

A satellite image of Western North America, showing the Pacific Northwest, California, and parts of Mexico. Large, billowing plumes of white and grey smoke are visible rising from the coast and inland areas, indicating active wildfires. Several red outlines are drawn on the landmass, highlighting specific regions affected by fires. The ocean is dark blue, and the land is a mix of brown, tan, and green, representing different vegetation and terrain types.

# WESTERN WILDFIRES AND CLIMATE CHANGE

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WINE COUNTRY FIRES

DANGER FAR FROM OVER



Embers still glow at a burned house on Mount Diablo Road in Napa County after flames from the Napa Fire scorched the area. The blaze joined the Northern Fire and consumed nearly 15,000 acres.

Pollution: Smoke spews dangerous toxins across the Bay Area, fouling air, creating health hazards

By Eric Lipton

The air quality in much of the Bay Area this week has at times been comparable — or even worse than — Beijing, one of the most polluted cities in the world, as smoke from the Wine Country wildfires drifts south and settles over the region.

Smoke-choked residents were made to wear masks and stay indoors, and even on BART trains and inside offices, schools kept residents



Smoke continues on A17

Death toll: Count hits 31, expected to jump with hundreds still missing

By Kimberly Vickrey, Jill Tucker, Melody Gonsky and Peter Frazier

The death toll from Northern California's monstrous wildfires jumped to 31 on Thursday as the search for survivors began to finally end and search teams began to find bodies and survivors. The search for survivors with bodies still missing is ongoing, but further north, the emergency response had turned into a grim search for what authorities fear could be dozens, even hundreds, more dead.

"We're moving into a recovery phase,"

Fires continue on A17

Family's tragedy: In pool to escape flames, wife dies in husband's arms

By Eric Lipton

As fire raged all around them and smoke choked their lungs, Carmen and Armando were in a pool, but they weren't trying to escape. They were trying to stay together. Carmen had no choice but to cling to her husband as the flames began to engulf them. Just before dawn, just as the worst of the inferno had passed, Carmen stopped breathing. She died in the

Fire continues on A17

Changes: Northern part of state becoming more like blaze-prone south

By Martin Alexander

The catastrophic fires that have ravaged Wine Country this week may be unprecedented in scale, but they aren't the latest in a series of disasters that have befallen the hills and valleys south of San Francisco in recent years. And the trend is likely to continue.

An unprecedented clash across the West and California's burning wine country is the latest in a series of disasters that have befallen the hills and valleys south of San Francisco in recent years. And the trend is likely to continue.

Climate continues on A17

WINE COUNTRY FIRES

FROM A SPARK TO AN INFERNO

Blazes quickly turned 'unstoppable' as North Bay slept

By Martin Frazier

His crew had just finished putting out a grass fire when Santa Rosa Fire Chief Tony Gonsky's radio crackled at about 10 p.m.

"We've got a fire at Saffari West and it's coming our way," the dispatcher said.

The wildfire preserve set in Sonoma County's thickly wooded hills was just 6 miles away, and Gonsky knew

that it was a uniquely dangerous spot. The winds this Sunday night were stiff, and parched grass and tinder-dry trees filled the valley leading straight to town. Gonsky drove up a hill to take a look.

Off in the distance, as he crested the slope, was an orange glow, angry and wide.

"My God," he thought. "We're in trouble."

Fires continue on A17



Santa Rosa firefighters keep a close watch on a fire in the Oakmont neighborhood in Santa Rosa, which suffered the greatest damage to homes and businesses.

SONOMA: Hundreds flee as windblown flames ignite homes near town square

By Catherine Ho, Martin Frazier, Howard Altschuler and Peter Frazier

Embers whirled up by flames Saturday, igniting several homes in the town of Sonoma and forcing the evacuation of thousands of people who, until now, had escaped the terrible wrath of the wildfires that have in the killed 30 people and destroyed 3,000 structures in the Wine Country and beyond.

Sonoma County burned just one of the historic towns in Sonoma as the party winds that consumed much of the county. The wind was powerful, driving embers into the air and igniting homes.

"There's a party and a fight going on in the field right now," said Dave Crawford, the county fire chief, chief of the California Department

Some continue on A17



Chenoweth's Winery in Santa Rosa's Downtown Village Winery.

