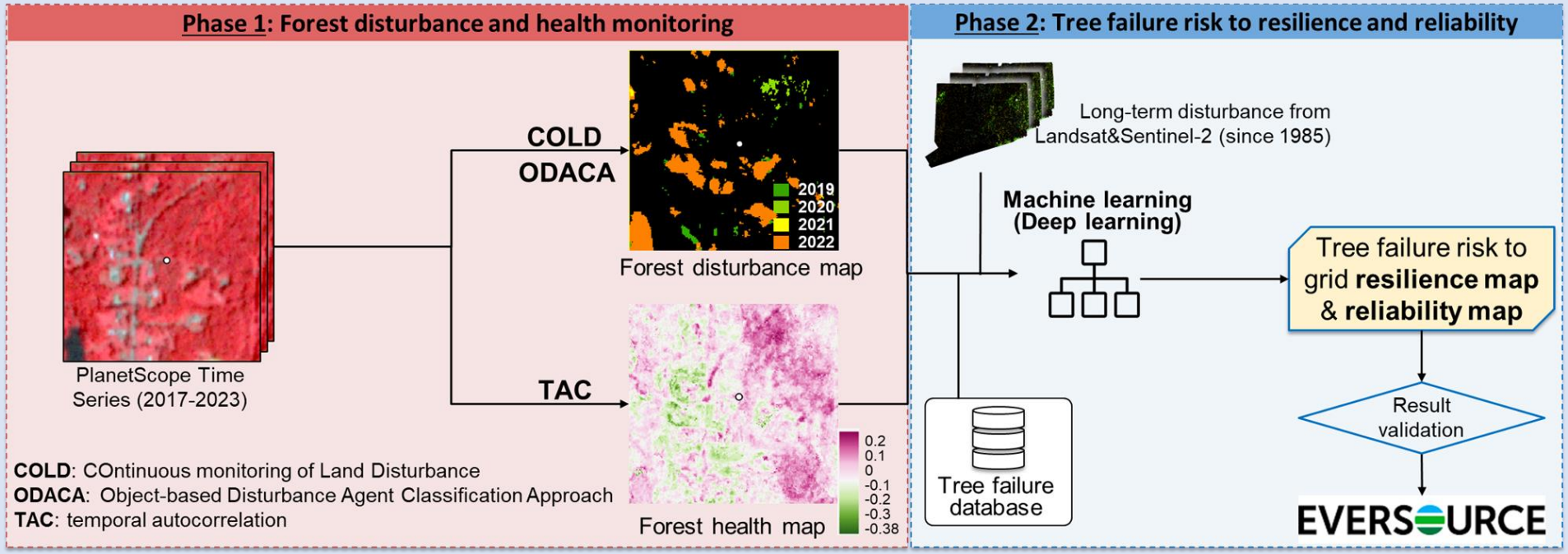
Estimating Roadside Tree Risk To Grid Resilience and Reliability Using PlanetScope Time Series



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Industry Relevance & Need

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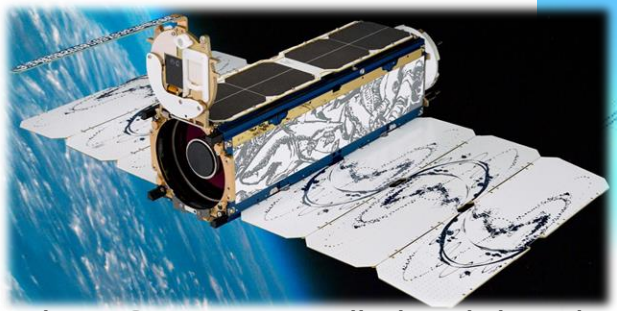
- Mitigating **vegetation risk to infrastructure** is a major challenge in highly forested areas.
  - **43%** of CT tree-caused outages in **windy conditions**. → resilience
  - **39%** of incidents observed in **normal weather conditions**. → reliability

A fallen roadside tree in New Canaan in the aftermath of Tropical Storm Isaias (*Hearst Connecticut Media*).

- Two important factors influencing the risk are the **disturbance and health** the roadside and right-of-way (ROW) forests.

