



Artificial Intelligence

NSF's role in the future of AI

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*National Science Board – Open Plenary
February 21, 2024*

AI of Today

NSF has invested in AI research since the early 1960s, **setting the stage for today's widespread use of AI technologies**. These critical investments led to the development of basic systems that underlie all AI technology, such as:

Reinforcement learning

- A machine-learning approach used widely for applications like training **self-driving cars**.

Large language models

- Which power generative AI systems like **ChatGPT**.

AI-driven learning

- Including **virtual teachers** (both digital and robotic) that incorporate speech, gesture, gaze and facial expression.

Neural networks

- Which underlie breakthroughs in pattern recognition, **image processing/generation** and natural language processing.

Collaborative filtering

- A technique that fuels **content recommendation** on the world's largest marketplaces and content platforms, from Netflix to Amazon.



This AI Moment

The implications of scale



Challenge: Need bigger “microscopes” to study impacts of scale

Managing the sociotechnical boundary



Challenge: Different kind of scale, and multiple disciplinary views essential

Addressing Vulnerabilities & Impact of AI

NSF is supporting research that addresses risks from and impacts of AI, including:

- Content authentication
- Deep fake detection
- Bias mitigation in AI systems
- Cybersecurity
- Model validation
- Explainable decisions

Programmatic Investments:

- Safe Learning-Enabled Systems program
- Responsible Design, Development, and Deployment of Technologies program
- AI Institute for Trustworthy AI in Law & Society
- AI Institute for Societal Decision Making
- AI Institute for Research on Trustworthy AI in Weather, Climate, & Coastal Oceanography
- Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science
- Core programs in Information & Intelligent Systems



