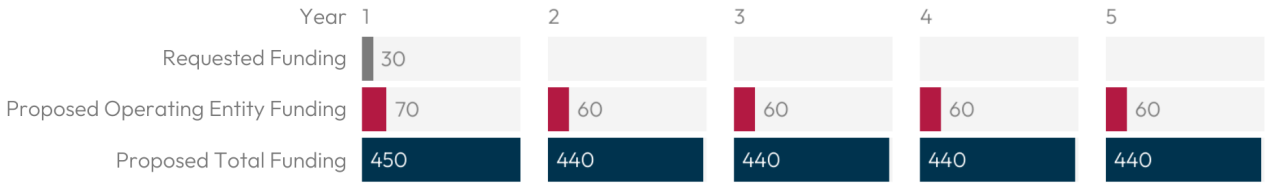
Source: Public Law 117-169, CHIPS and Science Act (2022); FY 2025 Budget Request to Congress, U.S. National Science Foundation at TIP 1 (2024); FY 2024 Budget Request to Congress: Directorate for Technology, Innovation and Partnerships (TIP), U.S. National Science Foundation (2023).

[27] Public Law 117-169, CHIPS and Science Act (2022); FY 2025 Budget Request to Congress, U.S. National Science Foundation at TIP 1 (2024); FY 2024 Budget Request to Congress: Directorate for Technology, Innovation and Partnerships (TIP), U.S. National Science Foundation (2023).

Funding for the National AI Research Resource (NAIRR) Per Operating Year

(in millions USD)

The proposed total funding for NAIRR is $2.2 billion over 5 years.



Source: Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023); FY 2025 Budget Request to Congress, U.S. National Science Foundation (2024).

- **The National AI Research Resource (NAIRR)** provides broader academic access to the entire AI stack— including data, software, and compute—through an integrated portal, fostering discovery and innovation and bridging the resource gap between the public and private AI sectors.[28] While the National Science Foundation is already piloting the NAIRR, requested funding falls short of the levels proposed by the National Artificial Intelligence Research Resource Task Force for the first year of the initiative, potentially delaying the initiative from becoming fully operational.[29]

[28] Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: A Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023); Democratizing the Future of AI R&D: NSF to Launch National AI Research Resource Pilot, U.S. National Science Foundation (2024).

[29] Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: A Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023); FY 2025 Budget Request to Congress, U.S. National Science Foundation (2024).

Department of Commerce

Funding for Department of Commerce Programs
(in millions USD)

Funding Account	Program Name	2019	2020	2021	2022	2023	2024*	2025 R
NIST: Scientific and Technical Research and Services	Laboratory Programs	$ 628.10	$ 655.80	$ 687.10	$ 705.80	$ 803.33	$ 763.67	$ 787.25
NIST: Scientific and Technical Research and Services	Activities for Advancing AI Research, Standards, and Testing to Meet National Needs	-	-	-	-	-	-	$ 82.70
NIST: Scientific and Technical Research and Services	United States AI Safety Institute (USAISI)*	-	-	-	-	-	-	-
NIST: Scientific and Technical Research and Services	AI Testbeds*	-	-	-	-	-	-	-
Economic Development Administration (EDA)	Regional Technology and Innovation Hubs Program	-	-	-	-	$ 41.00	$ 41.00	$ 1,541.00
NOAA: Oceanic and Atmospheric Research: Operations, Research, and Facilities	High Performance Computing Initiatives	$ 12.18	$ 16.75	$ 17.80	$ 17.80	$ 18.23	$ 18.23	$ 18.38
NOAA: Oceanic and Atmospheric Research: Procurement, Acquisition, and Construction	Research and Development (R&D) High Performance Computing (HPC)	$ 41.00	$ 42.00	$ 43.50	$ 43.50	$ 70.00	$ 70.00	$ 68.50

*Funding for AI testbeds is not explicitly reported within the budget requests. Funding for the United States AI Safety Institute is included in "Activities for Advancing AI Research, Standards, and Testing to Meet National Needs." Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding. "R" represents requested funding. The Fiscal Year 2025 request for the EDA Tech Hubs program includes mandatory and discretionary funding.