- **3 m PlanetScope time series** can provide regularly-update site-level vegetation risk information.
  - Help identify hazardous trees to **prevent tree fall events**.
  - Improve the predictive capability of **grid reliability and resilience**, such as the UConn Storm Outage Prediction Model (OPM).



PlanetScope constellation *(Planet).*

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Project Goals and Objectives

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The goal of this proposed project is to provide a **forest disturbance** and **health monitoring** framework for roadside **utility risk assessments**.

Objectives:

1. Monitor **forest disturbances** of the study site with 3-m PlanetScope time series and the COntinuous Land disturbance Detection (COLD) algorithm.
2. Monitor **forest health changes** with 3-m PlanetScope time series and the temporal autocorrelation (TAC).
3. Quantify **tree failure risks to grid resilience and reliability** using machine learning (deep learning).

Research Approach

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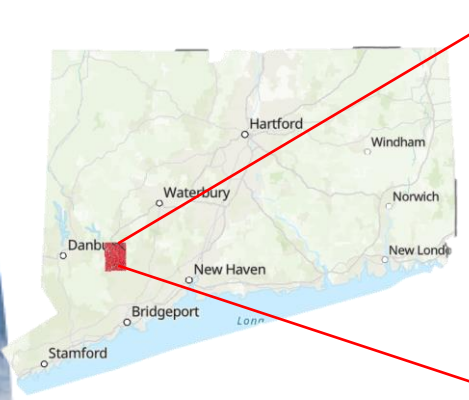
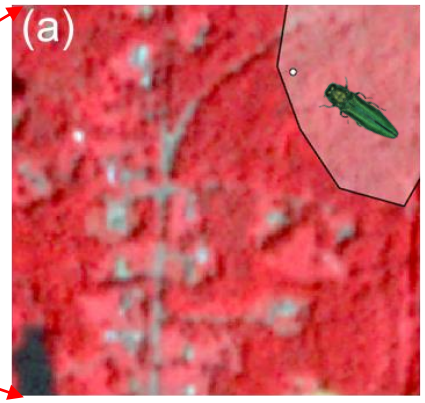
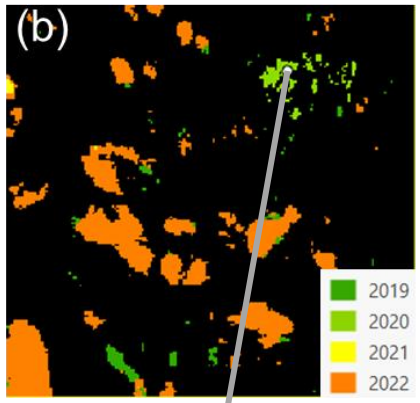
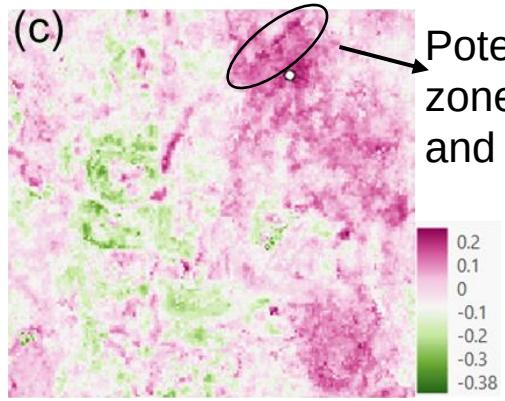


