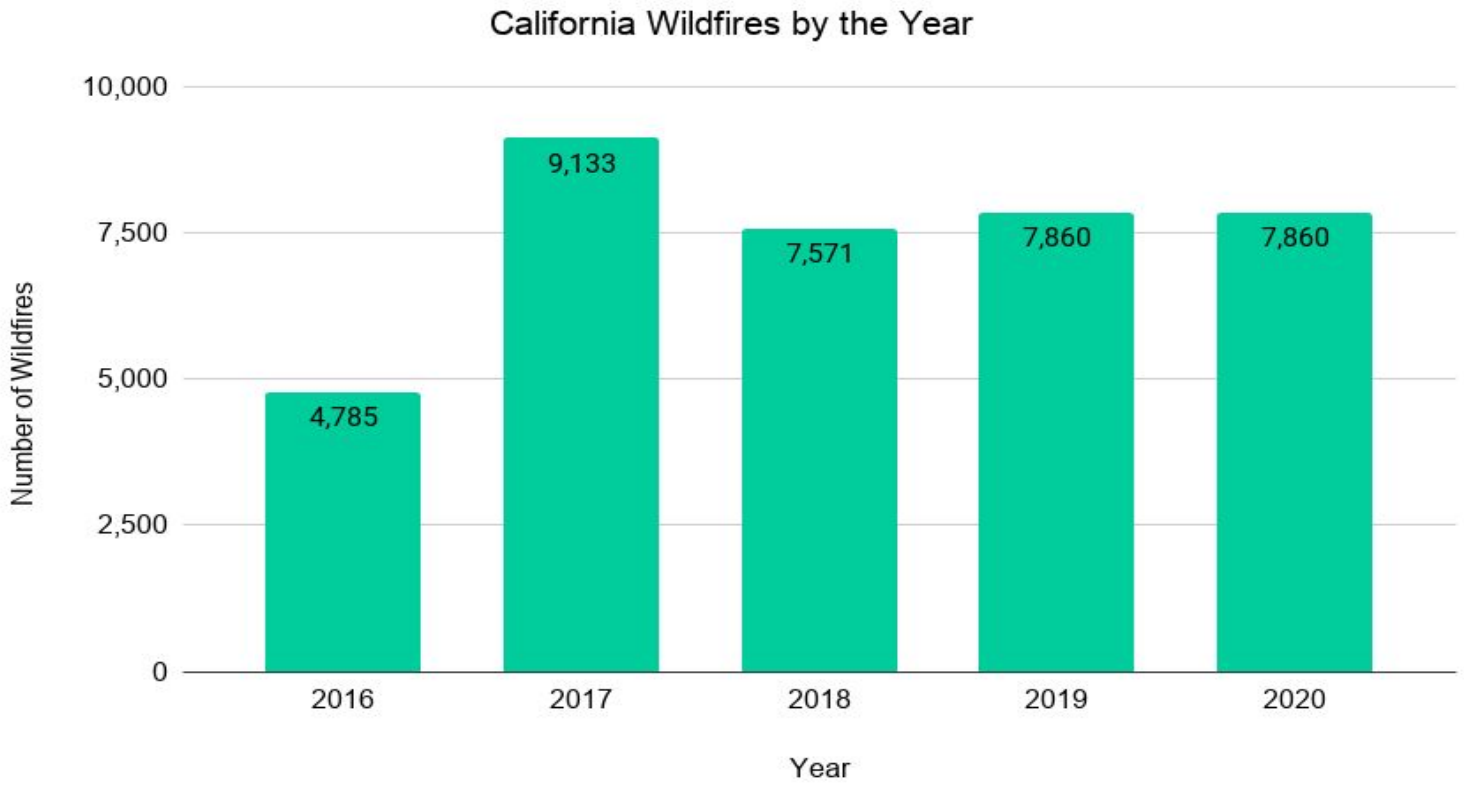
Detecting Wildfire Areas: with Convolutional Neural Networks

By: Paul Tanner

Project Relevancy :

- Each year the United States experiences 71,000 wildfires.
- Approximately 6.9 million acres burn per year.