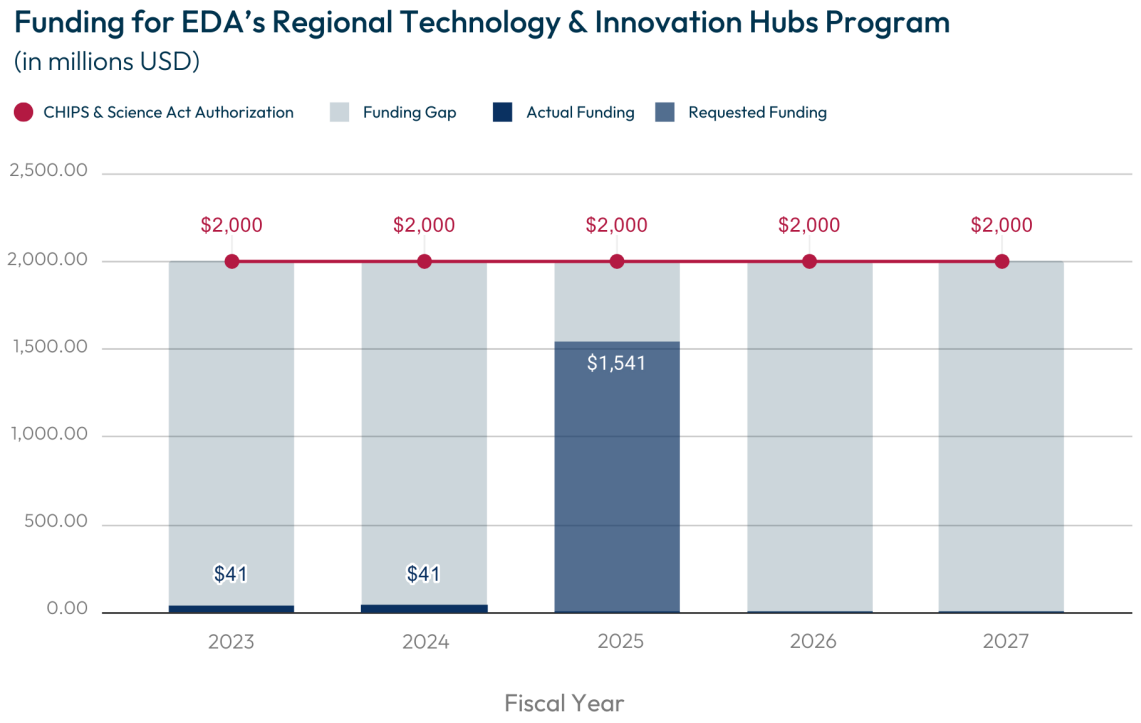
Source: Data pulled from NIST's, EDA's, and NOAA's budget requests for Fiscal Years 2021 to 2025, appropriation summary tables, and Congressional Research Service reports.

Across its many bureaus, the Department of Commerce is rapidly emerging as a consequential player in the research and development of AI applications and integration. As a uniquely data-rich Department overseeing agencies like the National Oceanic and Atmospheric Administration (NOAA) and the United States Census Bureau, Commerce is well-positioned to leverage this wealth of information for AI development.[30] Yet, some of the Department's initiatives are relatively new and face significant funding challenges. The National Institute for Standards and Technology (NIST), for example, aims to almost double its budget for advancing AI research – which includes spending for AI programs across the agency, like the U.S. Artificial Intelligence Safety Institute (USAISI).[31] At the same time, spending for the Economic Development Administration's Regional Technology and Innovation Hubs program is millions beneath

[30] At the Department level, the Commerce Chief Data Officer has proposed a $45 million initiative to consolidate and better leverage the Department's data holdings for AI. SCSP engagement with a DOC Employee (2024). See also Preparing Open Data for the Age of AI, U.S. Department of Commerce (2024).

[31] National Institute of Standards and Technology and National Technical Information Service Fiscal Year 2025 Budget Submission to Congress, U.S. Department of Commerce at 26 (2024).

authorized levels, leaving regional potential for AI innovation untapped.[32] Without proper funding, these initiatives have a lessened ability to set the rules of the game for AI, embed U.S. values into AI development and adoption, and maintain the nation's ability to shape the future of the technology itself.



Source: Public Law 117-169, CHIPS and Science Act (2022); Economic Development Administration Fiscal Year 2025 Congressional Budget Request, U.S. Department of Commerce (2024).

