NATIONAL SECURITY SCIENCES

Critical Infrastructure Modeling

Modeling risk and resilience of people and places over time

INTRODUCTION

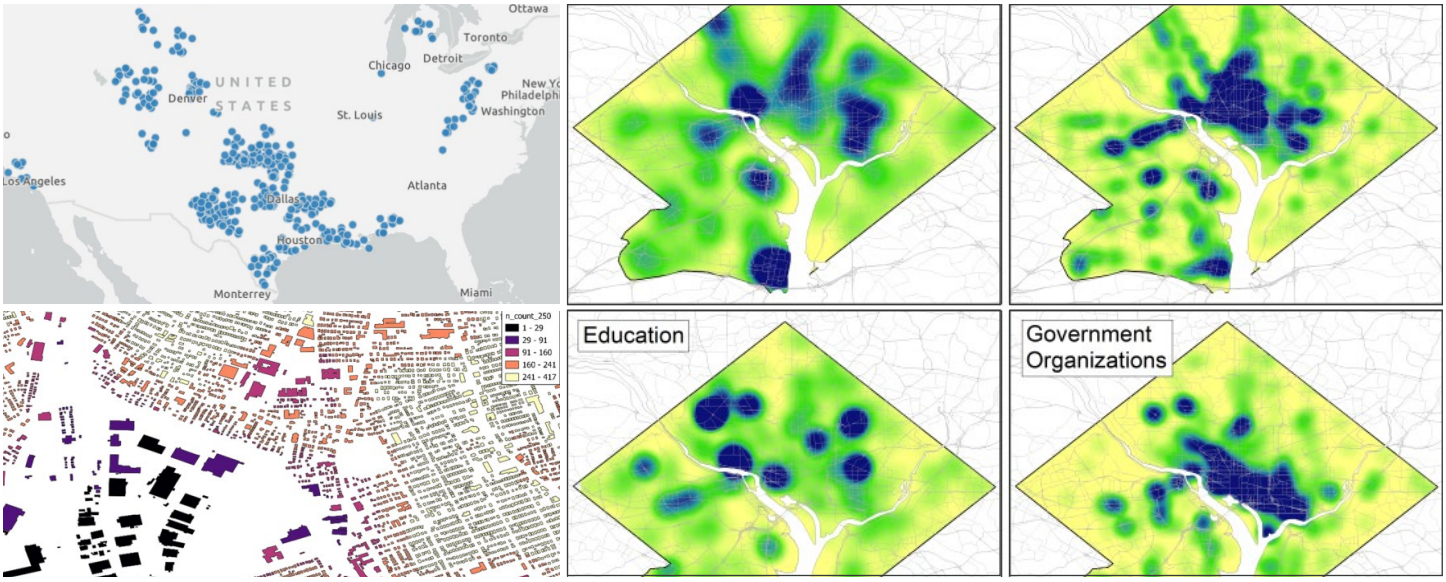
Given the dynamic nature of human and natural systems, understanding the cause and effect of changes to and in the built environment is critical to affecting decisions in national security. Innovative modeling techniques can create datasets that intersect disparate information to allow decision-makers detailed views of people, places, events and environments to protect infrastructure and citizens.

MISSION

Critical infrastructure modeling teams use geospatial science innovations to forecast and enhance situational awareness about the risk of natural, built, and social systems to extreme events. This work directly impacts decision-making for disaster response, counterterrorism, and global security planning, creating a mission-driven environment where technical expertise meets real-world impact.

IMPACT

- These capabilities support national and international security efforts in disaster response, counterterrorism operations for radiological material, and infrastructure resilience planning.
- By harnessing spatially explicit points of interest and buildings, road networks, and neighborhood information, the critical infrastructure modeling teams deliver fine-resolution insights into how urban areas function across space and time.
- ORNL's Outage Data Initiative Nationwide standardizes utility outage data reporting, with over 60 utilities reporting data into a collated map where power can see both their own outages and those at neighboring utilities to help deploy backup crews.



ORNL KEY DIFFERENTIATORS

Cross-referencing capabilities data processing techniques and access to world-class technology

- ORNL critical infrastructure modeling teams help develop databases and digital platforms to curate and analyze geospatial data on U.S. critical infrastructure for sponsors such as NGA, DHS, DoE and NASA.
- Data pipelines and conflation techniques create datasets from multiple sources, such as points of interest, building attributes, land use, and human mobility patterns.
- Dynamic analysis capabilities applying data science and geocomputational methods to develop solutions for national security.

Multidisciplinary teams answering questions about the Earth's surface faster and more completely than ever before

- The **Critical Infrastructure Resilience Group** has multi-disciplinary expertise ranging from risk Geographic Information Science, spatiotemporal analytics, multi-scale modeling, econometrics modeling, logistics and network flow optimization, and geo-visualization.
- The **Geospatial Data Modeling Group** skillsets span geospatial science, environmental informatics, remote sensing and data science. Additionally, researchers are proficient in geospatial and remote sensing techniques, application of machine learning on large spatial datasets, image classification, data engineering, data conflation, and geospatial intelligence.

Access to unparalleled national laboratory resources

- High performance computing
- Autonomous systems, artificial intelligence, and open-source as well as US government datasets
- Connections to multidisciplinary teams across a wide variety of science fields, including national security, cyber resilience, and nuclear nonproliferation.

CONTACT

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