Forecasting Forest Fires

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Background

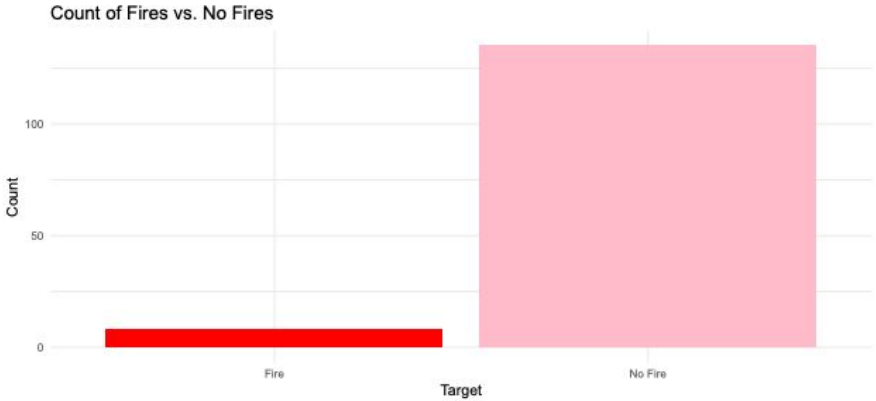
- Climate change poses a serious threat to us in both short and long term
    - Climate change induced natural disasters are already here
- We wanted to look at what are the environmental conditions that predict that these wildfires will occur

Research Question: What are the strongest environmental predictors of forest fires in California?

The Data

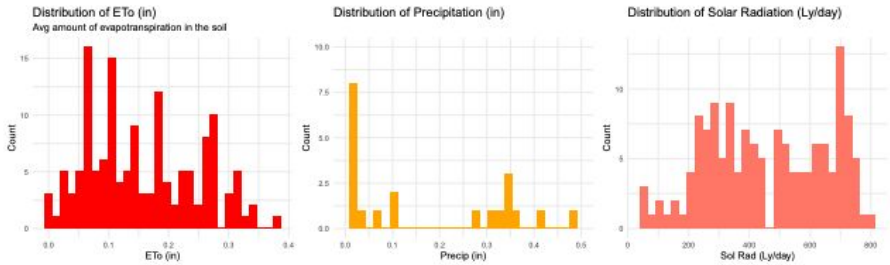
- 128, 126 observations from 2018 to fall 2020 in California
- Response variable: Target
- Predictor variables: evapotranspiration, precipitation, solar radiation, average vapor pressure, average soil temperature, wind run, average wind speed, dewpoint, average relative humidity, average air temperature
- Source: scraped from California Irrigation Management Information System

Exploratory Data Analysis



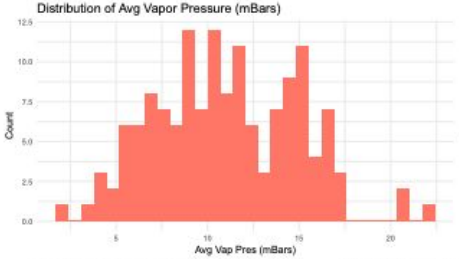
- Reduced full data set down to a random sample
  - From 120,000+ data points to 143
- Distribution of target (number of fires)
- Distribution of each of the variables within our training set

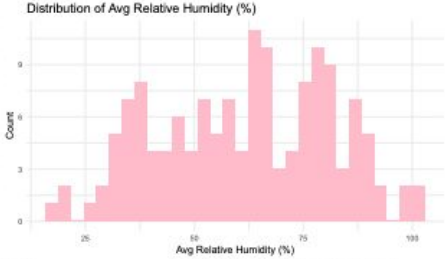
Histograms

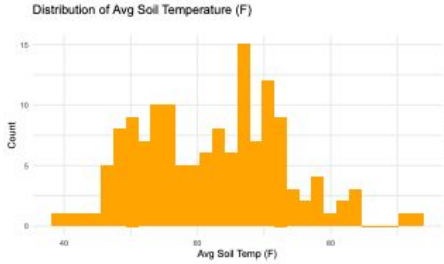

Distribution of ETo (in)
Avg amount of evapotranspiration in the soil
Count
ETo (in)

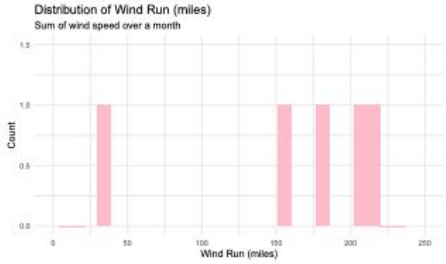
Distribution of Precipitation (in)
Count
Precip (in)

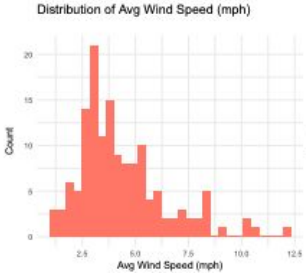
Distribution of Solar Radiation (Ly/day)
Count
Sol Rad (Ly/day)

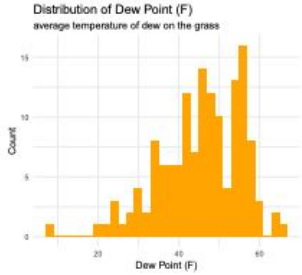

Distribution of Avg Vapor Pressure (mBars)
Count
Avg Vap Pres (mBars)

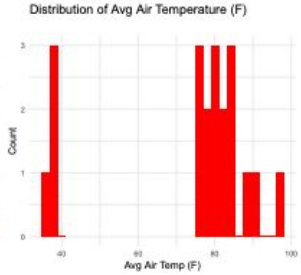

Distribution of Avg Relative Humidity (%)
Count
Avg Relative Humidity (%)


Distribution of Avg Soil Temperature (F)
Count
Avg Soil Temp (F)


Distribution of Wind Run (miles)
Sum of wind speed over a month
Count
Wind Run (miles)


Distribution of Avg Wind Speed (mph)
Count
Avg Wind Speed (mph)


Distribution of Dew Point (F)
average temperature of dew on the grass
Count
Dew Point (F)


Distribution of Avg Air Temperature (F)
Count
Avg Air Temp (F)

Final Model

$$log - odds(\hat{Target}) = -6.727 + 157.331ETo - 0.070solrad$$

$$+0.434avgsoiltemp + 5.255windrun + 0.002(dewpoint^2) - 0.374avgairtemp$$

$$-127.386avgwindspeed$$

Target	pred_resp	n
1	fire	6
1	no fire	2
0	fire	6
0	no fire	129

x
0.915

Discussion and Next Steps

- Reliability of data comes into question
- Stronger predictor of no fire than of fire
- Could have included more meaningful interaction terms
- Partial to AIC over BIC
    - could re-evaluate strategy when building future models with same dataset
- Model's variables are naturally occurring meteorological/environmental features

Bibliography

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