- **NIST's laboratory programs**[33] provide physical spaces for scientific discovery and the development of cutting-edge AI testing and evaluation, applications, and new AI-enabled technologies.[34] For example, the Material Measurement Laboratory oversees NIST's Living Measurements Systems Foundry, an automated, AI-enabled, facility that

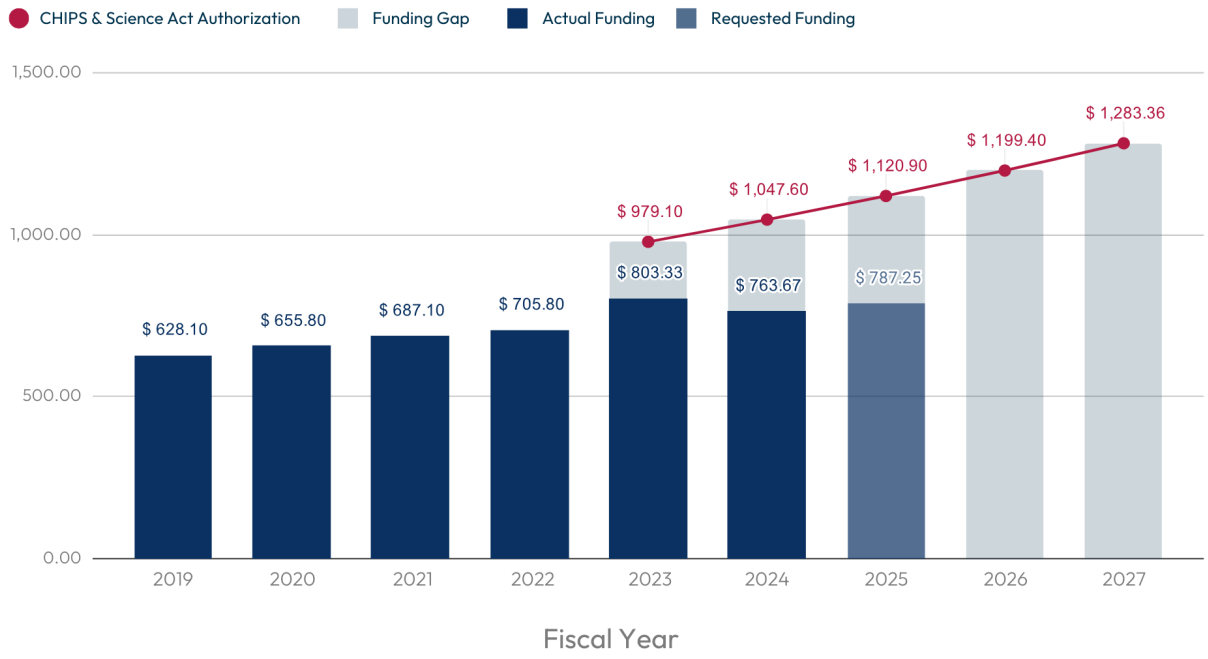
[32] Public Law 117-169, CHIPS and Science Act (2022); Economic Development Administration Fiscal Year 2025 Congressional Budget Request, U.S. Department of Commerce (2024).

[33] This includes NIST's Information Technology Laboratory, which leads NIST's cross-laboratory AI research, is home to the NIST's AI Risk Management Framework, and oversees efforts to build AI measurement methods and guidelines to incorporate into international standards. See National Institute of Standards and Technology and National Technical Information Service Fiscal Year 2025 Budget Submission to Congress, U.S. Department of Commerce at 22 (2024).

[34] National Institute of Standards and Technology (last accessed 2024); National Institute of Standards and Technology and National Technical Information Service Fiscal Year 2025 Budget Submission to Congress, U.S. Department of Commerce at 13-25 (2024).

grows engineered microbes and cells for future therapeutics and material fabrication.[35] Yet, funding for these comprehensive and multi-disciplinary programs remains stagnant and over $400 million below authorized levels.[36] This lack of resourcing limits R&D across AI-enabled fields, from quantum information science to bioscience and advanced manufacturing.

Funding for NIST's Laboratory Programs
(in millions USD)



Source: Calculations derived from Public Law 117-169, CHIPS and Science Act (2022) and data from NIST's budget requests and appropriation summaries for Fiscal Years 2021 to 2025.

[35] NIST Living Measurement Systems Foundry, National Institute of Standards and Technology (last accessed 2024).

[36] Public Law 117-169, CHIPS and Science Act (2022); National Institute of Standards and Technology and National Technical Information Service Fiscal Year 2025 Budget Submission to Congress, Department of Commerce at 13-25 (2024).

