UCLA ENGINEERING
B. John Garrick Institute for the Risk Sciences

Seminar Series: Winter 2024

Machine Learning for Wildfire Spread and Fuel Estimation from Remote Sensing Data

Thursday, February 29th 2024, 12 - 1 PM

Location: Engineering 6 BLDG, Room 580B

https://ucla.zoom.us/j/94778587870

Abstract

Predicting wildfire spread is critical for land management and disaster preparedness. To this end, I present two projects inferring 1) wildfire spread and 2) wildfire fuel using machine learning on remote sensing data.

The first is "Next Day Wildfire Spread," a curated, large-scale, multivariate dataset of historical wildfires aggregating nearly a decade of remote-sensing data across the United States. In contrast to existing fire datasets based on Earth observation satellites, our dataset combines 2-D fire data with multiple explanatory variables aligned over 2-D regions, providing a feature-rich dataset for machine learning. To demonstrate the usefulness of this dataset, we implement a neural network to predict wildfire spread. This dataset can be used as a benchmark for developing wildfire propagation models based on remote-sensing data for a lead time of one day.

The ability to apply advanced wildfire modeling is limited by the availability of reliable fuel inputs, the most challenging of which is fine-scale fuel properties at fine spatial resolution. To tackle this problem, we infer high resolution wildfire fuel from satellite and aerial imagery using machine learning. The source of fine resolution imagery is Google Maps/Earth, which has extensive geographic coverage throughout the United States and worldwide. First, we compile a sub-meter resolution dataset by collecting fuel class annotations from fire experts on imagery from Google Maps/Earth. Next, this dataset of imagery and fuel labels is used to train machine learning models to predict the fuel class associated with each pixel in the input image. This methodology is demonstrated on a small region within California, USA to predict wildfire fuel at 0.15m resolution.

Lily Hu, Ph.D.

Lily Hu is a researcher and engineer with Google Research. She received a M.S/Ph.D. in engineering from the University of California at Berkeley, and a B.A.Sci. in engineering science from the University of Toronto. She conducted research in machine learning for the physical sciences and sustainability, drawing upon computer vision, decision analysis, and optimization. Previously, she worked at Salesforce Research and the Lawrence Berkeley National Laboratory.