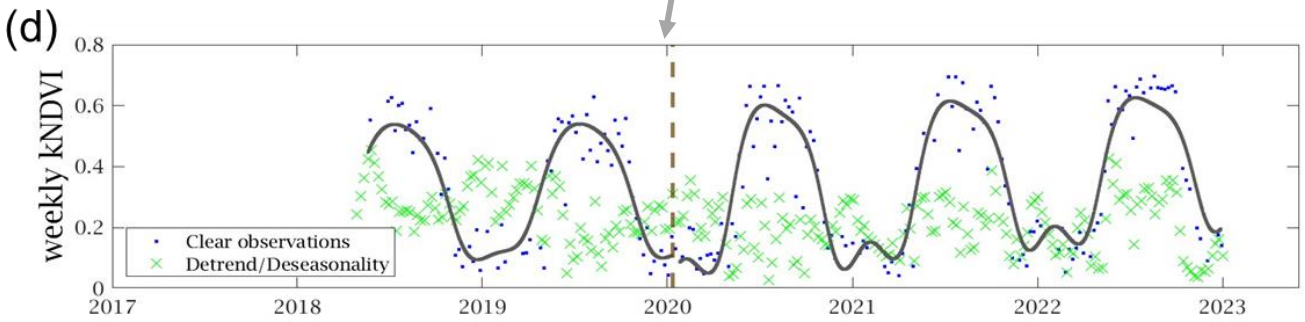




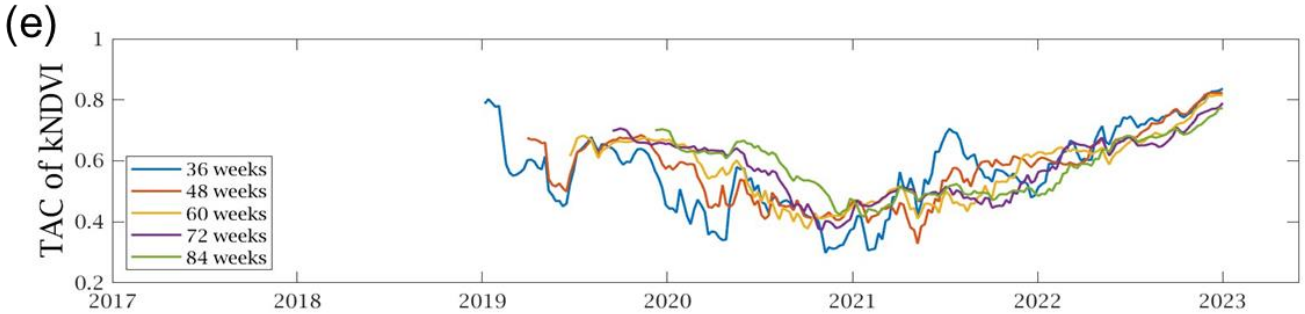


Potential high-risk zone of tree failure and outages

COntinuous monitoring of Land Disturbance (COLD)



Lag-1 temporal autocorrelation (TAC)



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Outcomes and Deliverables

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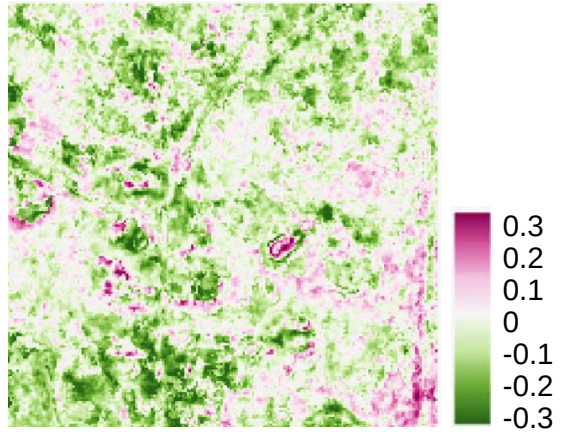
We will employ time series analysis and machine learning (deep learning) to provide:

- **Forest disturbance (annual),**
- **Forest health (weekly or bi-weekly),**
- **Forest risk products (same frequency as forest health)**.

These products would help modeling the effects of vegetation management on grid resilience and reliability.

Forest health change
(2020 – 2022)



Research Impact

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- This project aligns tightly with the goal of **Eversource – UConn Partnership Research Pillars**.
  - Enabling quick and efficient prioritization of vegetation management efforts to prevent tree fall events and mitigate the risk of power outages.
  - Improving the predictive capability of grid reliability and informing decision-making.
- This project will likely lead to multiple extramural research supports, including the **NSF Humans, Disasters, and the Built Environment (HDBE)** program, and the **NASA Land-Cover and Land-Use Change (LCLUC), Future Investigators in NASA Earth and Space Science and Technology (FINESST)** programs.