Wine industry: Vintners optimistic over long term, but big questions remain

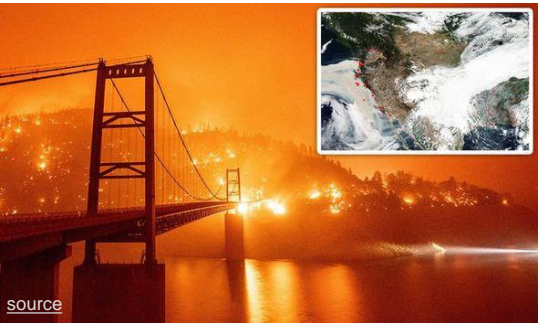
By Martin Frazier

Many of the most powerful vintners coming out of the Wine Country fire last week depicted the wine industry as resilient. In future harvests, a generation-old vineyard regilled in flames will produce a vintage. Some of the devastation in the wine country region is still being assessed.

"Uncertainty and anxiety grip the wine community. And in the magnitude of the damage because there are so many vineyards, it's a big loss," said a vintner who declined to be named.

It is not clear whether the loss of vines will be the loss of life. But what is clear is that the loss of vines will be a significant loss to the wine industry.

Wine continues on A17



source



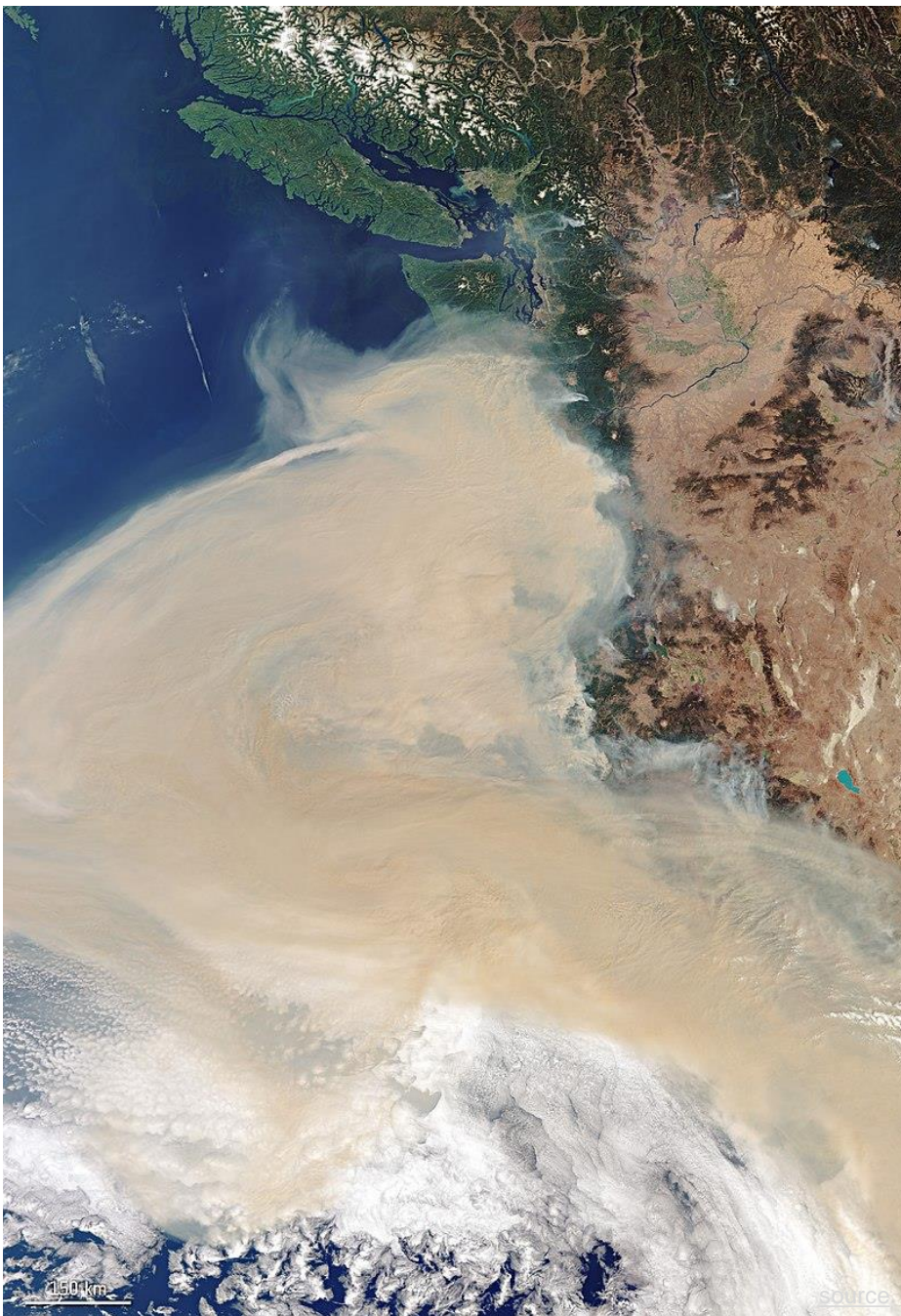
**HISTORIC BLAZES**  
**CAN FIREFIGHTING ALONE STOP WESTERN WILDFIRES?**  
Jennifer Balch | Fire Scientist / Earth Lab Director, Univ. of Colorado, Boulder  
9:38 AM ET  
SMERCONISH



