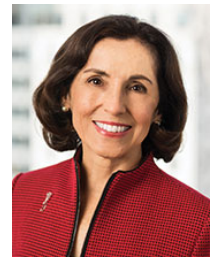


NSF and Artificial Intelligence: Research Foundations, Education and Workforce, Computing and Data, Government Leadership

NSF invests nearly \$500 million annually in fundamental research, workforce development, and advanced, scalable computing resources that collectively advance artificial intelligence (AI). NSF's ability to bring together numerous fields—including computer and information science and engineering, along with cognitive science and psychology, economics and game theory, engineering and control theory, ethics, linguistics, mathematics, philosophy—uniquely positions the agency to lead the Nation in expanding the frontiers of AI.



“NSF has a long and rich history of supporting transformative research in artificial intelligence and machine learning and is an essential contributor to growing the workforce needed to advance AI research and development... The AI innovations that NSF has funded have helped the U.S. capitalize on the full potential of this critical research area, and we are eager to (continue to) strengthen our economy, advance job growth, and better our society.” —Dr. France A. Córdova, Director, NSF, Feb. 11, 2019, Statement on the Signing of the Executive Order to Maintain American Leadership in AI



Enabling Research Advances

NSF’s investments in AI span foundational as well as translational (application-driven) research. A significant investment in AI foundations is through the Division of Information and Intelligent Systems in the Directorate for Computer and Information Sciences and Engineering (CISE), which provides **\$120 million annually** across the breadth of AI research and development (R&D), including machine learning, reasoning and problem solving, knowledge representation, planning and scheduling, natural language processing, decision making, human-machine interaction, AI and ethics, and more. Advances in AI are also core to many of **NSF’s 10 Big Ideas**, notably *Harnessing the Data Revolution* and *Future of Work at the Human-Technology Frontier*.

NSF has also launched several special-emphasis programs with partners:

- **NSF Program on Fairness in Artificial Intelligence in Collaboration with Amazon**—aims at building trustworthy AI systems that are readily accepted and deployed to tackle grand challenges facing society. Specific topics of interest include transparency, explainability, accountability, bias, mitigation strategies, validation, and inclusivity.
- **AI and Society, supported jointly with the Partnership on AI**—aims at understanding the social challenges arising from AI technology and enable scientific contributions to overcome them.
- **Real-Time Machine Learning (RTML)**—NSF and DARPA have teamed up to explore high-performance, energy-efficient hardware and machine learning architectures that can learn from a continuous stream of new data in real time.



Workforce

NSF is funding research and development that is building the necessary foundations for implementing rigorous and engaging computer science education at all levels: preK-12, colleges/universities, and continuing education programs.

- **Computer Science for All: Researcher Practitioner Partnerships (CSforAll: RPP)**—aims to provide all U.S. students the opportunity to participate in computer science (CS) and computational thinking education in their schools at the preK-12 levels.
- **Improving Undergraduate STEM Education: Computing in Undergraduate Education (IUSE: CUE)**—re-envision the role of computing in undergraduate education, where CS student populations are larger and more diverse, and seeking to pursue careers in both CS and non-CS fields that require computational competencies to be used collaboratively across different contexts.
- **Future of Work at the Human Technology Frontier**—aims to understand and develop the human-technology partnership, design new technologies to augment human performance, understand the risks/benefits and impacts of new technologies and AI on workers and work, and foster lifelong and pervasive learning.

NSF is also prioritizing AI opportunities within existing Foundation-wide fellowship and educational programs, including Graduate Research Fellowships and NSF Research Traineeships.

Data and Advanced Computing: A Driver of Modern AI

Advances in AI rely upon the availability of high-quality datasets as well as advanced, scalable computing resources. NSF supports high-performance computing (HPC) resources that advance the full range of computational- and data-intensive science and engineering research, including AI. In 2018, NSF awarded \$60 million to the University of Texas at Austin's Texas Advanced Computing Center to deploy **Frontera**, the largest and most powerful supercomputer the agency has ever supported. In addition, NSF has launched a new program, **Enabling Access to Cloud Computing Resources for CISE Research and Education (CloudAccess)**, to enable the research community to access cloud computing platforms, which provide robust, agile, reliable, and scalable infrastructure.



NSF Leadership in AI Across the U.S. Government

NSF leadership plays an important role in helping drive and coordinate AI R&D efforts across the Federal Government through the National Science and Technology Council (NSTC).

- **NSTC Select Committee on AI.** The NSF Director co-chairs this committee, which advises The White House on interagency AI R&D priorities and establishes structures to improve government planning and coordination of AI R&D including with academia and industry.
- **NSTC Machine Learning and AI Subcommittee.** The NSF Assistant Director for CISE co-chairs this subcommittee, which serves as the implementation arm for the Select Committee on AI, and also co-chairs the NSTC Networking and Information Technology Research and Development (NITRD) Subcommittee.
- **NSTC/NITRD Artificial Intelligence R&D Interagency Working Group.** The NSF/CISE Division Director for Information and Intelligent Systems (IIS) co-chairs this group, which is updating the *2016 National AI R&D Strategic Plan* and will issue a Progress Report to accompany the updated Plan.