NATIONAL SECURITY SCIENCES

Geospatial Artificial Intelligence

Executing rigorous science and automation for real-world impact

INTRODUCTION

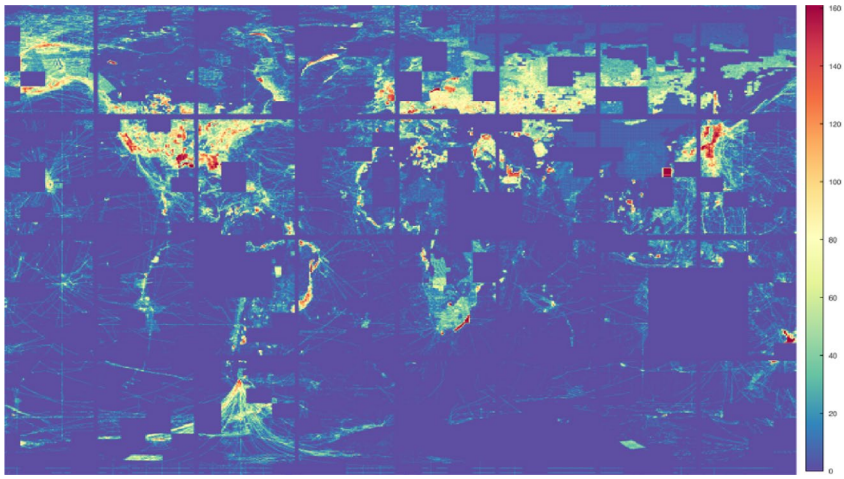
Complex global challenges can call for advanced, calculated solutions. ORNL's Geospatial Artificial Intelligence capability draws from applied mathematics, machine learning, statistics and engineering to create novel geospatial analytic methods for information that improves our understanding of global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

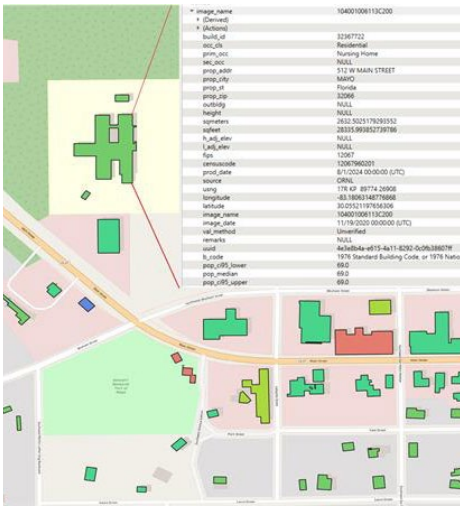
MISSION

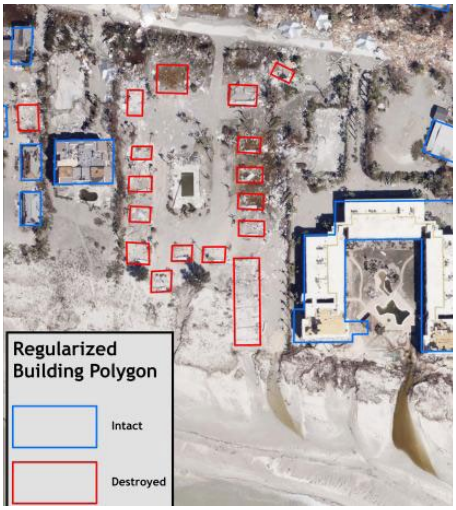
Exploring complex geospatial analytic workflows to deliver actionable insights for real-world human and global security applications.

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 deep-learning methods underlie a critical geographic dataset used during hurricane response 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** is a team of dedicated, mission-driven researchers with expertise in electrical engineering, applied mathematics, computer engineering, statistics, computer science, and data science. These backgrounds help with machine learning for high-performance computing, geoassurance, probabilistic reasoning, and spatio-temporal analytics.

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.

CONTACT

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