Health and Human Services — National Institutes of Health (NIH)

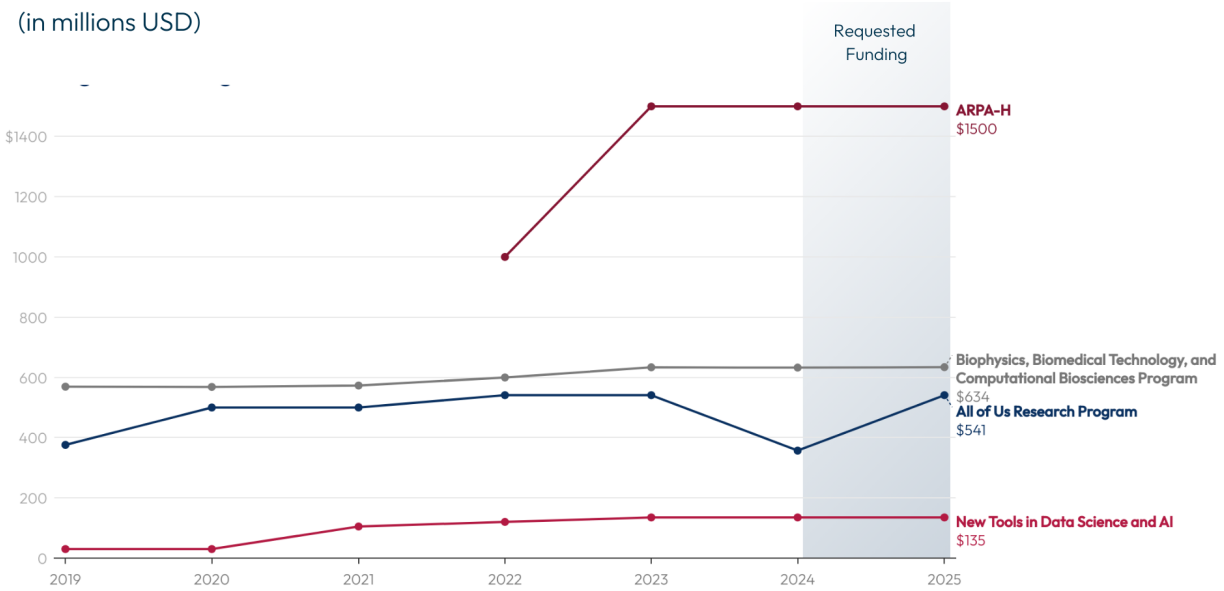
Funding for Health and Human Services - National Institutes of Health (NIH) Programs
(in millions USD)

Funding Account	Program Name	2019	2020	2021	2022	2023	2024*	2025 R
NIH: Office of the Director	New Tools in Data Science and AI	$ 30.00	$ 30.00	$ 105.00	$ 120.00	$ 135.00	$ 135.00	$ 135.00
NIH: Office of the Director	All of Us Research Program*	$ 376.00	$ 500.00	$ 500.00	$ 541.00	$ 541.00	$ 357.00	$ 541.00
National Institute of General Medical Sciences	Biophysics, Biomedical Technology, and Computational Biosciences Program	$ 549.31	$ 568.45	$ 574.03	$ 599.73	$ 633.40	$ 632.42	$ 633.90
ARPA-H		-	-	-	$ 1,000.00	$ 1,500.00	$ 1,500.00	$ 1,500.00
National Library of Medicine	Clinical Data Iniative	-	-	-	-	-	-	$ 30.00

*Funding for the All of Us Research Program includes appropriations from the Cures Act. Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding. "R" represents requested funding for Fiscal Year 2025.

Source: Data pulled from the National Institutes of Health's budget requests for Fiscal Years 2021 to 2025.

Funding for the National Institutes of Health's (NIH) Programs Over Time
(in millions USD)



Funding for the All of Us Research Program includes appropriations from the Cures Act. Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding. Fiscal Year 2025 is requested funding.

Source: Data pulled from the National Institutes of Health's budget requests for Fiscal Years 2021 to 2025.

The Department of Health and Human Services conducts AI R&D largely through the National Institutes of Health, which drives progress at the intersection of AI and the biological, biomedical, and biotechnical fields. While NIH programs like the Bridge to Artificial Intelligence (Bridge2AI), saw slight increases in investment from 2019 to 2023, resulting in AI-ready datasets and advanced AI applications, recent budget requests indicate a stagnation in AI-related R&D funding.[37] This plateau affects initiatives like the Advanced Research Projects Agency for Health (ARPA-H). As the nation's premier medical research institution and largest funder of AI research, NIH programs require sustained funding growth.