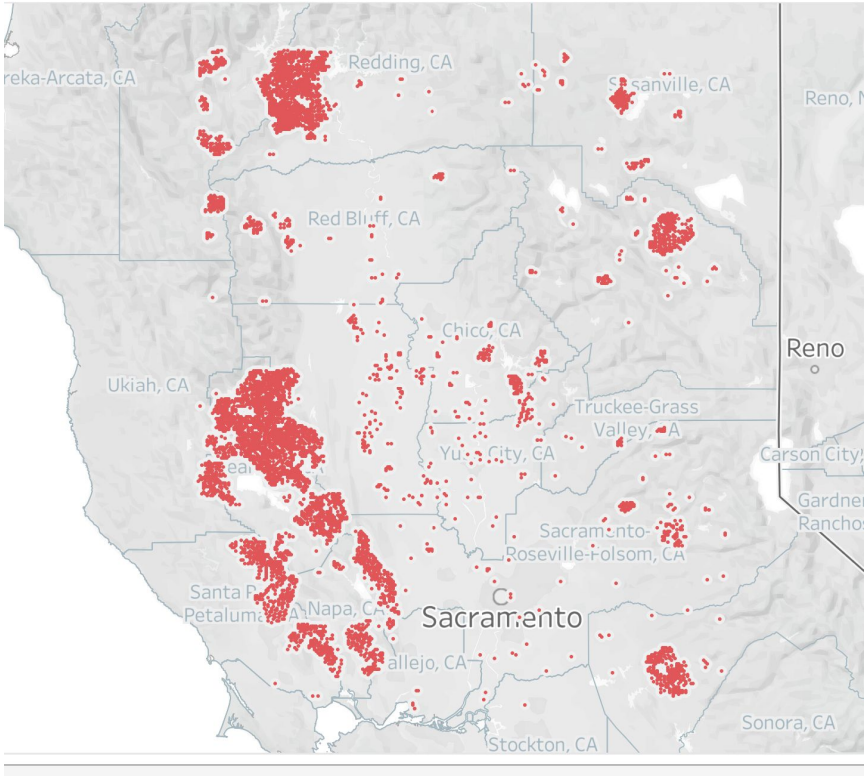


Source: Cal Fire, https://www.fire.ca.gov/stats-events/

Project Goals:

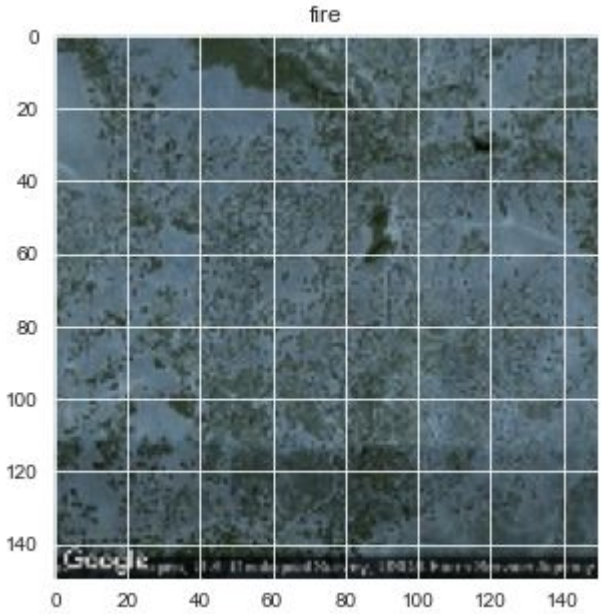
- **Build a Convolutional Neural Network that is able to distinguish between areas that have been burned by wildfires and areas that have not in Northern California.**

