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A Message From Leadership

Welcome to the latest edition of the Department of Energy's (DOE's) AI newsletter. Since the Manhattan Project, the National Nuclear Security Administration (NNSA) and its predecessor agencies have been the world leaders in High Performance Computing. So it's as no surprise that NNSA is also playing an essential role in the Department of Energy's exascale and artificial intelligence (AI) initiatives.



The combination of AI with high performance computing will enable innovative solutions to some of the most pressing challenges of nuclear security.

NNSA's first exascale supercomputer, "El Capitan," is expected to be in service at Lawrence Livermore National Laboratory (LLNL) in 2023. El Capitan will have a sustained performance of more than 1.5 quintillion calculations per second, revolutionary power enabling it to make significant contributions to the NNSA's mission of ensuring the safety, security, and effectiveness of the U.S. nuclear weapons stockpile.

How, specifically, will an exascale computer help us maintain the U.S. nuclear deterrent?

Simulating a nuclear explosion requires more physics calculations than those required to understand a supernova, and as our stockpile ages and weapon designers with nuclear test experience retire from the workforce, stockpile stewards increasingly rely on digital technologies to confirm their confidence in the safety and effectiveness of our deterrent. High performance computing is therefore essential for NNSA's next-generation capabilities supporting weapons

design and stockpile stewardship without a return to nuclear testing.

AI promises to increase the capabilities of NNSA's high performance computing capabilities in a variety of ways, including developing new models of material behavior, making conventional computers more efficient at standard calculations and optimizing manufacturing processes.

While the United States is facing the most complex and demanding global security environment since the end of the Cold War, DOE and NNSA are continuing to lead the way in applying advanced computing technologies to safeguard our national security.

Lisa Gordon-Hagerty

AI@DOE News



US-UAE Joint Statement on Artificial Intelligence Cooperation

The United States of America and the United Arab Emirates reaffirm their shared commitment to a strong bilateral relationship within the framework of the U.S.-UAE Strategic Energy Dialogue first established in 2010 and reiterated in 2017. U.S. Secretary of Energy Rick Perry and UAE Minister of State for Artificial Intelligence Omar bin Sultan Al-Olama met to exchange views on the responsible use of Artificial Intelligence in improving grid resilience, increasing energy exploration and environmental sustainability, optimizing transportation and enabling smarter cities, improving water resource management, and in the discovery of new materials and compounds.

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AI in the News



The NNSA's deputy for defense programs discusses that important topic with Aaron Mehta.

What Role Does AI Have in the American Nuclear Arsenal?

NNSA's Deputy for Defense Programs Dr. Charles Verdon discusses how AI and supercomputing is helping to manage our nuclear weapons stockpile.

[Watch Here](#)

AI Fighting Cancer!

Computational scientists, biophysicists and statisticians from Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL) are leading a massive multi-institutional collaboration that has developed a machine learning-based simulation for next-generation supercomputers capable of modeling protein interactions and mutations that play a role in many forms of cancers.

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Brookhaven National Lab Hosts Third GPU Hackathon

Last month, the Computational Science Initiative (CSI) at Brookhaven National Lab hosted the third GPU Hackathon. Participants from around the country and the world spent five days with graphics processing unit (GPU) programming experts to accelerate scientific applications spanning the fields of high-energy physics, astrophysics, chemistry, biology, machine learning, and geoscience.

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Sharing the Load Speeds Machine Learning from Pacific Northwest National Lab

In today's digital age, the rabbit hole of connected information can be not only a time sink, but downright overwhelming. Computers struggle to efficiently process and analyze the patterns hidden behind the bulk. When speed is of the essence, this deficiency becomes a frustrating bottleneck. A team of researchers led by PNNL thinks they may have a solution. The team's idea builds on an emerging machine learning approach called graph convolutional networks, or GCN, that infer patterns from graph data.

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PNNL and LAS Collaborate on Machine Learning

Twenty-four analysts from several U.S. intelligence organizations met in August for a machine learning activity with Pacific Northwest National Laboratory (PNNL) researchers. The immersive five-day focused-discovery activity represented the culmination of months of close coordination and collaboration between PNNL and the Laboratory for Analytic Sciences (LAS.) It also created an opportunity for analysts to interact with emerging machine learning technology and to provide real-life feedback that will strengthen future research and applications.

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AI Predicting Earthquake Damage

Researchers at Berkeley National Lab are using high-performance computing systems to better predict how structures will respond to an earthquake along one of the Bay Area's most dangerous faults. In this Q&A, Berkeley Lab

scientist David McCallen discusses how exascale computing could dramatically accelerate research and earthquake safety.

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Careers in AI



Alnur's Story

Alnur Ali didn't have a clue that the computer his finance-focused dad set up in the attic when Alnur was in elementary school would shape the course of his life. After he got glued to playing games on the computer after school, he began to think about making his own games and quickly progressed to learning coding and how to make websites. Alnur went on to land a job at Microsoft where he discovered his passion for machine learning. He later was accepted into DOE's Computational Science Graduate Fellowship and hopes to work on more problems that use machine learning for social good in his future.

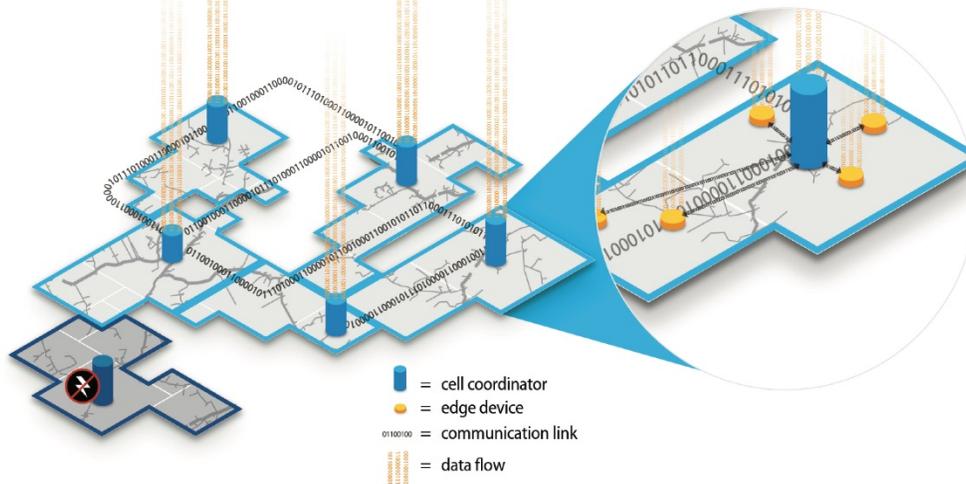
[Read Alnur's Story Here](#)

Inter-Cell Communication

- Distributed computation
- Real-time analytics
- Scalable

Intra-Cell Communication

- Edge computation
- Privacy of information
- Knowledge generation close to data source



DOE-FUELED AI...

enables smart infrastructure

National lab researchers are developing Autonomous Energy Systems (AES) using machine learning and artificial intelligence methods to better coordinate distributed energy resources in energy infrastructure. These smart networks will optimize power distribution and align it with energy generation and demand making more efficient use of limited resources.



AI at ENERGY.GOV/AI



IMAGE OF THE WEEK:

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