source

Is fire season now a year-round reality?





Between 1992 – 2015 more than 1.8 million  
wild fires were recorded

Number of fires between 4 – 20 km<sup>2</sup> is  
increasing



By the end of 2020, 9,639 fires had burned  
4,397,809 acres – more than 4% of California's  
acres of land

# DATA STRATEGY

## DATA MINING



### Fire Program Analysis (FPA)

US wildfires from 1992 - 2015

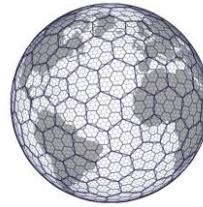


### NOAA API

Creating a database of weather and climate data

Temperature | Precipitation  
Wind Speed

## DATA PROCESSING



### H3: Uber's Hexagonal Hierarchical Spatial Index



### Time Series Forecasting

## MODELING

1

### Risk of wildfires in California

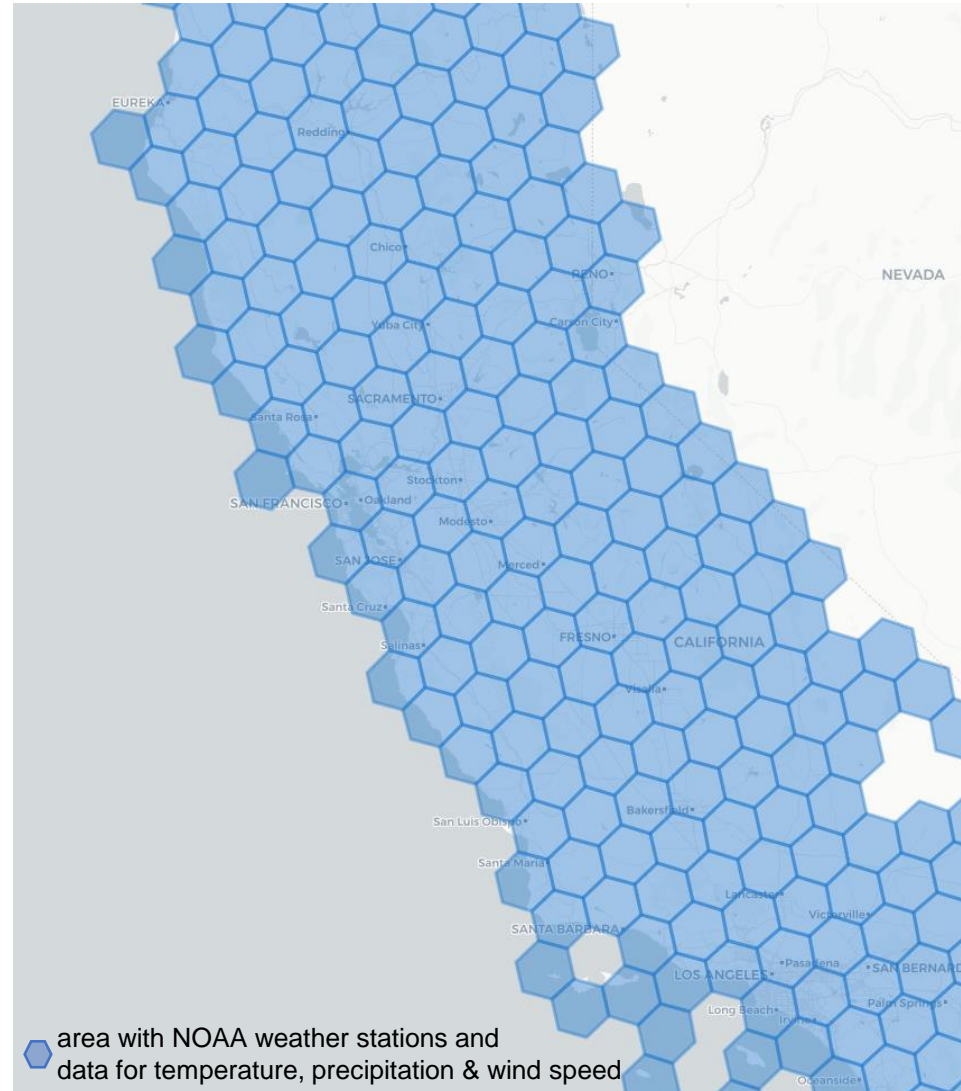
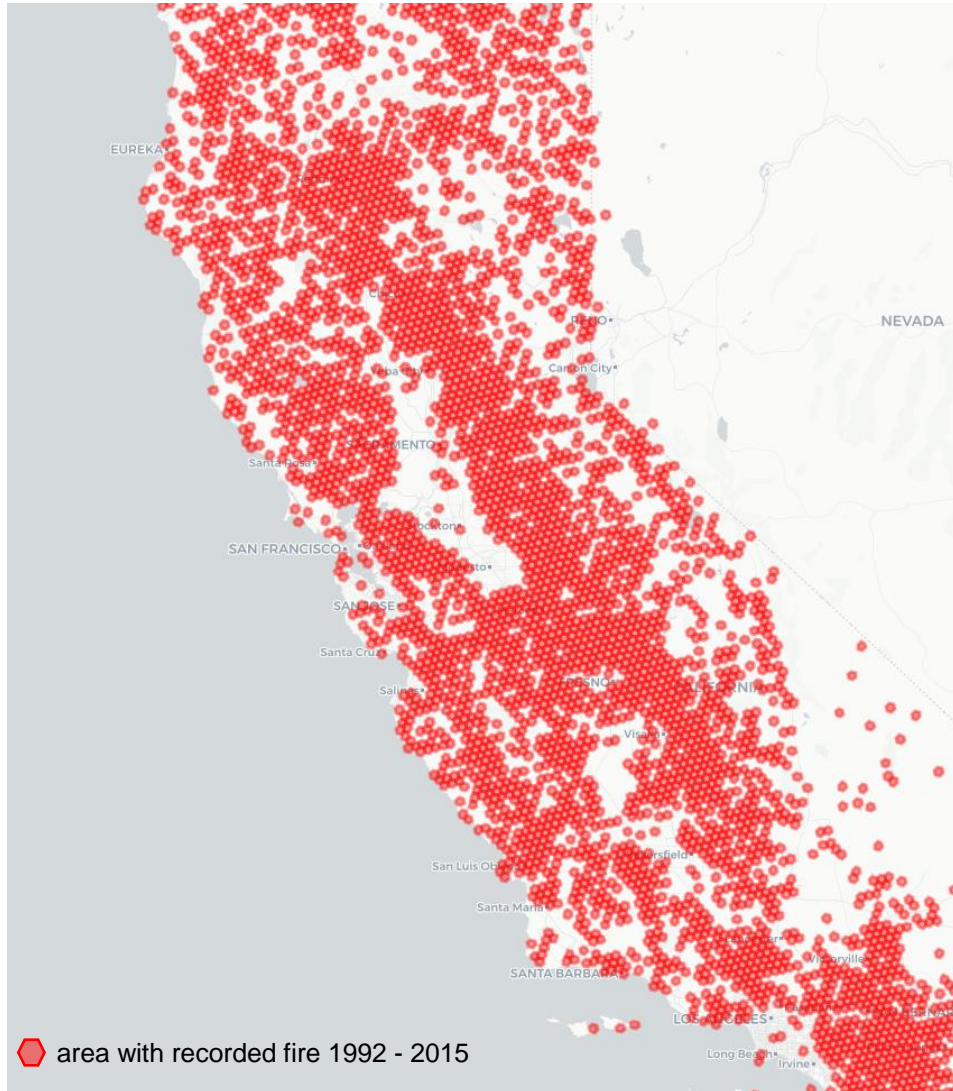
2