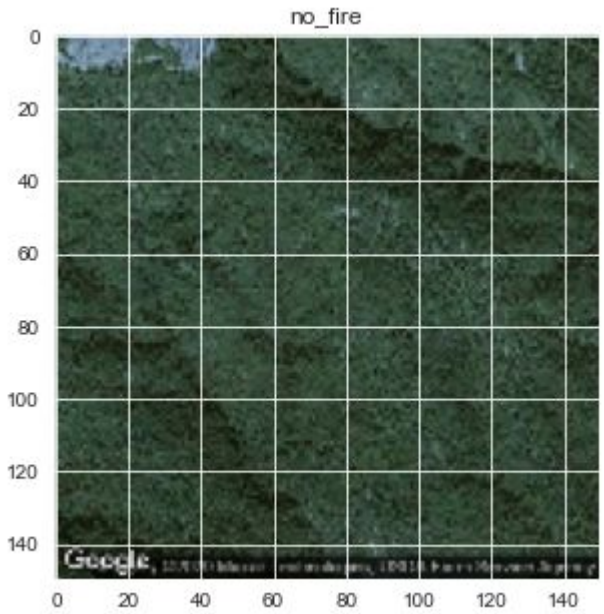
Problem Space: Northern California (2016-2019)



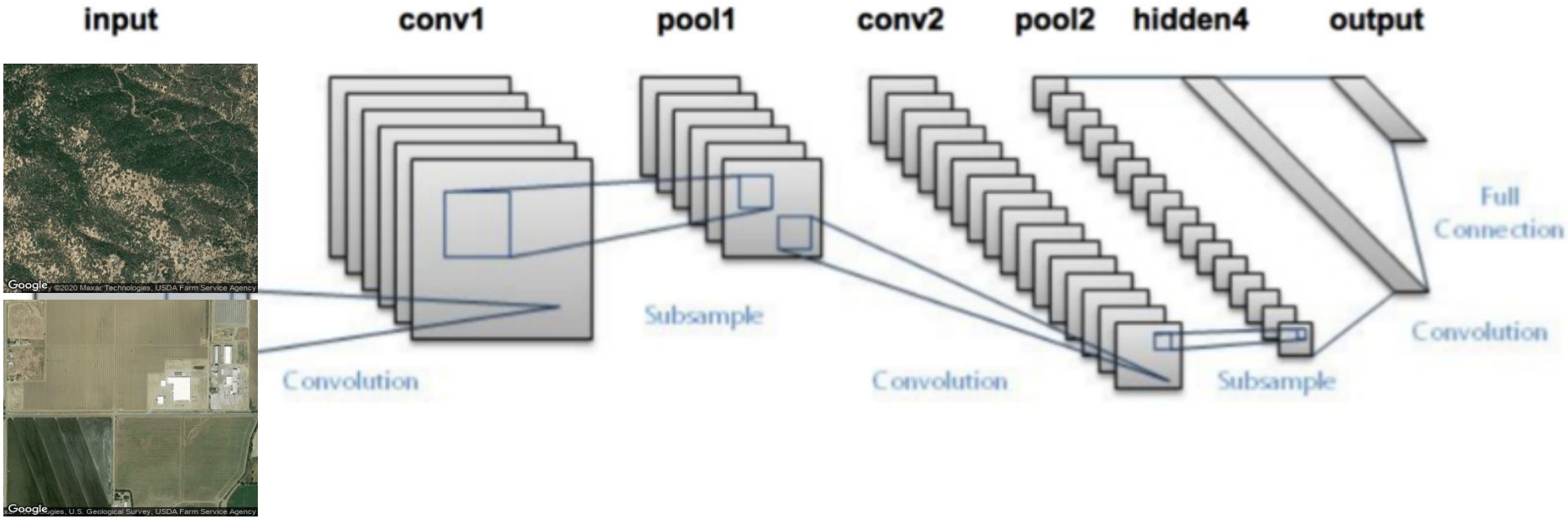
- Images collected over N. California after referencing NASA's MODIS aqua/terra fire anomaly instances directory.
- 10,000+ "fire" images collected from Google Maps API from areas touched by wildfires.
- 10,000 additional non-fire images gathered by randomizing co-ordinated over the same area

Image Examples:

