

# INTRODUCING THE WORLD'S MOST POWERFUL SUPERCOMPUTER

## A NEW AGE OF SCIENTIFIC DISCOVERY

Summit is Oak Ridge National Laboratory's (ORNL) newest leadership-class system and the world's smartest and most powerful supercomputer. With more than 27,000 NVIDIA Volta™ Tensor Core GPUs paired with 9,000 IBM Power9 CPUs, Summit is the world's largest GPU-accelerated system, purpose-built for AI and high performance computing (HPC) and designed to advance scientific discovery.

### NVIDIA Volta-accelerated improvements over ORNL's previous system:

**8X**  
higher performance

**5X**  
higher energy efficiency

**4X**  
fewer nodes

### AI + HPC SUPERCHARGING EARLY SCIENCE PROJECTS

Summit combines HPC and AI techniques to automate, accelerate, and drive advancements in health, energy, and engineering. In fact, new breakthroughs are already underway in the Summit Early Science projects.

#### Understanding the Human Condition

Using deep learning and Summit's advanced supercomputing, researchers are mapping patterns in human proteins and cellular systems, seeking to understand the genetic factors that contribute to diseases such as Alzheimer's and conditions such as opioid addiction.



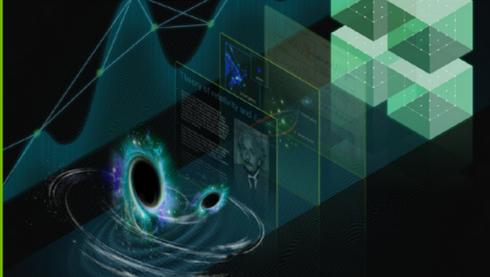
#### Combating Cancer

Using scalable deep neural networks, scientists are making strides in the fight against cancer. By pairing unstructured data with deep learning on Summit, researchers can uncover hidden relationships between genes, biological markers, and the environment.



#### Investigating Astrophysics Data

Exploding stars reveal clues about how heavy elements seeded the universe. With AI supercomputing on Summit, physicists can simulate these phenomena at unprecedented scale, thousands of times longer and tracking 12X more elements than previously possible.



#### Harnessing Fusion Energy

Fusion energy—the source of the sun's energy and a potential source of clean electricity—requires reliable reactors. With deep learning on Summit, scientists at the world's largest experimental fusion reactor can explore performance criteria and optimize operations before it comes online in 2025.



### FUN FACTS

Summit can perform 200 quadrillion floating-point operations per second (FLOPS). If every person on Earth completed 1 calculation per second, it would take 1 year to do what Summit can do in 1 second.



**1 second**

Summit is connected by 185 miles of fiber optic cables, or the distance from Knoxville to Nashville, Tennessee.



**185 mi**



**250 PB**

Summit's file system can store 250 petabytes of data, or the equivalent of 74 years of high-definition video.

At over 340 tons, Summit's cabinets, file system, and overhead infrastructure weigh more than a large commercial aircraft.



**340 tons**



**5,600 ft²**

Occupying 5,600 square feet of floor space, Summit is the size of two tennis courts.

### PERFORMANCE SPECIFICATIONS

**APPLICATION PERFORMANCE** 200 petaFLOPS (Double Precision), 3.3 exaOPS (Tensor operations)

**PROCESSORS (per node: total system)** 6 NVIDIA Volta: 27,648 GPUs  
2 IBM POWER9: 9,216 CPUs

**NUMBERS OF NODES** 4,608

**POWER CONSUMPTION** 13 megawatts

**NODE PERFORMANCE** 49 teraFLOPS

**NODE INTERCONNECT** 300 GBps NVIDIA NVLink

**TOTAL SYSTEM MEMORY** >10 PB DDR4 + HBM2 + Non-volatile

**OPERATING SYSTEM** Red Hat Enterprise Linux (RHEL) version 7.4

### MADE POSSIBLE BY NVIDIA GPU ACCELERATION

NVIDIA Volta is the revolutionary GPU architecture bringing today's moonshots within reach. Each Volta GPU is equipped with over 21 billion transistors, 640 Tensor Cores, and 125 teraFLOPS of deep learning performance. And there are over 27,000 of them powering Summit today. Imagine what's possible.

Discover new capabilities with GPU-accelerated AI and HPC.

[www.nvidia.com/hpc](http://www.nvidia.com/hpc)