OAK RIDGE National Laboratory



GEOSPATIAL SCIENCE AND ENGINEERING DIVISION

Delivering global insights for national security solutions

Federal agencies need better ways to understand connected infrastructure, anticipate population change, and respond quickly to disasters. Oak Ridge National Laboratory advances human security by helping mission partners and communities anticipate, analyze, mitigate, and respond to complex risks around the world.

Together, our scientific capabilities transform how we observe, analyze, and understand the landscape and humans that occupy it, with timely insight for decision makers.

CORE RESEARCH CAPABILITIES

Our scientists and engineers deliver data, systems, and analysis that reveal the full picture of human activity, natural and built environments, and the interactions among them — from local to global scales.

Population Dynamics: Delivering global-scale understanding of human populations and their environments to support precision military operations, disaster response, and community resilience.

Geospatial Artificial Intelligence: Developing AI foundation models that enable global mapping and characterization of geographic features, places, and activities.

Critical Infrastructure Modeling: Creating novel datasets and analytic methods to protect U.S. critical infrastructure and the communities that depend on it.

Resilient Autonomous Intelligent Systems: Designing next-generation collaborative autonomous sensing architectures for ISR, counter-UxS, and attritable operations.

Imagery Science: Exploiting and integrating satellite imagery to improve global positioning, targeting, mensuration, and 3D modeling.

High-Performance and Edge Computing: Designing custom environments for workflows ranging from autonomous edge operations and geospatial digital twins to multi-billion-parameter, multimodal AI models.

MISSION SOLUTIONS

We build agile, mission-focused solutions and transition them to partners.

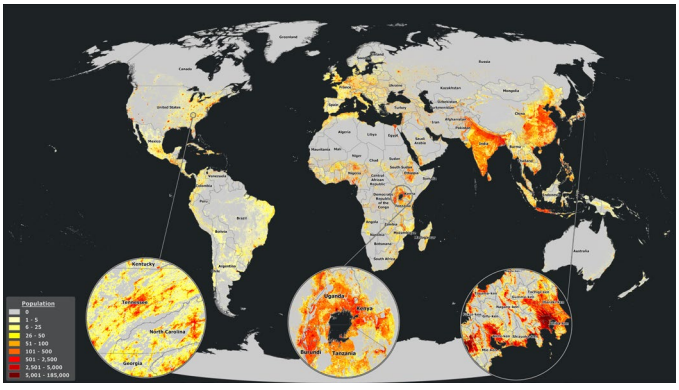
Global Population Data: For more than 25 years, ORNL has delivered the highly accurate, high-resolution LandScan population distribution datasets to support military planning, emergency response, and disaster recovery around the globe. With advances in high-performance computing, AI, and digital twin workflows, researchers are now providing near-real-time population estimates for disasters and conflicts, as well as population forecasts.

Autonomous Platforms: We construct and deploy ground, air, and submersible autonomous systems, along with enabling technology platforms. From custom communications packages for beyond-line-of-sight operations to lightweight software that automates edge data management, ORNL is expanding mission functionality in austere environments.

Geospatial Digital Twins: We develop geospatial digital twin pipelines that use cutting-edge HPC technologies to create dynamic, data-driven virtual representations of the physical world. These platforms help organizations move from traditional product-centric GIS workflows to data-centric enterprises. These platforms enable rapid what-if analysis and informed decision-making for missions such as targeting, collateral damage estimation, disaster response, and critical infrastructure risk.

Real-Time Power Outage Monitoring: The Environment for Analysis of Geo-Located Energy Information, or EAGLE-I, is an essential Department of Energy platform for national disaster recovery, providing accurate, real-time utility outage data. EAGLE-I collects outage data every 15 minutes from utility providers, and provides the ability to monitor and anticipate outage impacts, cascading effects, and community resilience.

Resilience Modeling for Data Center Growth: Modeling Energy Growth Associated with Data Centers, or MEGA-DC, applies geospatial modeling, digital twins, load forecasting, and infrastructure analytics to help states, utilities, and industry understand the energy, siting, affordability, and resilience implications of rapid data center growth. We support scenario-based decision-making so stakeholders can plan for data centers as secure, efficient, and grid-supportive national assets.



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