National Aeronautics and Space Administration (NASA)

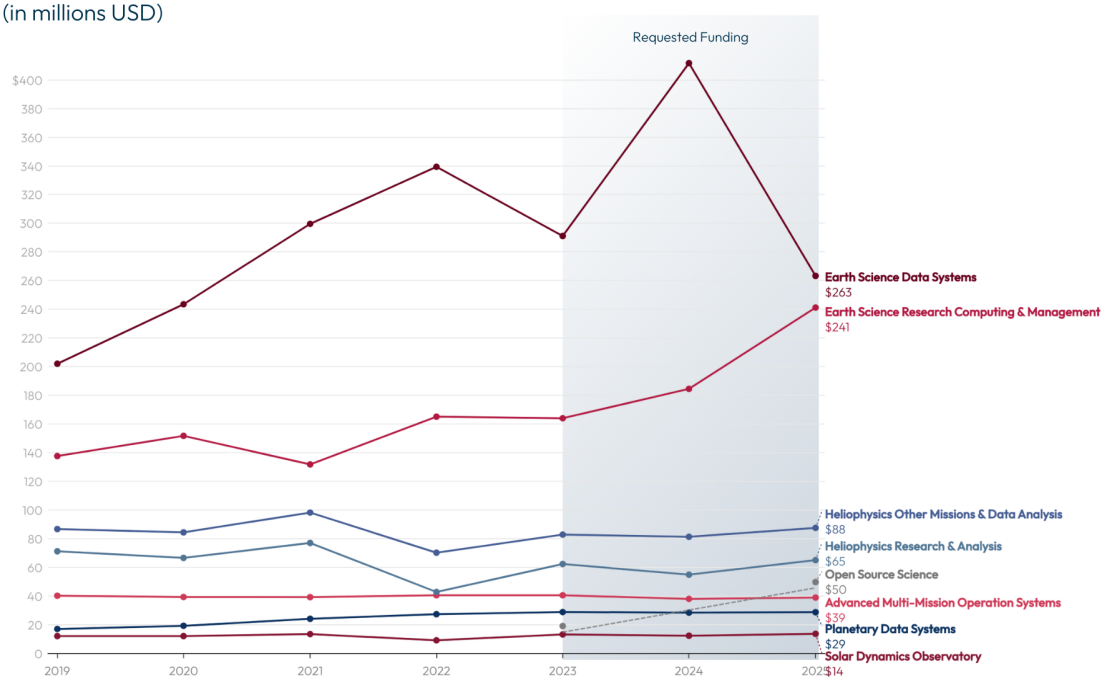
Funding for National Aeronautics and Space Administration (NASA) Programs
(in millions USD)

Funding Account	Program Name	2019	2020	2021	2022	2023	2024 R	2025 R
Science: Earth Science Research	Computing and Management	$ 137.60	$ 151.70	$ 131.80	$ 165.10	$ 164.00	$ 184.50	$ 241.20
Science: Earth Science	Earth Science Data Systems	$ 202.00	$ 243.50	$ 299.60	$ 339.40	$ 291.10	$ 411.70	$ 263.30
Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Open Source Science	-	-	-	-	$ 19.00	-	$ 49.70
Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Planetary Data Systems (PDS)	$ 17.00	$ 19.20	$ 24.10	$ 27.30	$ 28.80	$ 28.40	$ 28.70
Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Advanced Multi-Mission Operation Systems (AMMOS)	$ 40.20	$ 39.20	$ 39.90	$ 40.50	$ 40.50	$ 38.00	$ 38.90
Science: Heliophysics: Heliophysics Research	Research and Analysis	$ 71.20	$ 66.60	$ 77.00	$ 42.80	$ 62.30	$ 54.90	$ 65.00
Science: Heliophysics: Heliophysics Research	Other Missions and Data Analysis	$ 86.70	$ 84.40	$ 98.20	$ 70.20	$ 82.80	$ 81.30	$ 87.50
Science: Heliophysics: Living with a Star: Other Missions and Data Analysis	Solar Dynamics Observatory (SDO)	$ 12.00	$ 12.00	$ 13.40	$ 9.10	$ 13.20	$ 12.30	$ 13.60

* Fiscal Years 2019-2023 represent actual funding. "R" represents requested funding.
Source: Data pulled from the NASA's budget requests for Fiscal Years 2021 to 2025.

[37] Bridge to Artificial Intelligence (Bridge2AI), National Institutes of Health (last accessed 2024); Cross-Cutting NIH Initiatives, Department of Health and Human Services at 128-133 (2024).

