Advanced Scientific Computing Research

Program Website https://science.osti.gov/ascr

The mission of the Advanced Scientific Computing Research (ASCR) program is to discover, develop, and deploy computational and networking capabilities to analyze, model, simulate, and predict complex phenomena important to the Department of Energy (DOE). A particular challenge of this program is fulfilling the science potential of emerging computing systems and other novel computing architectures, which will require numerous significant modifications to today's tools and techniques to deliver on the promise of exascale science.

Research Priority Areas:

Interagency Partnerships (includes projects with funding from other Agencies)

ASCR partners with other agencies to advance the adoption of HPC to accelerate progress toward their mission challenges. Projects sponsored by other agencies are not required to be part of an active collaboration with ASCR to apply under this Research Priority Area. However, contact information for the program sponsor is critical to gathering program priority input.

Industrial Competitiveness (includes Industry sponsored projects)

ASCR supports increased adoption of HPC to advance U.S. Industrial Competitiveness. Projects sponsored by Industry are not required to be part of an active collaboration with ASCR to apply under this Research Priority Area. However, contact information for the program sponsor is critical to gathering program priority input.

National Preparedness (includes COVID related research)

ASCR partners with other agencies and the private sector to improve our ability rapidly respond to national emergencies through HPC modeling and simulations. Projects sponsored by other agencies or the private sector are not required to be part of an active collaboration with ASCR to apply under this Research Priority Area. However, contact information for the program sponsor is critical to gathering program priority input.

Exascale Computing Projects (Includes ECI applications and current CSGF fellows)

SC and the National Nuclear Security Administration (NNSA) continue to partner in the Department's Exascale Computing Initiative (ECI) to overcome key exascale challenges in parallelism, energy efficiency, and reliability, with emphasis on the implications for both simulation and data science at this scale. The ECI focuses on delivering advanced simulation through an exascale-capable computing program, emphasizing sustained performance in science and national security mission applications and increased convergence between exascale and large-data analytic computing. This Research Priority Area also supports allocations to current fellows of the Computational Sciences Graduate Fellowship.

Applied Math

The Applied Mathematics program supports basic research leading to fundamental mathematical advances and computational breakthroughs across DOE and SC missions. Basic research in scalable algorithms and libraries, multiscale and multiphysics modeling, AI/ML, and efficient data analysis underpin all of DOE's computational and data-intensive science efforts. More broadly, this activity includes support for foundational research in problem formulation, multiscale modeling and coupling, mesh discretization, time integration, advanced solvers for large-scale linear and nonlinear systems of equations, methods that use asynchrony or randomness, uncertainty quantification, and optimization. Forward-looking efforts by this activity anticipate DOE mission needs from the closer coupling and integration of scientific data with advanced computing, scientific AI/ML, and for enabling greater capabilities for scientific discovery, design, and decision support in complex systems.

Computer Science

In order to ensure the efficiency and productivity of the supercomputing systems managed and operated by the Office of Science, the Computer Science program addresses challenges in advanced computer architectures; programming models, languages, and compilers; execution models, operating, runtime, and file systems; performance and productivity tools; and data management and data analytics, including visual analysis, and cybersecurity innovation that can enable the scientific integrity of extreme scale computation, networks, and scientific data. This research priority area also supports fundamental research for public benefit in quantum computing and networking relevant to DOE's science and energy mission.