Near Real-time Monitoring of Roadside and Right-of-way (ROW) Forest Disturbances in CT

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Background

• **Forest disturbance**
  - Abrupt change (Trimming, Fire, Wind)
  - Subtle change or Stress (Drought, Diseases, Insects)

• **Disturbances** can cause canopy loss and impact forest structure and health condition.

• Unhealthy trees are **major risks to the** electric infrastructure.
  - Preventive tree trimming
  - Improve the outage prediction model

Tropical Storm Isaias leaves behind downed trees at Union Street, Manchester. Photo by Bryan Futoma.

Hynes Avenue, New London. Photo credit: Sean D. Elliot/The Day.
Objectives

- **Task1** - Near real-time **monitoring** of roadside and right-of-way (ROW) forest disturbances.

- **Task2** - Near real-time **characterization** of forest disturbance type.

- **Task3** - Evaluate **risks** of disturbed forests on powerlines.
Harmonized Landsat Sentinel-2 (HLS) Data

- All available Landsat-8 and Sentinel-2A&B imagery
- Spectral bands: RGB, NIR, SWIR1&2
- Spatial resolution: 30 m
- Temporal resolution: ~3days
COntinuous Monitoring of Land Disturbance (COLD) Algorithm (Zhu et al., 2020)

\[ \hat{\rho}_{i,x} = a_{0,i} + \sum_{k=1}^{3} \left\{ a_{k,i} \cos\left(\frac{2\pi}{T} x\right) + b_{k,i} \sin\left(\frac{2\pi}{T} x\right) \right\} + c_{1,i} x \]

Method

1. Time series model initialization
2. Compare model predictions with observations
3. Identify “breaks” (potential land disturbances)
4. Exclude non-disturbance “breaks”
ROW Density Map (Aggregate proximity pixel raster to 30 m grids)

ROW Forest Disturbance Map (30 m)
Example A. Tree Removal (Storrs 2019)
Example B. Gypsy Moth (Litchfield 2021)
Conclusions

1. 30 m Harmonized Landsat and Sentinel-2 (HLS) data can produce useful roadside and ROW forest disturbance maps in near real-time.

2. Time series characteristics provide potential to distinguish different disturbance agents. Ongoing work uses detected disturbance results (time, magnitude, change vector) to characterize disturbance agents.

3. Some defoliation patches are still missing. To develop a comprehensive forest disturbance database, enhanced HLS data (10 m) is needed.