U.S. DEPARTMENT OF ENERGY

Frontiers in Artificial Intelligence for Science, Security and Technology (FASST)

A bold Department of Energy initiative to solidify U.S. leadership in safe and trustworthy artificial intelligence systems for scientific discovery, energy research, and national security.

Artificial intelligence (AI) is transforming how we innovate, grow our economy, and protect our nation. However, certain strategic areas of the US government's artificial intelligence capabilities currently lag industry while foreign adversaries are investing in AI at scale. If U.S. government leadership is not rapidly established in this sector, the nation risks falling behind in the development of safe and trustworthy AI for national security, energy, and scientific discovery, and thereby compromising our ability to address pressing national and global challenges.

DOE's Enabling Infrastructure

DOE and its 17 national laboratories are uniquely positioned to develop AI capabilities for the nation, leveraging key enabling components:

Data: DOE is the leading generator of classified and unclassified scientific data through the world's largest collection of advanced experimental facilities, including particle accelerators, powerful light sources, specialized facilities for genomics and nanoscience, and neutron scattering sources.

Computing: For decades, DOE has built and operated the world's fastest, most powerful, and highly energy efficient supercomputers. These supercomputers are strategic components of the nation's defensive capabilities, drive innovation through open access to the scientific community, and are the basis upon which to build safe and trustworthy AI capability for the nation.

Workforce: DOE and its national labs host over 40,000 physicists, chemists, biologists, materials scientists, and computer scientists, who tackle some of the most urgent challenges in the national interest.

Partnerships: DOE has unparalleled experience in mission-driven public-private collaborations. Through the Exascale Computing Project (ECP), DOE worked with industry partners to co-design and develop critical components of the computer chips that power today's leading AI models.

The proposed Frontiers in AI for Science, Security, and Technology (FASST) initiative leverages DOE's enabling infrastructure to deliver key assets for the national interest:

Advance National Security.
The development of AI models for national security applications, such as threat detection and strategic deterrence is crucial to maintaining America's defensive posture.

Attract and build a talented workforce.
FASST is the most ambitious AI initiative of its kind. This mission will attract, train, and retain top scientific talent for a leading capability deployed in the public interest.

Harness AI for Scientific Discovery.
FASST will develop AI tools that will dramatically reduce the time to discovery and extend the nation's competitive edge in technological innovation.

Develop technical expertise necessary for AI governance. FASST will provide insight and independent expertise to quickly inform and validate standards and regulations for a responsible and safe AI industry.

Address Energy Challenges.
FASST will unlock new clean energy sources, optimize energy production, and improve grid resilience, and build tomorrow's advanced energy economy. America needs low-cost energy to support economic growth and FASST can help us meet this challenge.

FASST Overview

FASST will build the world's most powerful integrated scientific AI systems through four key interconnected pillars:

Pillar 1

AI-Ready Data. Data is the fuel that drives the engine of AI. FASST will transform DOE's vast repositories of classified and unclassified scientific data into the world's largest, high-quality repository of AI-ready datasets. These data repositories will be made available to partners across government, industry, and the scientific community to train, test, and validate the next generation of scientific AI models.

Pillar 2

Frontier-Scale AI Computing Infrastructure and Platforms. FASST will build the next generation of energy efficient AI-enabled supercomputing platforms and algorithms capable of seamlessly merging scientific computing with machine learning and digital infrastructure, including high speed data networks and storage. FASST will establish public-private partnerships that will lead to innovation, including vendor agreements to develop, leverage and advance the frontier of what is currently possible.

Pillar 3

Safe, Secure, and Trustworthy AI Models and Systems. Combining DOE's scientific and engineering data with commensurate computing power, DOE will build, train, test, and validate frontier-class AI models for science. Using the diverse datasets established under the AI-Ready Data pillar, these models will learn to speak the languages of physics, chemistry, and biology, thereby accelerating discovery across all branches of science. Developing these models will also provide insight into the properties of AI systems at scale, enabling the ability to predict and manage emergent behaviors for safety, security, trustworthiness, and privacy.

Pillar 4

AI Applications. AI models developed through FASST will revolutionize the way DOE delivers on its science, energy, and security mission. AI-accelerated scientific discoveries can lead to affordable batteries for electric vehicles, breakthroughs in fusion energy, new cancer-fighting drugs, and help assure our national security. While industry focuses on model development for commercial uses, DOE has the scientific and technological expertise to bring uniquely tailored models into strategic and critical application spaces that would otherwise be underinvested. These AI models will also be combined with autonomous labs– a combination of robotics, machine learning, and simulations - to rapidly design and conduct scientific experiments and generate valued data, creating a virtuous cycle for the development of ever more capable models.

Why FASST *now?*

The speed and scale with which AI is developing requires investment in a strategic capability now.

Without FASST, the United States stands to lose its competitive scientific edge and ability to maintain our national and economic security, will have a less diverse and competitive innovation AI ecosystem, will not have the independent technical expertise necessary to govern AI, and will lose the nation's ability to attract and train a talented workforce.

Through FASST, we will meet the mission needs of national security, energy security, and scientific discovery that will support sustained economic prosperity for the nation for decades to come.

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