Funding for the NASA's Programs Over Time
(in millions USD)



Fiscal Years 2019-2023 represent actual funding. 2024 and 2025 numbers are requested funding.
Source: Data pulled from the NASA's budget requests for Fiscal Years 2021 to 2025.

NASA's research activities harness the full AI stack, including high-performance computing, data development, and advanced algorithms, to encourage innovation across multiple initiatives and projects.[38] While artificial intelligence is naturally embedded in the agency's work, funding for many programs is either decreasing or plateauing. For example, spending on data initiatives for Earth science and heliophysics remains below 2021 levels.[39] The Fiscal Year 2025 request has nearly tripled the budget for the Open Source Science program, which provides computing system capabilities for the entire Science Mission Directorate, but actual funding remains uncertain.[40] Just as NASA played a pivotal role during the space race, its AI and AI-enabled research programs today allow the United States to remain at the cutting edge of science and technology. This work should continue to be supported to preserve America's competitive edge.

[38] Artificial Intelligence, National Aeronautics and Space Administration (last accessed 2024); FY 2025 Full Budget Estimates, National Aeronautics and Space Administration (2024).

[39] FY 2025 Full Budget Estimates, National Aeronautics and Space Administration (2024); FY 2024 Budget Estimates, National Aeronautics and Space Administration (2023); FY 2023 President's Budget Request Summary, National Aeronautics and Space Administration (2022).

[40] FY 2025 Full Budget Estimates, National Aeronautics and Space Administration (2024); FY 2024 Budget Estimates, National Aeronautics and Space Administration (2023); FY 2023 President's Budget Request Summary, National Aeronautics and Space Administration (2022).

Other Noteworthy Programs

Funding for Other Programs Across Departments & Agencies
(in millions USD)

Department/Agency	Funding Account	Program Name	2019	2020	2021	2022	2023	2024*	2025 R
DHS	Science and Technology Directorate: Research, Development and Innovation PPA: Innovative Research and Foundational Tools Thrust Area: Technology Centers	Advanced Computing Technology Centers	-	$ 9.40	$ 11.13	$ 11.13	$ 17.56	$ 17.56	$ 17.56
DHS		AI Testbeds*	-	-	-	-	-	-	-
USDA	National Institute of Food and Agriculture	Foundational and Applied Science RFA	$ 273.28	$ 279.24	$ 304.33	$ 326.58	$ 317.90	$ 332.30*	$ 339.30
USDA	AgARDA		-	-	-	$ 1.00	$ 1.00	-	-
DOT	Office of the Secretary: Research and Technology	ARPA-I	-	-	-	-	$ 3.22	$ 3.22	$ 15.00
VA	Medical and Prosthetic Research	National Artificial Intelligence Institue (NAII)	-	-	-	-	$ 10.79	$ 10.00	$ 10.00
SBA		SBIR/STTR Programs	$ 6.98	$ 6.68	$ 5.03	$ 3.87	$ 3.24	$ 4.98	$ 5.32

* Funding for AI testbeds is not explicitly reported within the budget requests. Fiscal Years 2019-2023 represent actual funding. 2024 numbers are the annualized CR funding unless otherwise noted. 2024 funding for USDA's Foundational and Applied Research RFA and the National Artificial Intelligence Institute (NAII) are estimated. "R" represents requested funding.

Source: Data pulled from the Department's budget requests for Fiscal Years 2021 to 2025 and recent announcements.

Beyond the agencies mentioned above, numerous other departments contribute significantly to R&D across the AI stack and AI-enabled fields and may also deserve more financial support. The U.S. Department of Agriculture's National Institute of Food and Agriculture, for instance, supports the development of artificial intelligence for agricultural applications, with funding for this program on an upward trajectory.[41] Additionally, the Small Business Administration operates several programs that, with increased investment, could further catalyze critical technology development nationwide.[42] These diverse initiatives, although outside the purview of the nation's leading R&D agencies, are vital components of a robust and multifaceted AI ecosystem.

- **The Department of Veteran Affairs National Artificial Intelligence Institute (NAII)** was established in 2019 and has since launched several projects designed to advance Veteran-centered medical research, like the Institute's AI Tech Sprint program that incentivizes the development of AI solutions to healthcare challenges.[43] The $10 million

[41] 2025 USDA Explanatory Notes – National Institute of Food and Agriculture, U.S. Department of Agriculture (2024).

[42] FY 2025 Congressional Budget Justification and FY 2023 Annual Performance Report, U.S. Small Business Administration at 56 to 66 (2024).