### Expected size of wildfires



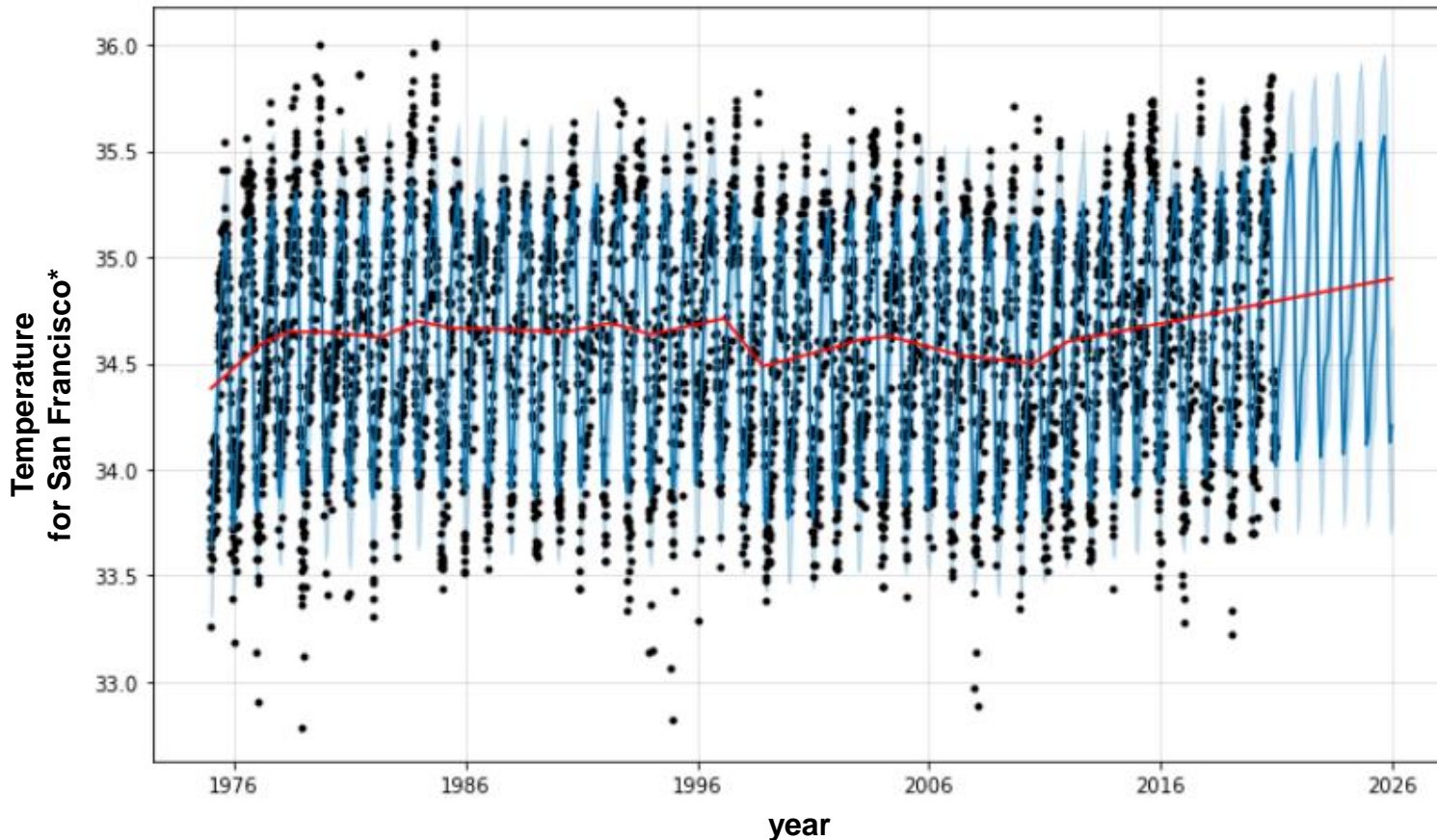
# DATA MINING & PROCESSING

Creation of a database with more then 1.5 million data points



