



"Oak Ridge National Laboratory uniquely has the expertise and facilities to advance the state of the art in AI and to apply AI to DOE's most pressing scientific challenges."

David Womble,
AI Program Director

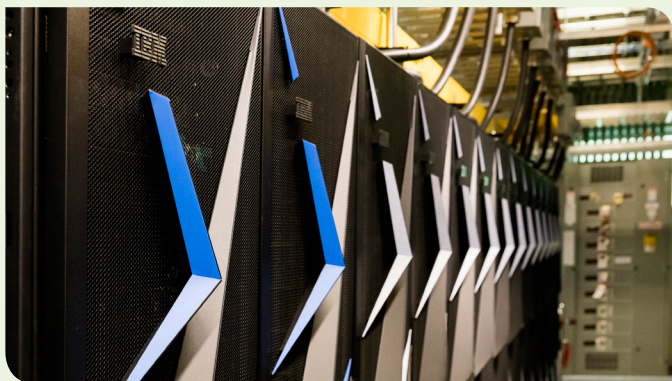


Accelerating Scientific Discovery and National Security with Artificial Intelligence

The advent of artificial intelligence (AI) is rapidly revolutionizing society and the way in which researchers tackle some of science's most complex problems. Exponential increases in data volume and computing capabilities have altered the R&D landscape for both science and industry and created a unique opportunity to expedite understanding and vastly improve our world.

Oak Ridge National Laboratory (ORNL) currently applies AI to a wide variety of science and national security applications including materials science, nuclear science, satellite imagery, cyber security, urban dynamics, and health sciences. But the Lab is now looking to harness its resources in theory, experiment, modeling and simulation, and big data to integrate AI across research domains. To this end, ORNL has made a significant internal research investment toward an AI Initiative aimed at advances across the AI and analytics spectra.

The Initiative will harness the Lab's unique suite of expertise, compute capabilities, and user facilities to accelerate scientific breakthroughs and enhance national security.



When it comes online this year, Summit will be the world's most powerful AI supercomputer.

2018

Launch year of Summit, world's most powerful AI supercomputer

10

AI-related patents

3

Key partnerships with AI industry leaders: NVIDIA, IBM, and Google

>100

ORNL staff participating in Deep Learning User Group

Expertise

ORNL is building on a foundation that has enabled two R&D 100 Awards and 10 patents for AI R&D—innovation that allows researchers to accelerate data analytics, create novel workflows, and expedite outcomes via modeling and simulation.

The Lab is a recognized leader in algorithm and application development and currently has working research groups dedicated to neuromorphic computing and machine learning—a series of strategic hires is further expanding upon this expertise. ORNL shares numerous joint faculty with the University of Tennessee, and the two institutions have recently launched the Bredesen Center Data Science and Engineering Program, designed to educate future data scientists in solving a range of problems that stand to benefit from the application of AI.

Infrastructure

The Lab's Leadership Computing Facility will launch Summit, billed to be the world's most powerful AI supercomputer, in 2018. Summit will succeed Titan, currently the nation's fastest open-science supercomputer, as ORNL's premier computational science platform. Such massive computing resources are critical to the development of AI models eventually deployed at the individual researcher and consumer levels.

ORNL also hosts an in-house AI analytics capability via its Compute and Data Environment for Science (CADES). The CADES suite features two separate NVIDIA DGX platforms (DGX DL and DGX-1), both of which are engineered to rapidly enable deep learning, a type of AI that uses neural networks to recognize features and relationships within datasets and generate outputs that otherwise may remain hidden.

Five additional NVIDIA DGX DL workstations have also been distributed across the Lab for use by researchers in numerous domains of interest to the Department of Energy.

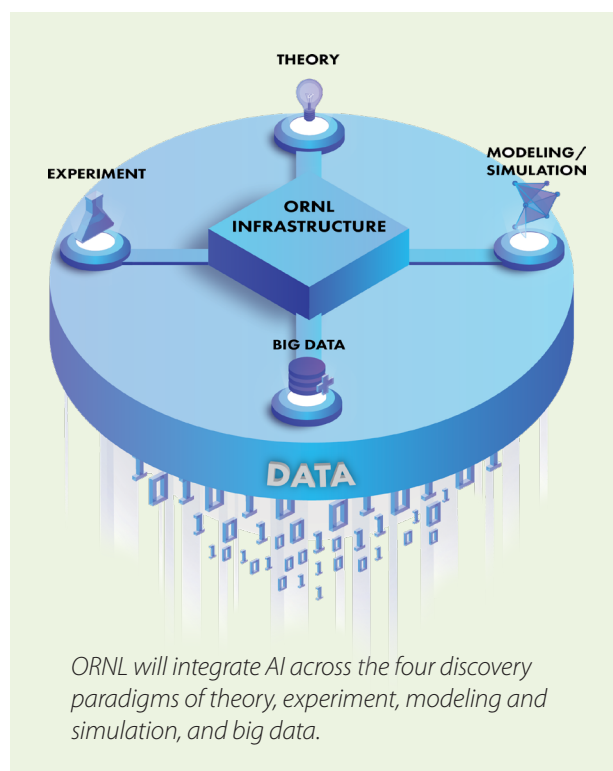
Data

ORNL hosts some of the world's most advanced scientific facilities and instruments, including the National Transportation Research Center, the Spallation Neutron Source, and the Urban Dynamics Institute. These assets generate the large and unique scientific datasets perfectly suited for AI analysis. Such datasets are critical for advancing the ability of AI to tackle grand challenge science problems and enhance national security in both the cyber and physical arenas.

Applications and Mission Need

ORNL's mission of leadership in science and national security requires advanced data analytics and the ability to translate understanding into practical applications and real-world outcomes.

The Lab's expertise in algorithm development and its rich history of algorithm deployment in scientific applications, along with its unique data and computing infrastructure, make ORNL the ideal setting in which to realize the potential of AI in missions of national and international importance.



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