[43] National Artificial Intelligence Institute (NAII), U.S. Department of Veterans Affairs (last accessed 2024); AI Tech Sprint, U.S. Department of Veterans Affairs (last accessed 2024); U.S. Department of Veterans Affairs FY 2025 Budget Submission: Medical Programs, U.S. Department of Veterans Affairs at 603-606 (2024).

budget for research under NAII aims to create infrastructure to test promising AI technologies and utilize VA Medical Centers to move successful AI and AI-enabled innovations into real-world clinical settings.[44]

- **Advanced Computing Technology Centers**, under the Department of Homeland Security's Science and Technology Directorate, support AI and AI-related basic and applied research in areas such as modeling and simulation and emerging computing paradigms.[45] Funding for these centers has remained the same over the past three years, with no projected increase on the horizon.[46] Yet, as AI advances, the need for these Advanced Computing Technology Centers increases to horizon scanning for the next generation of AI-enabled technologies, study their impacts, and defend against potential threats.[47]

- **The Advanced Research Projects Agency for Infrastructure (ARPA-I) and the Agriculture Advanced Research and Development Authority (AGARDA)** were recently established to adapt the DARPA model to sectors that form the backbone of society, funding high-risk, high-reward research in infrastructure and agriculture.[48] ARPA-I, authorized in 2022, leverages AI to drive advances across the transportation sector. Its funding level is currently 0.68 percent of ARPA-E's current funding level, suggesting the funding amount ARPA-I may be insufficient to achieve its goals.[49] Similarly, AGARDA, authorized in 2018, remains in a pilot phase without further funding.[50] .

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[44] U.S. Department of Veterans Affairs FY 2025 Budget Submission: Medical Programs, U.S. Department of Veterans Affairs at 603-606 (2024).

[45] Technology Centers, U.S. Department of Homeland Security (last accessed 2024); Technology Centers Research Agenda, U.S. Department of Homeland Security (2023); Science and Technology Directorate Budget Overview Fiscal Year 2025 Congressional Justification, U.S. Department of Homeland Security at 184-191 (2024).

[46] Science and Technology Directorate Budget Overview Fiscal Year 2025 Congressional Justification, U.S. Department of Homeland Security (2024).

[47] Technology Centers, U.S. Department of Homeland Security (last accessed 2024); Science and Technology Directorate Budget Overview Fiscal Year 2025 Congressional Justification, U.S. Department of Homeland Security at 184-191 (2024).

[48] Janika Schmitt & Jacob Swett, The ARPA Model: A Reading List, Institute for Progress (2024); Advanced Research Projects Agency - Infrastructure (ARPA-I), U.S. Department of Transportation (last accessed 2024); AGARDA, Agriculture Advanced Research and Development Authority: A Vision for Disruptive Science to Confront Audacious Challenges, U.S. Department of Agriculture (2023).

[49] Office of the Secretary of Transportation, Budget Estimates Fiscal Year 2025, U.S. Department of Transportation (204); Department of Energy FY2025 Congressional Justification: Volume 2, U.S. Department of Energy (2024).

[50] The 2018 Farm Bill established the Agriculture Advanced Research and Development Authority (AGARDA) based on the Advanced Research Projects Agency (ARPA) model to ensure the United States maintains leadership in agriculture R&D. See AGARDA, Agriculture Advanced Research and Development Authority: A Vision for Disruptive Science to Confront Audacious Challenges, U.S. Department of Agriculture (2023); Adin Richards, The Case for AgARDA, Institute for Progress (2023).

Conclusion

We stand on the brink of a new technological frontier. Reaching this cutting-edge and the next forms of artificial intelligence has implications for national security, economic prosperity, and technological supremacy. The nation that harnesses these new capabilities first will shape the next decade and beyond. The United States now stands at a crossroads, where current American leadership in AI is a testament to an innate innovative spirit and a challenge to maintain amid global competition. Therefore, increasing federal spending for non-defense AI R&D to reach $32 billion by 2026 is not merely an ambitious goal. It is a strategic imperative. With more funding for fundamental research and critical R&D infrastructure, the United States can drive advancements across the AI stack and foster a stronger, more expansive, innovation ecosystem that yields dividends for years to come. By investing in AI today, the United States invests in its future – a future where the nation is consistently at the helm of scientific breakthroughs, defends its national security, and continues to be a beacon of technological progress.

