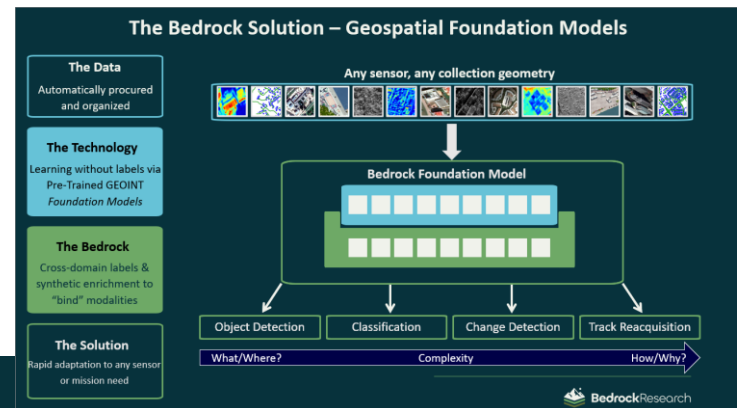
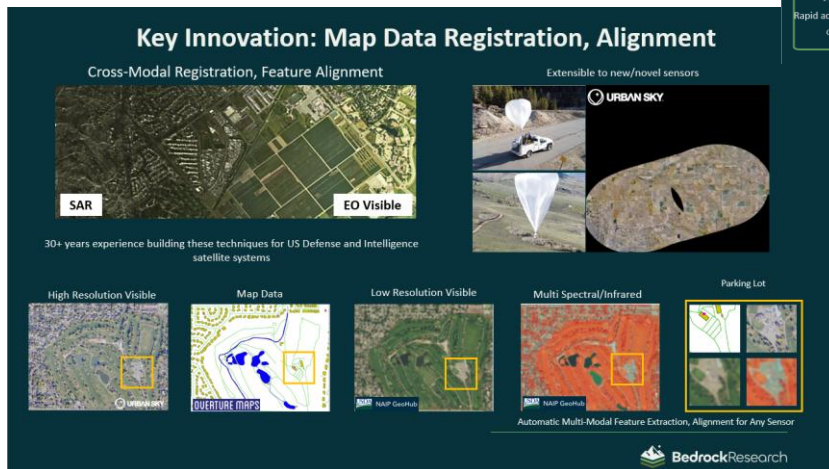


# Cross-Modal Foundation Models for Real-Time Decisions

Bedrock Research, in collaboration with AgileView, Inc. and the Multimodal Vision Research Lab at Washington University, is advancing AI-driven remote sensing technologies designed to accelerate specialized model training and deployment for challenging remote sensing applications.



## Applications

- **Disaster Management:** Enables rapid responses to natural disasters and emergencies.
- **Sensor-Agnostic Change Detection:** Recognizes changed targets, regions, and object features regardless of input modality.
- **Defense Operations:** Supports military decision-making with timely, accurate insights.

## Leveraging Cutting-Edge AI

Advanced AI and research to enhance model capabilities and improve decision-making accuracy.

## Integrating Multiple Data Sources

Models combine sensor data from diverse image modalities and spectral bands to provide comprehensive, real-time insights.

### Team:

**Bedrock Research, Inc.** (Dr. Matt Reisman, Kevin LaTourette); **AgileView, Inc.** (Avi Lindenbaum, Peter Shagnea); **Multimodal Vision Research Lab,** Washington University (Prof. Nathan Jacobs — TGI researcher)

## Key Features

- **Comprehensive Environmental Insights:** Combines diverse data types for a complete and accurate understanding of complex situations.
- **Synthetic Data Generation:** Enhances model training and enabling faster adaptation to rare or novel targets.
- **Cost & Time Efficiency:** Will lower the cost and development time for creating specialized computer vision models, serving both defense and commercial sectors.

## Generative AI for Geospatial Challenge

Bedrock's effort aimed to build a remote sensing foundation model with an aligned feature space between real and synthetic data. Foundation models are pretrained neural networks that ingest substantial volumes of data without requiring any manual annotation. As such, they can utilize massive amounts of data to yield an encoder with a rich feature space. Innovative techniques from the MVRL are extended to remote sensing to ensure a singular encoder with a shared feature space across disparate input data modalities.

Downstream task-specific fine-tuning for applications such as object segmentation and change detection can then be trained with far smaller volumes of labeled data required than traditional techniques and extended to novel situations and use cases. By incorporating AgileView's synthetic data, Bedrock Research presents a comprehensive diversity of features in the foundation model pretraining, spanning highly varied illumination, perspective, geography, and context, ensuring the generalizability for downstream applications.

### Challenges/Lessons Learned

The key challenge of this project was the sheer volume of datasets across disparate modalities and sensor types necessary for foundation model pretraining and alignment. Big research groups and firms invest billions of dollars in perfecting foundation models for other applications; naturally, smaller teams like Bedrock cannot, and, did not expect to disrupt the field of geospatial foundation models with a much smaller time frame and volume of resources available, but instead extend existing capabilities towards novel remote sensing applications. Therefore, the key lesson from this Challenge was to utilize open-source models, architectures, datasets, and training regimes to adapt for specific use cases and areas.

### Next Steps

The next steps of this work remain the same as the initial goals of this Challenge: continued exploration of the foundation model approach to latent space alignment between real and synthetic data for rapid adaptation to novel use cases and applications. Having now identified some of the more pressing customer use cases for future business opportunities, the team will focus more on applications. Specifically, focusing on change detection capabilities as well as rare target tracking and reacquisition across multiple sensor types and modalities.

### Customer Opportunities

The Bedrock team promoted the technology at the USGIF GEOINT conference in St. Louis, MO in May 2025. As a direct result of that demo, many customer engagements occurred and have led to several follow ups scheduled. These span both US government labs/groups spanning the IC and DoD, as well as foreign governments that expressed interest and many collaborative partners identified across data providers.