# DATA PROCESSING

Impact of climate change on features



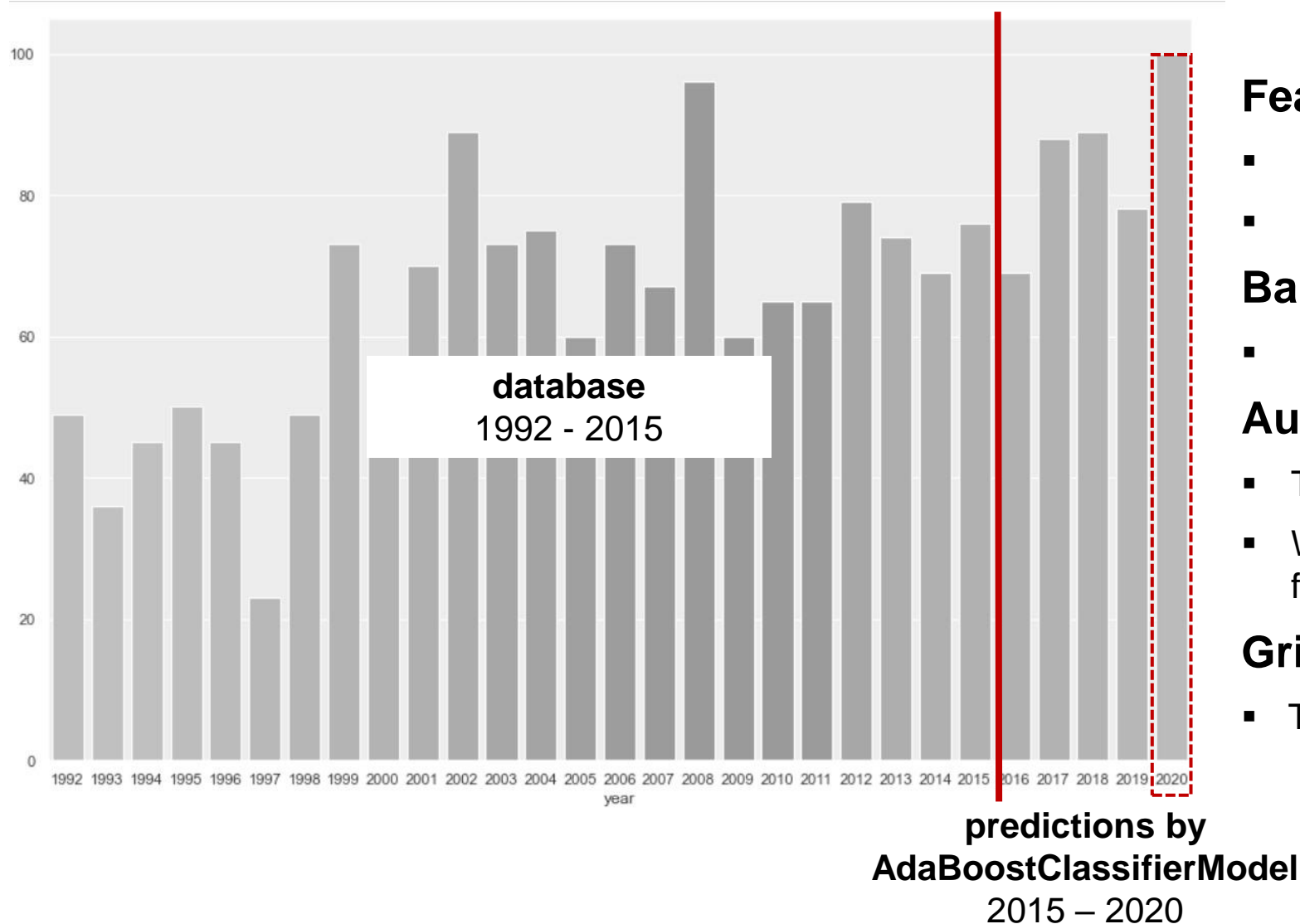
\*Available for precipitation and wind speed

