A Risk Model for Predicting Powerline-induced Wildfires in Distribution System

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Background

- As climate change intensifies, parts of the world are experiencing longer and more intense wildfire seasons.
- Largest wildfire season in CA 2020: 9,639 fires had burned 4,397,809 acres[1]
- PG&E file of bankruptcy due to Campfire 2018: powerline ignition caused wildfire killed 84 people and 9.3 billion in housing damage [2]

[1] 2020 National Large Incident Year-to-Date Report (PDF). Geographic Area Coordination Center(Report). National Interagency Fire Center. December 21, 2020. Archived
[2] https://www.nytimes.com/2020/06/16/business/energy-environment/pge-camp-fire-california-wildfires.html

Objective

- Develop a model that comprehensively incorporates a wide range of weather, vegetation, and power infrastructure characteristics to predict the risk of the power-grid-induced ignitions
- Gain a deeper understanding of what information is most important for powerline-induced wildfire prediction.

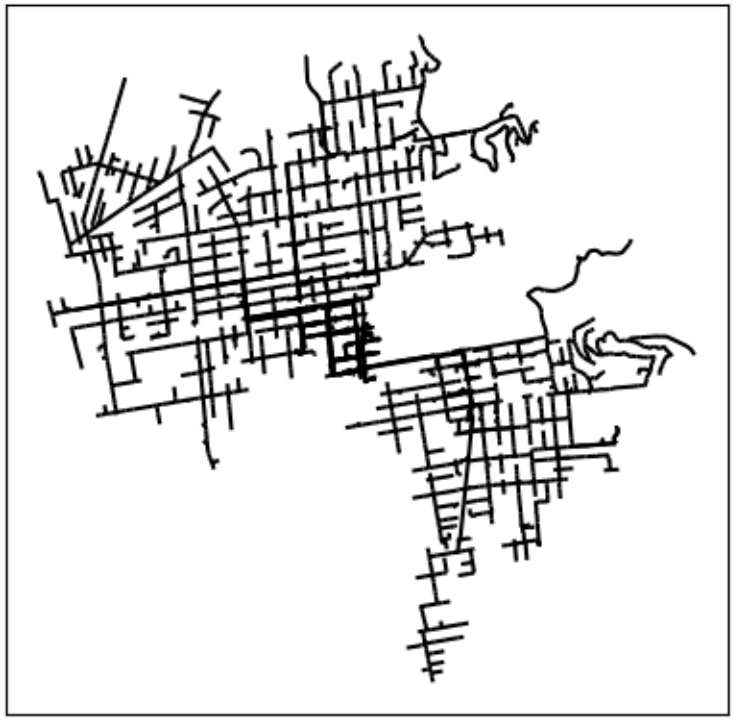
Data Overview

- All data are collected within PG&E territory.
- The time span: 1/1/2015 - 12/31/2019
- Infrastructure data: PG&E Wildfire Mitigation Plan website
- Weather data: gridMET (4-km/Daily) and Mesowest (Hourly)
- Tree height data: Forest Observatory (10-m/Yearly)

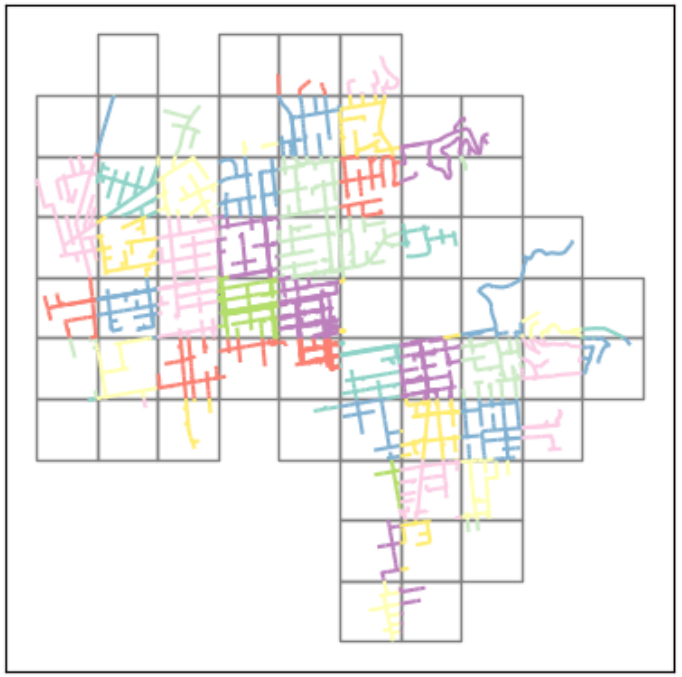
Data Aggregation

Temporal aggregation: Daily vs Weekly

Spatial aggregation:



Feeder-level Model



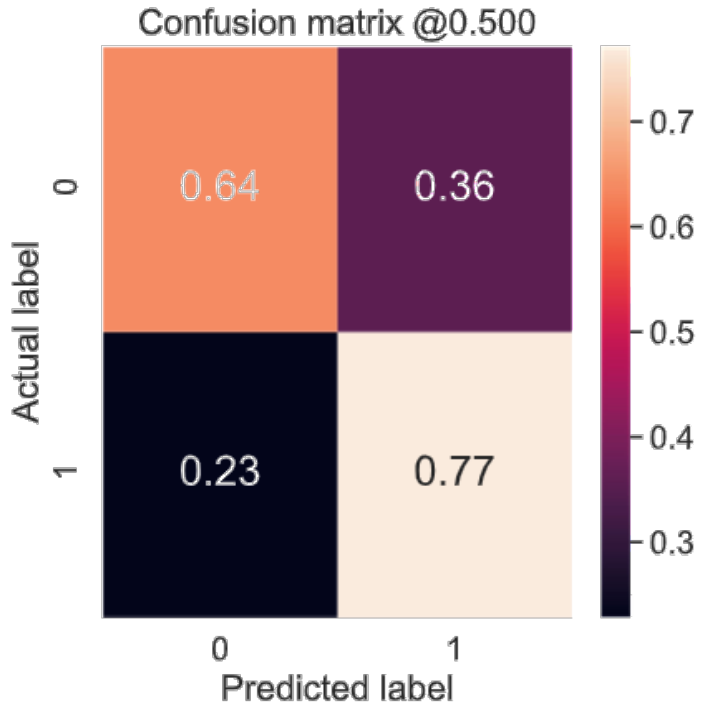
Grid-cell Model

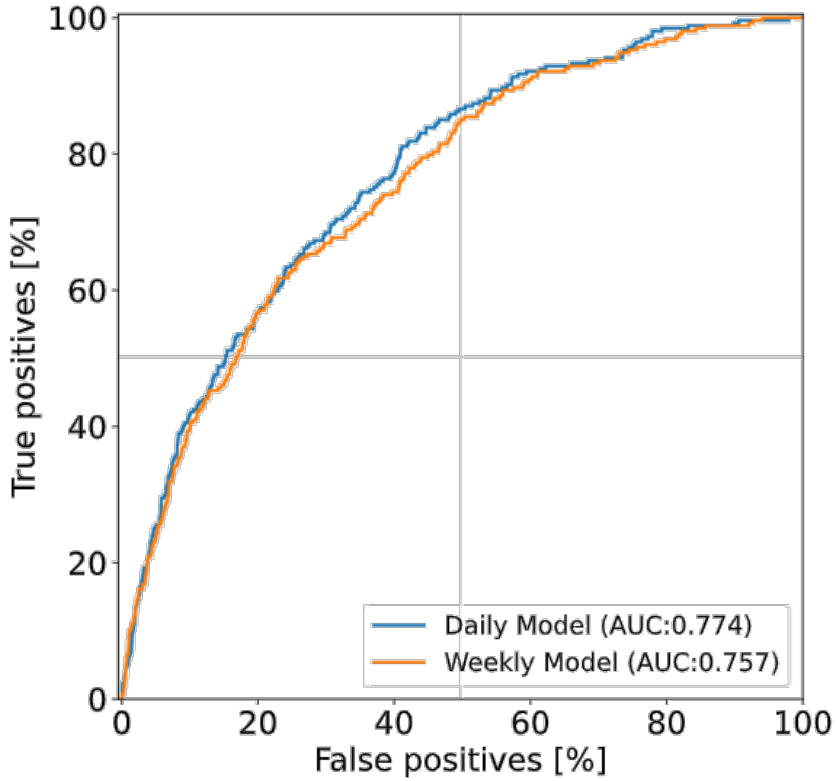
Methodology

- Classification algorithm:
  - Logistic Regression
  - Classification Tree: Random Forest and Histogram-based Gradient Boosting Classification Tree
  - Neural Network
- Imbalance data
  - Data resampling
  - Class weight modification

Preliminary Results

- Feeder-level model: Histogram-based Gradient Boosting Tree algorithm with the under-sampling strategy (AUC = 0.777)





Work Plan

- Building the grid-cell model with different temporal and spatial resolution and compare with the feeder-level model
- Conducting feature importance analysis to figure out what information is helpful and important for the power-grid-induced wildfire prediction
- This work will guide how to collect new information and provide valuable suggestions for wildfire mitigation planning.