OAK RIDGE National Laboratory



GEOSPATIAL ARTIFICIAL INTELLIGENCE

Executing rigorous science and automation for real-world impact

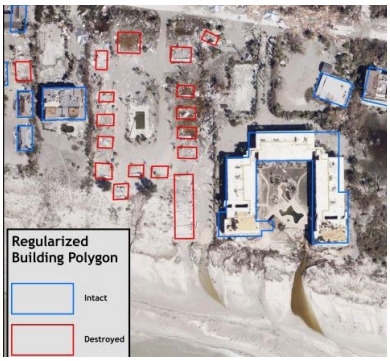
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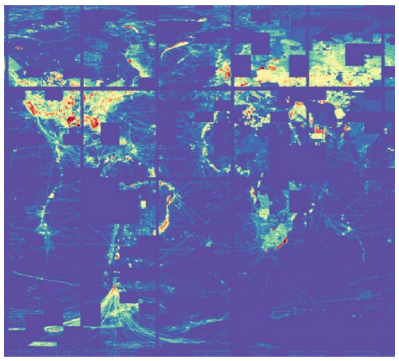
Exploring complex geospatial analytic workflows to deliver actionable insights for real-world human and global security applications

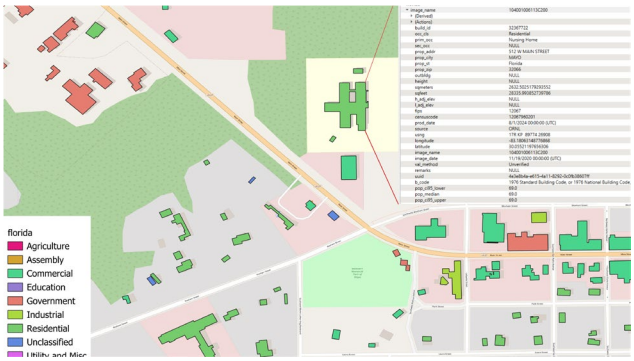
Complex global challenges can call for advanced, calculated solutions. ORNL's Geospatial Artificial Intelligence capability draws from applied mathematics, machine learning, statistics and engineering to create novel geospatial analytic methods for information that improves our understanding of global environments.

IMPACT

- Improving urban planning, emergency management, disaster response, and military precision
- Support for navigation systems, early detection of potential earthquakes, and measurement of changes in water patterns
- Developing scalable ways to characterize socioeconomic neighborhoods for economic stimulus, unstructured settlement mapping, and population distribution studies







ORNL KEY DIFFERENTIATORS

Rigorous statistical science and modeling powered by world-class leadership in AI and machine learning

- **Automated feature extraction** technology employs machine learning, computer vision, and high-performance computing to automate the creation of foundational data layers for building footprints, road networks, and solar panels at scale
- Bayesian learning approaches help **estimate building occupancy** at varying times of day and night across a variety of sociocultural environments
- Our teams adapt AI techniques to produce **high-resolution gravity maps** on a global scale
- ORNL multimodal deep neural network learning methods underlie built infrastructure datasets used during natural hazards and combat damage assessment efforts

Multidisciplinary teams answering geospatial intelligence questions faster and more completely than ever before

- The **Spatial Statistics Group** includes research skillsets in Bayesian modeling and inference, machine learning, artificial intelligence, and applied statistical research. These skills allow our team to excel in probabilistic programming, data fusion and multiscale modeling, functional data analysis, AI/ML workflow automation, scientific software development and reproducibility.
- The **GeoAI Group** contains expertise in electrical engineering, applied mathematics, computer engineering, statistics, computer science, and data science. These backgrounds help with machine learning for high-performance computing, multimodal learning, and vision-language foundation models.

Access to unparalleled national laboratory resources

- High performance computing
- Autonomous systems and artificial intelligence
- Leading multidisciplinary teams across a wide variety of science fields, including national security, cyber resilience, and nuclear nonproliferation

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