## Time Series Analysis with **PROPHET**

Extending the database for California  
until 2026 to 2.0 million data points

# MODELING

## Creation & evaluation of the model



### Feature Engineering

- Including urban areas
- Computing climate data of quarter & years

### Balancing of Data

- Manual balancing between fire size classes

### Automated Feature Selection

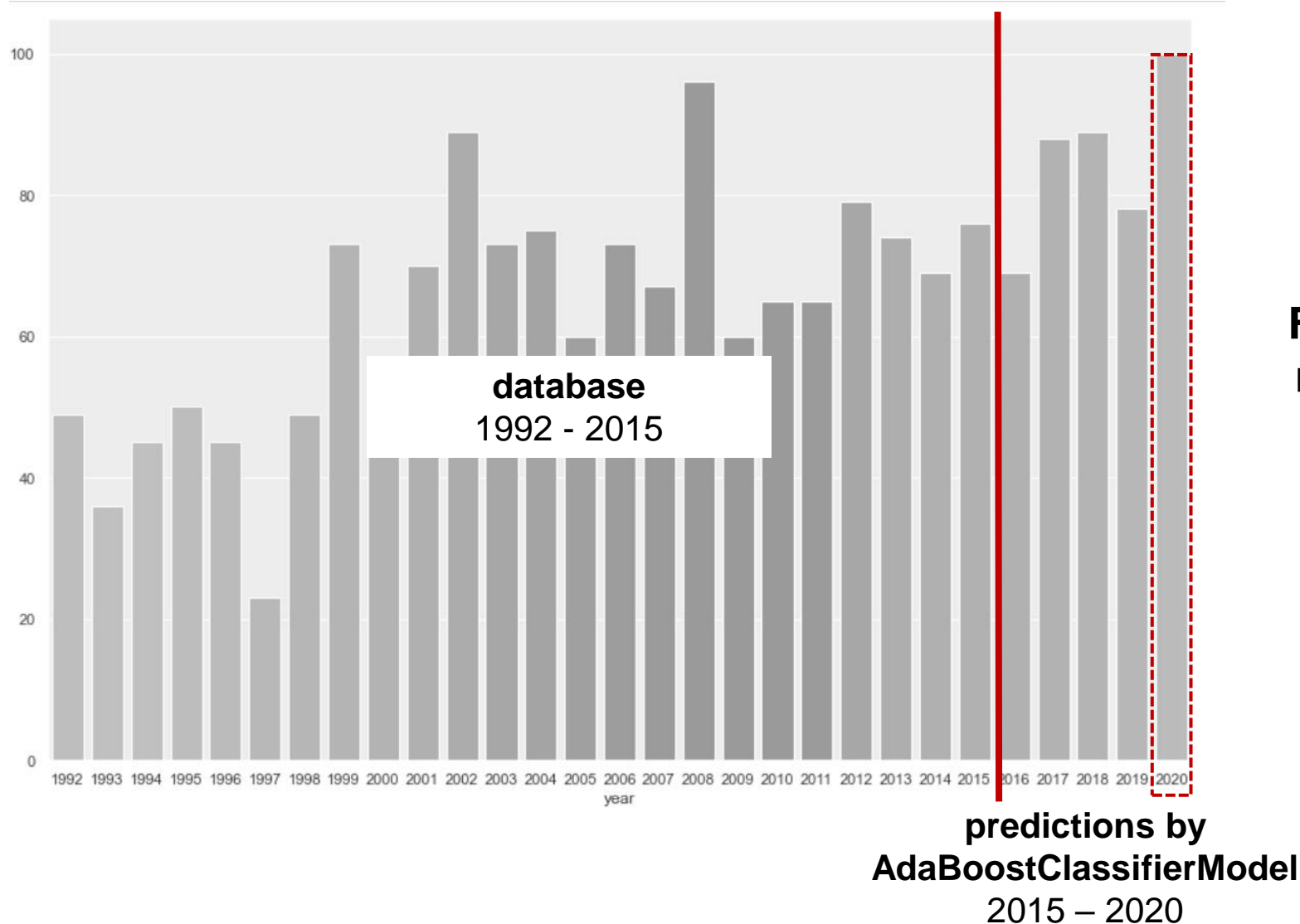
- Tuning down the number of features
- Weather variables identified as main features