Investing in the AI of Tomorrow



Supporting the next generation of AI technology



Advancing trustworthy AI



Applying AI to solve societal challenges



Translating research breakthroughs



Supporting access to research infrastructure



Developing the AI workforce of the future



National AI Research Institutes

- NSF has funded **25 multi-organization AI Institutes**

~\$500 million investment to advance fundamental and use-inspired AI

★ LEAD ORGANIZATION

● SUBAWARD

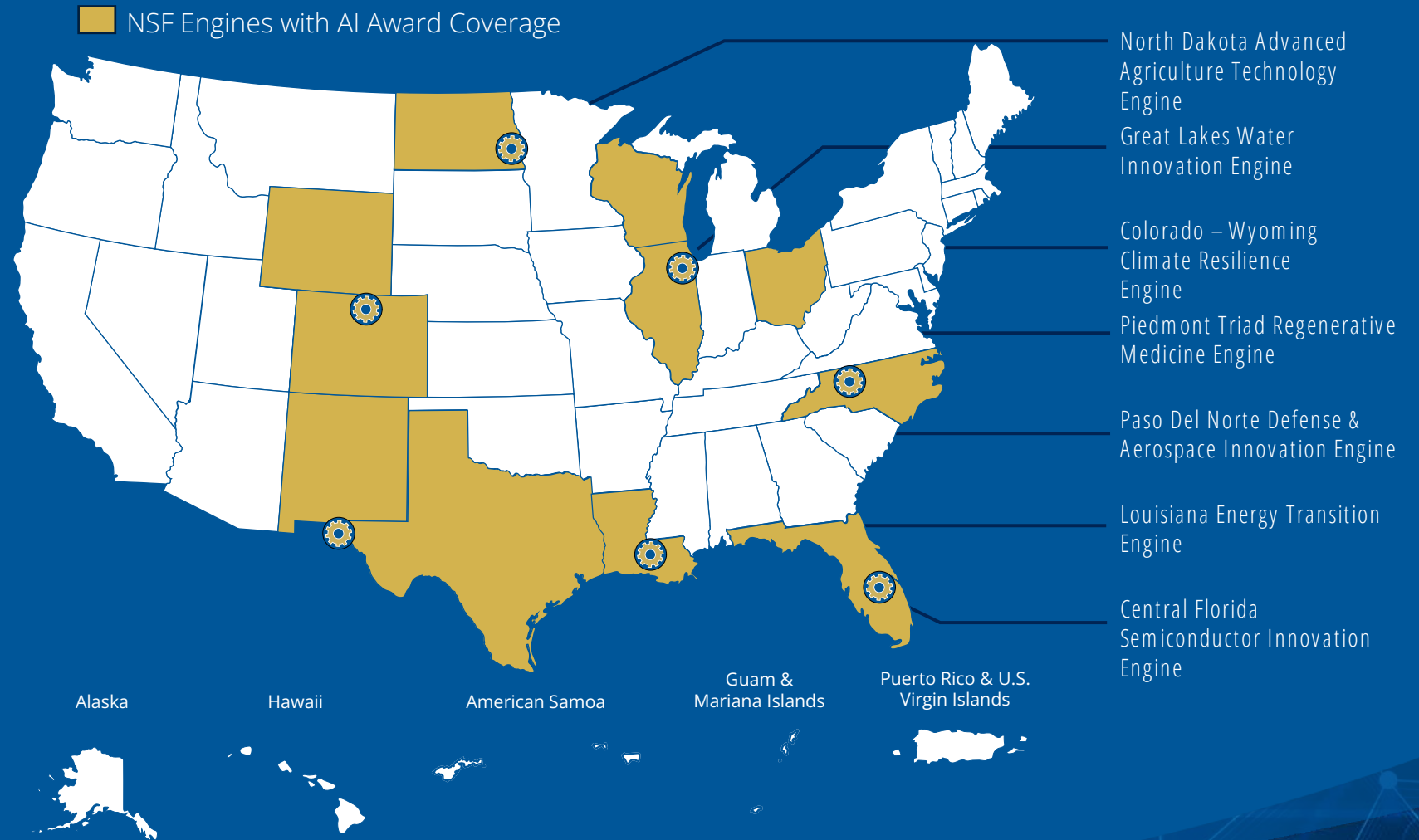
FEDERAL AGENCY AND INDUSTRY PARTNERS



NSF Regional Innovation Engines Program

The NSF Engines program **supports the application of AI** to a wide range of societal and economic challenges, such as advanced mobility solutions, climate-resilient food production, and cybersecurity.

- **7 of the 10 inaugural NSF Engines** involve focus on application of AI.
- **15 NSF Engines development awards** made in 2023 involved in AI.



AI Infrastructure Resources



NSF-led pilot of the National AI Research Resource



NSF-funded CloudBank Project



NSF Frontera supercomputer at the Texas Advanced Computing Center



NSF partnered with 5 federal agencies to develop a Prototype Open Knowledge Network

Developing the AI Workforce

Reflecting the diversity of America

- K-12 education
- Community College programs
- Undergraduate and Graduate programs
- Upskilling and Reskilling
- Experiential Learning




Implementing the Executive Order on the Safe, Secure, and Trustworthy Development and Use of AI

Principles:

- Ensure the safe and secure use of AI
- Promote responsible innovation and competition
- Support American workers
- Advance equity and civil rights
- Protect American consumers
- Preserve Americans' privacy
- Adopt AI in government to deliver better results for Americans
- Ensure that the United States leads the way

OCTOBER 30, 2023

Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence

 BRIEFING ROOM › PRESIDENTIAL ACTIONS

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Purpose. Artificial intelligence (AI) holds extraordinary potential for both promise and peril. Responsible AI use has the potential to help solve urgent challenges while making our world more prosperous, productive, innovative, and secure. At the same time, irresponsible use could exacerbate societal harms such as fraud, discrimination, bias, and disinformation; displace and disempower workers; stifle competition; and pose risks to national security. Harnessing AI for good and realizing its



Implementing the Executive Order on the Safe, Secure, and Trustworthy Development and Use of AI

NSF Tasks:

- Launch NAIRR Pilot
- Fund 1 NSF Engine focused on AI
- Establish 4 new AI Institutes
- Prioritize resources to support AI education and workforce development
- Fund privacy-enhancing technologies (PETs) research coordination network
- Prioritize support for developing PETs solutions

Supporting Tasks :

- With Commerce & DOE – develop testbeds for AI & PETs
- With DOE – enhance existing training programs for scientists
- With State, USAID, & DOE – develop a Global AI Research Agenda

Government Wide:


- Participate in White House AI Council
- Appoint a Chief AI Officer



Congressional Engagement

Interest from Congress on:

- NAIRR pilot
- AI education and workforce
- Impact of AI on science
- AI and cybersecurity
- AI and semiconductors



COMMITTEE ON
**SCIENCE, SPACE
AND TECHNOLOGY**
CHAIRMAN FRANK LUCAS

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
AND SUBCOMMITTEE ON ENERGY

HEARING CHARTER

“Federal Science Agencies and the Promise of AI in Driving Scientific Discoveries”

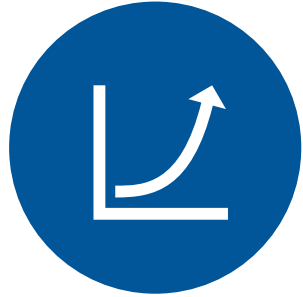
Tuesday, February 06, 2024
10:00 a.m.
2318 Rayburn House Office Building

Purpose

Hearing Purpose: The purpose of this hearing is to examine how federal science agencies can further harness artificial intelligence (AI) to drive discoveries in new scientific domains and pursue leading-edge AI research. The hearing will be an opportunity for the committee to explore the recommendations from the National AI Research Resource (NAIRR) Task Force’s report, the NAIRR Pilot Program at the National Science Foundation, and efforts within the Department of Energy’s National Labs network to drive advances in AI. The hearing will also examine the state of access to AI research resources, including advanced computational power and large data sets, for researchers and how industry can partner in this important effort. This hearing will inform current and future oversight and legislative efforts of the Science, Space, and Technology Committee



Challenges Moving Forward



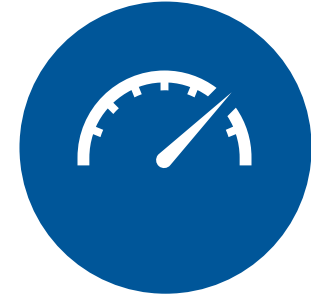
Funding levels and **proposal demands**, growth of academic interest



Depth and breadth of **education and workforce needs**



Integrating AI into areas of science and engineering



Pace of innovation

