# Wildfire Ignition Prediction in California using Machine Learning based models

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## INTRODUCTION

In the western United States, wildfire season typically peaks between late summer and early fall. However, the effects of climate change—such as increased aridity and other environmental shifts—are lengthening the duration of this fire season. To mitigate wildfire risks, utility companies frequently implement Public Safety Power Shutoffs[1] (PSPS), cutting power to neighborhoods to prevent electrical equipment from sparking fires. While there are several models to track wildfire spread, few focus on predicting ignition locations.

This research seeks to:

- **Develop a python-based machine learning model** to predict **wildfire ignition risk** in California.
- **Identify areas with high ignition potential** several days in advance, allowing for **improved preparedness** on high-risk days.

## WIM FRAMEWORK

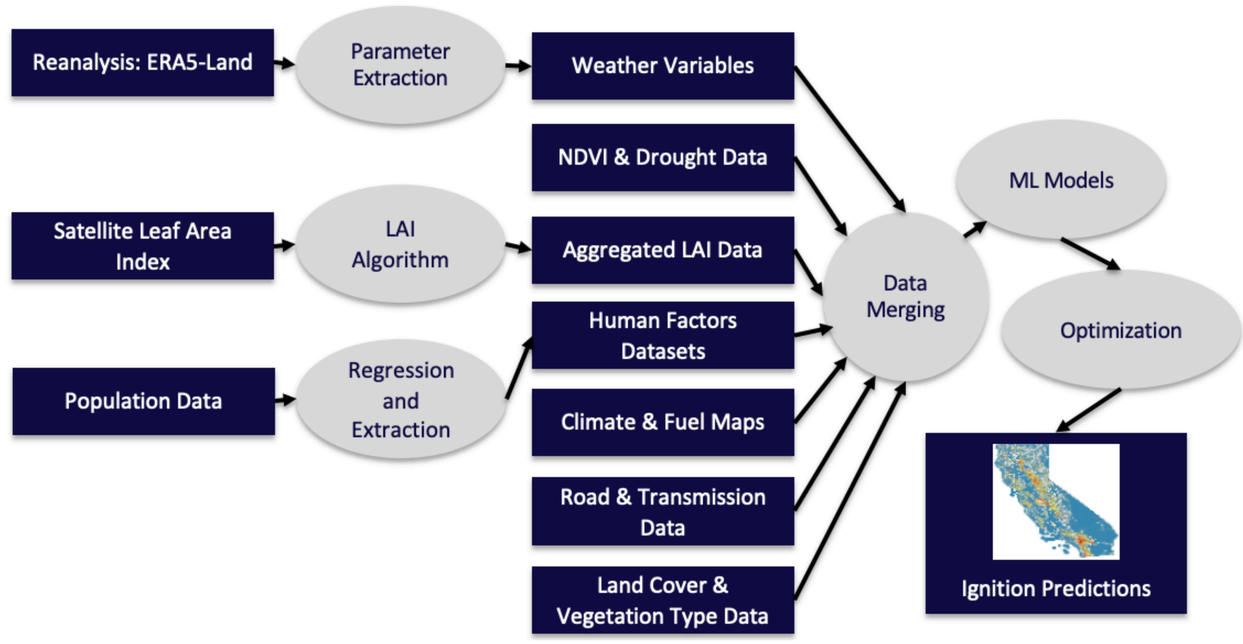



*Fig. 1: Wildfire Ignition Model Framework*

## WILDFIRE TRENDS AND CAUSES

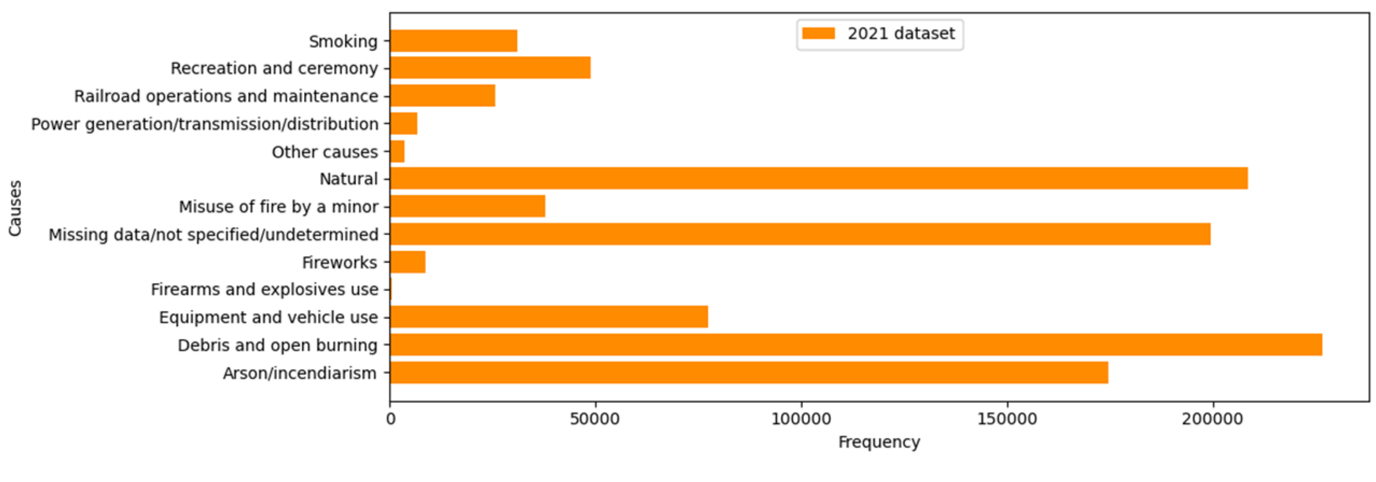



*Fig. 2: Reported cause of fires in California from 1992-2020*

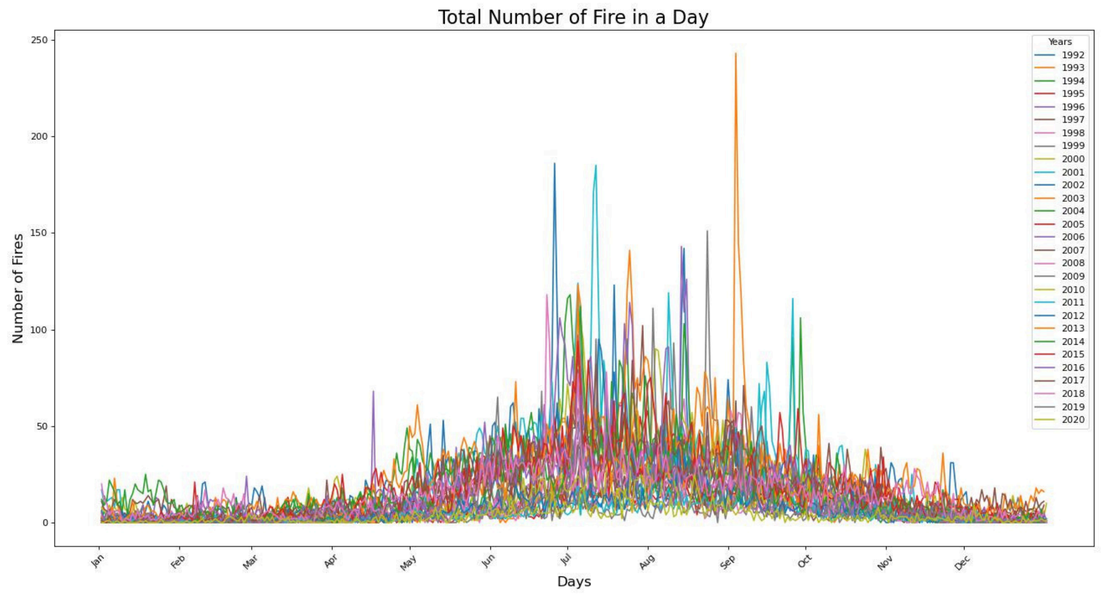



*Fig. 3: Total number of fires in a day for all months from Jan 1992 - Dec 2020*

## MODEL PRELIMINARY RESULTS

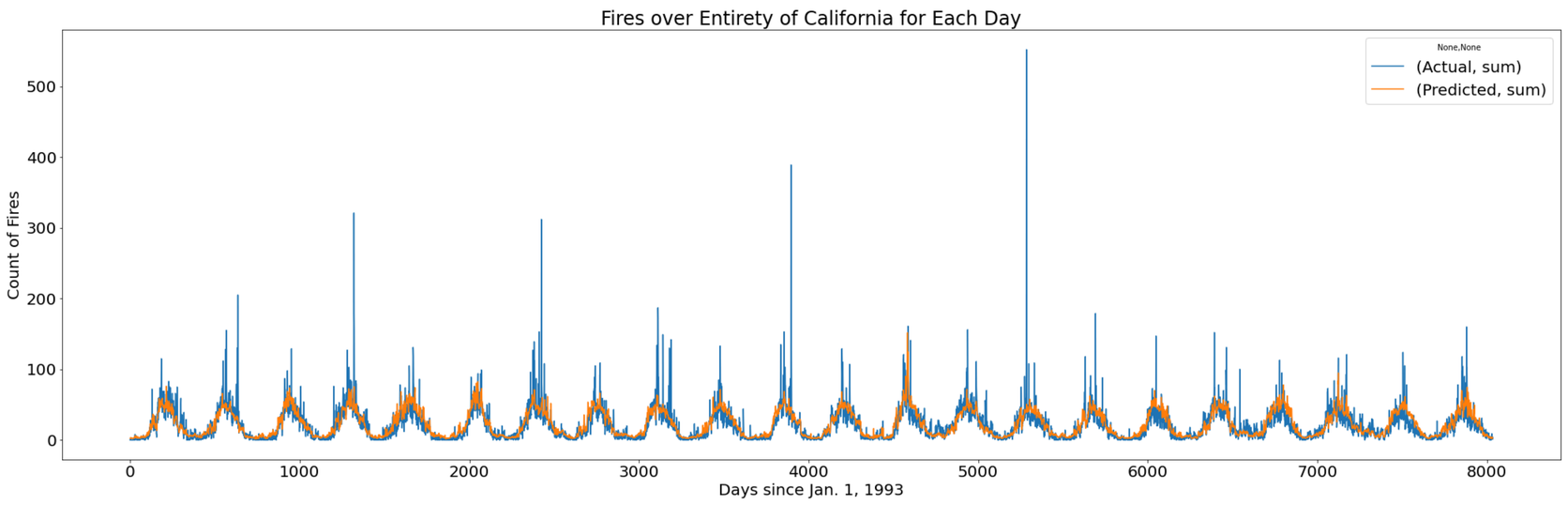



*Fig. 4: Time series for the periods of 1993-2015 of actual and predicted fires in California.*

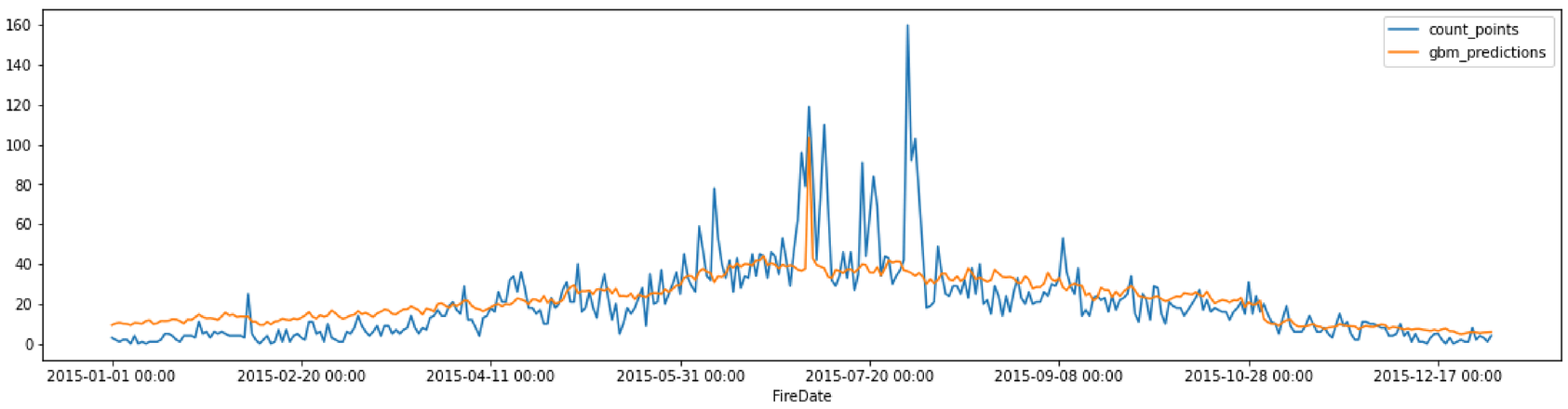



*Fig. 5: Time series for 2015 of actual and predicted fires in California.*

## FUTURE WORKS

- **Incorporate** a Wildfire Threat Index with a historical weather database into the existing wildfire prediction framework.
- **Enhance** the framework using state-of-the-art machine learning models and artificial intelligence techniques.
- **Introduce** a nested approach to improve the model's predictability and refine its forecasting capabilities.
- **Extend** the model to predict ignition spots near power lines, helping to reduce Public Safety Power Shutoffs (PSPS).
- **Adapt** the Wildfire Ignition Model (WIM) for use in other states to broaden its impact and applicability.
- **Develop** a user-friendly interface for stakeholders to easily access and interpret wildfire risk predictions, improving decision-making during wildfire season.

*Patent Pending: Cerrai D., Nyame, S., Taylor, W. O., Spaulding, A., Koukoula, M., Yang, F., & Anagnostou, E. (2023). System and Method for Wildfire Ignition Modeling (U.S. Patent Application No. 63/603,311). U.S. Patent and Trade-mark Office.*