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

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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**

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).
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).

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

Potential high-risk zone of tree failure and outages

COntinuous monitoring of Land Disturbance (COLD)

Lag-1 temporal autocorrelation (TAC)
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.
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.