### Grid Search for AdaBoostClassifier

- Tuning the hyper-parameters of an estimator

# MODELING

## Creation & evaluation of the model



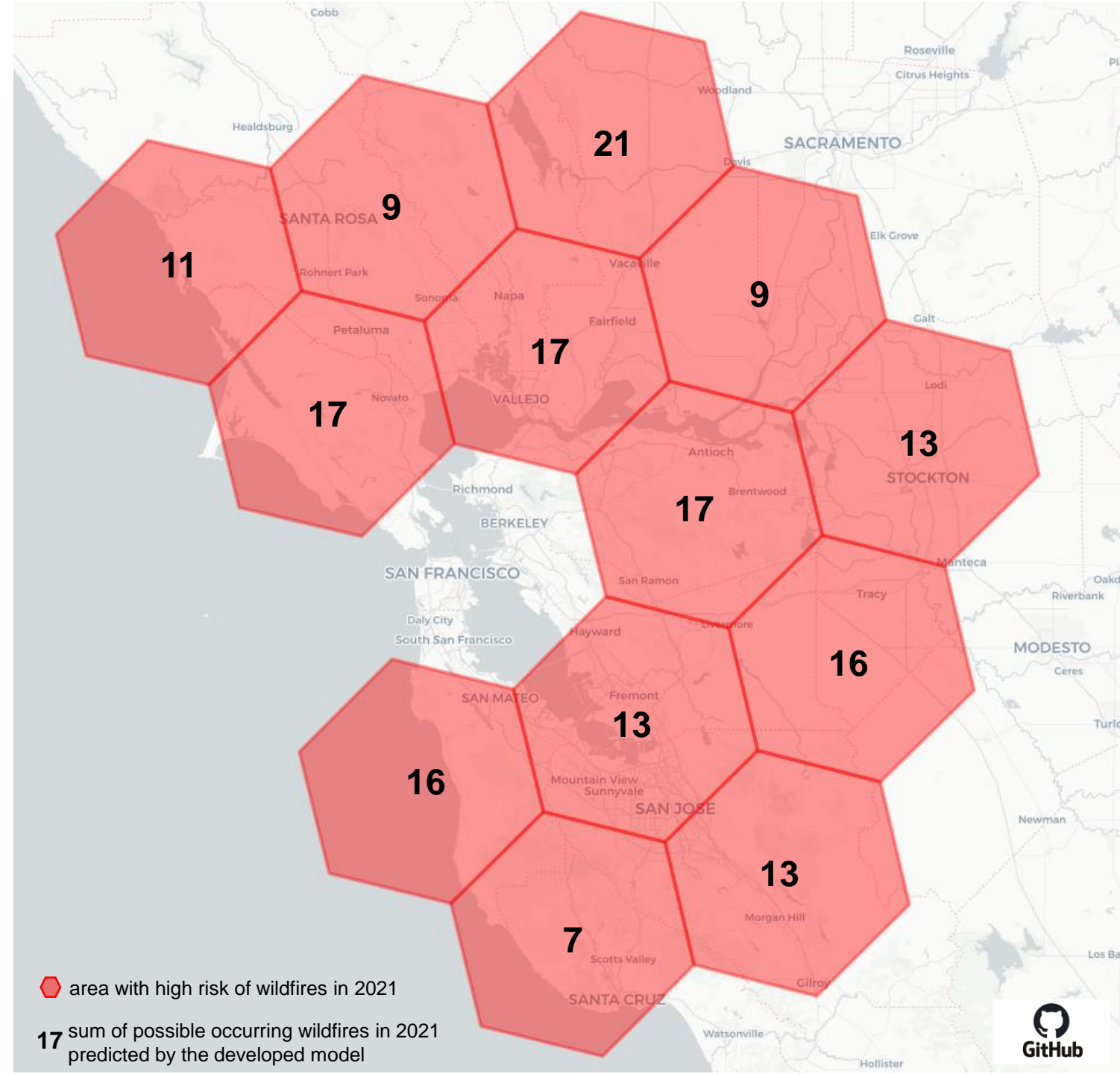
**For 2020, the model predicts a record number of fires for the area around San Francisco**



# MODELING

## Wildfire forecast 2021

- Wildfires are increasing and wildfire season is getting longer
- Conditions are primed for wildfires to ignite and spread
- Their emissions worsening global warming





A satellite map of the Middle East region, showing the Mediterranean Sea to the west, the Red Sea to the south, and the Persian Gulf to the east. Several countries are highlighted with red outlines, including Iraq, Syria, Lebanon, Israel, and Jordan. Red dots are scattered across these countries, possibly indicating specific locations of interest. The terrain is a mix of arid, mountainous, and coastal areas.

# THANK YOU



# MORE TO READ

[https://github.com/caaarov/finalproject\\_wildfires\\_CA.git](https://github.com/caaarov/finalproject_wildfires_CA.git)

<https://www.kaggle.com/rtatman/188-million-us-wildfires>

<https://www.ncdc.noaa.gov/cdo-web/webservices/v2>

<https://www.theguardian.com/us-news/2020/dec/30/california-wildfires-north-complex-record>

<https://www.sfchronicle.com/bayarea/article/Warm-days-and-historic-winds-Winter-fire-season-15886169.php>

<https://medium.com/@gpj/getting-started-with-weather-data-ba7749838549>

<https://towardsdatascience.com/mapping-the-uks-traffic-accident-hotspots-632b1129057b>

[https://facebook.github.io/prophet/docs/quick\\_start.html#python-api](https://facebook.github.io/prophet/docs/quick_start.html#python-api)

<https://eng.uber.com/h3/>