Appendix

Table 1. Key Federal Agency 2025 Funding Requests for Non-Defense AI R&D Programs (in millions USD)

The table below provides an SCSP staff analysis of the 2025 budget requests from key federal agencies to identify non-defense AI R&D program funding proposals.

Department/ Agency	Funding Account	Program Name	2025 Requested Funding
DOE	Cross-Cutting Activities	AI	$ 455.10
DOE	Cross-Cutting Activities	Microelectronics	$ 276.15
DOE	Office of Science	Advanced Scientific Computing Research Program (ASCR)	$ 1,152.68
DOE	Stockpile Research, Technology, and Engineering (SRT&E)	Advanced Simulation and Computing Program (ASC)	$ 879.50
DOE	Cross-Cutting Activities	Frontiers in Artificial Intelligence for Security, Science, and Technology (FASST) Program	-
DOE	Office of Science	Microelectronics Science Research Centers (MSRCs)	-
DOE	ARPA-E		$ 450.00
DOE		AI Testbeds	-
NSF	Cross-Cutting Activities	AI	$ 729.16
NSF	Cross-Cutting Activities	Microelectronics	$ 174.97
NSF	Research & Related Activities	National AI Research Resource (NAIRR)	$ 30.00
NSF	Cross-Cutting Activities	AI Research Institutes	$ 61.86
NSF	Research & Related Activities	Directorate for Technology, Innovation and Partnerships (TIP)	$ 900.00
NSF	Research & Related Activities	Directorate for Computer and Information Science and Engineering (CISE)	$ 1,067.58
NSF	Research & Related Activities	CISE Graduate Fellowships (CSGrad4US)	$ 10.50
NSF		AI Testbeds	-
DOC	NIST: Scientific and Technical Research and	Laboratory Programs	$ 787.25

	Services		
DOC	NIST: Scientific and Technical Research and Services	Activities for Advancing AI Research, Standards, and Testing to Meet National Needs	$ 82.70
DOC	NIST: Scientific and Technical Research and Services	United States AI Safety Institute (USAISI)	-
DOC		AI Testbeds	-
DOC	Economic Development Administration (EDA)	Regional Technology and Innovation Hubs Program	$ 1,541.00
DOC	NOAA: Oceanic and Atmospheric Research: Operations, Research, and Facilities	High-Performance Computing Initiatives	$ 18.38
DOC	NOAA: Oceanic and Atmospheric Research: Procurement, Acquisition, and Construction	Research and Development (R&D) High-Performance Computing (HPC)	$ 68.50
HHS	NIH Office of the Director	New Tools in Data Science and AI	$ 135.00
HHS	NIH Office of the Director	All of Us Research Program	$ 541.00
HHS	National Institute of General Medical Sciences	Biophysics, Biomedical Technology, and Computational Biosciences Program	$ 633.90
HHS	ARPA-H		$ 1,500.00
HHS	National Library of Medicine	Clinical Data Initiative	$ 30.00
NASA	Science: Earth Science Research	Computing and Management	$ 241.20
NASA	Science: Earth Science	Earth Science Data Systems	$ 263.30
NASA	Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Open Source Science	$ 49.70
NASA	Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Planetary Data Systems (PDS)	$ 28.70
NASA	Science: Planetary Science: Planetary Science Research: Other Missions and Data Analytics	Advanced Multi-Mission Operation Systems (AMMOS)	$ 38.90
NASA	Science: Heliophysics:	Research and Analysis	$ 65.00

	Heliophysics Research		
NASA	Science: Heliophysics: Heliophysics Research	Other Missions and Data Analysis	$ 87.50
NASA	Science: Heliophysics: Living with a Star: Other Missions and Data Analysis	Solar Dynamics Observatory (SDO)	$ 13.60
DHS	Science and Technology Directorate: Research, Development and Innovation PPA: Innovative Research and Foundational Tools Thrust Area: Technology Centers	Advanced Computing Technology Centers	$ 17.56
DHS		AI Testbeds	-
USDA	National Institute of Food and Agriculture	Foundational and Applied Science RFA	$ 339.30
USDA	AgARDA		-
DOT	Office of the Secretary: Research and Technology	ARPA-I	$ 15.00
Veterans Affairs	Medical and Prosthetic Research	National Artificial Intelligence Institute (NAII)	$ 10.00
SBA		SBIR/STTR	$ 5.32

Funding for AI testbeds is not explicitly mentioned in the department and agency budget requests. Requested funding for Fiscal Year 2025 pulled from department and agency budget requests.