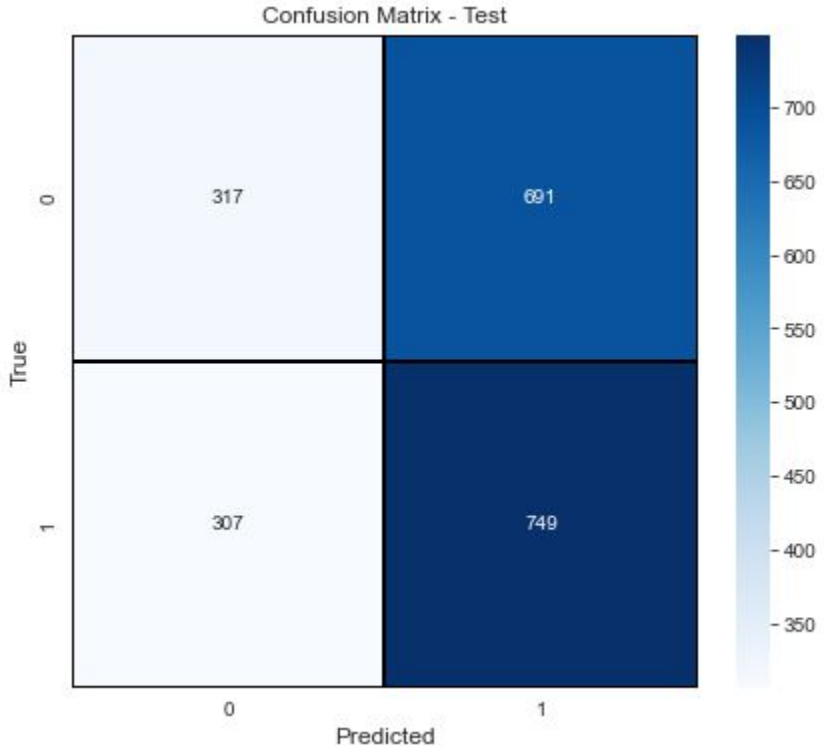




Model Architecture:



Model Performance:

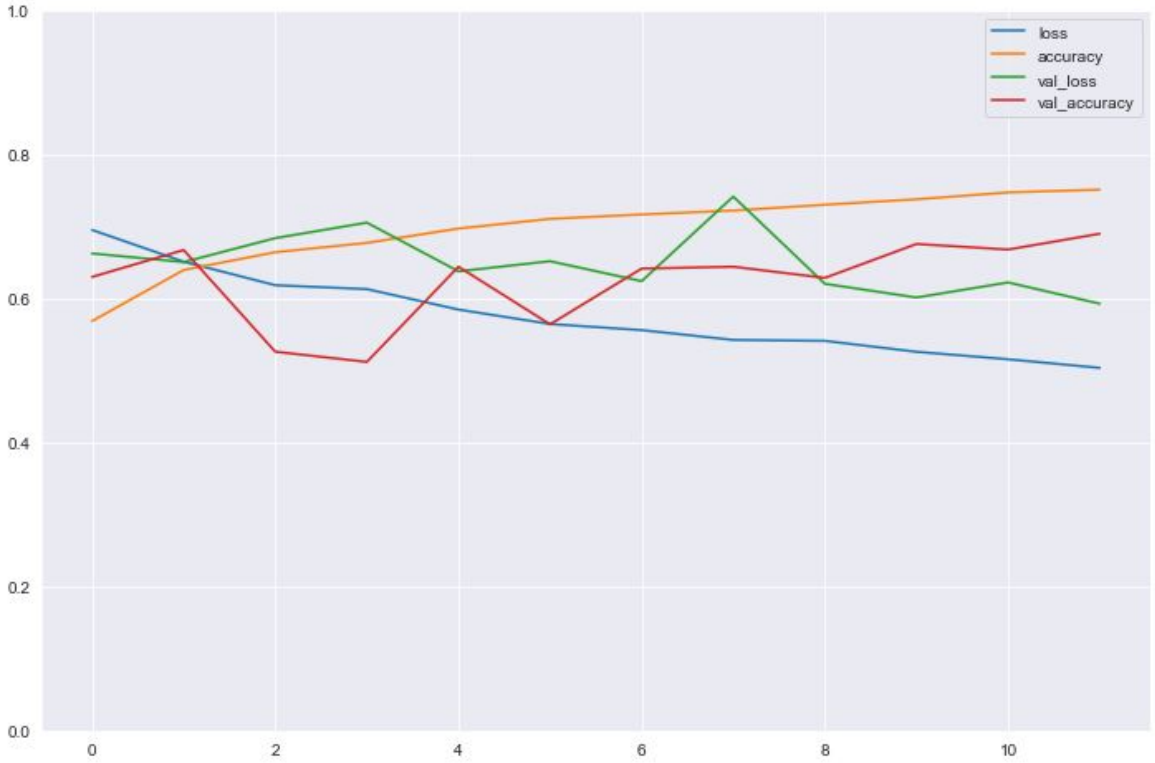


0 = Wildfire Area
1= Non-Wildfire Area

Model accuracy = 51.67%

Model Loss = 79.11 %

Accuracy and Loss Metrics:

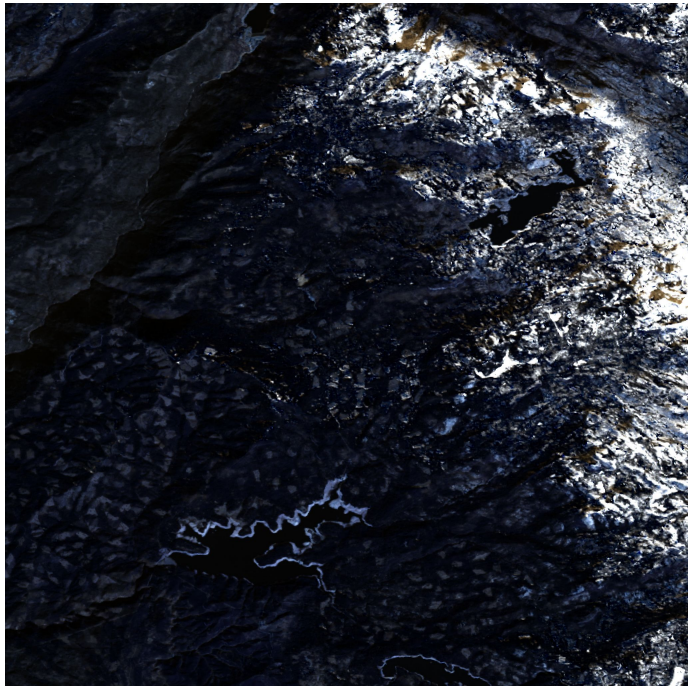


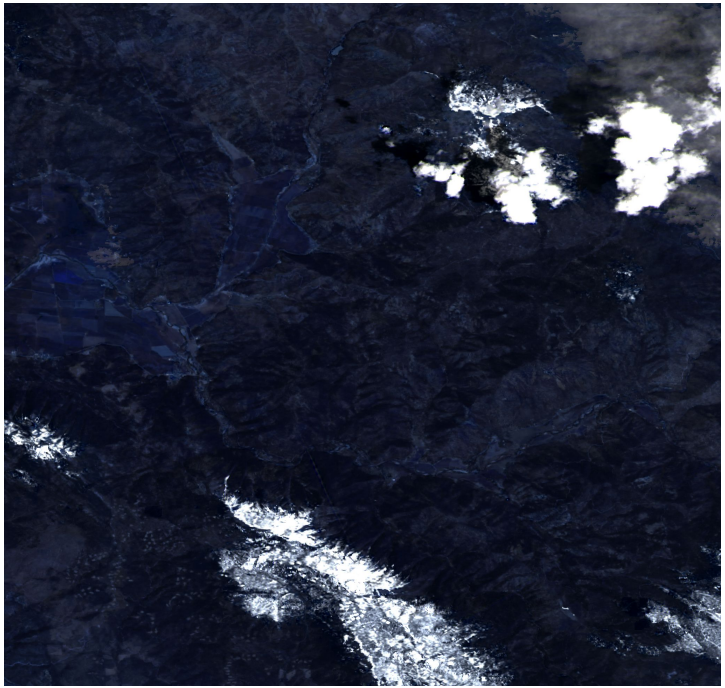
Evaluation:

- Model performed just about as well as performing a coin toss.
- We need a wider range of features and parameters to train on.
- Significant overlap between Wildfire Areas and Non-Wildfire Areas
- Model is likely finding that Wildfire Areas are just as combustible as Non-Wildfire Areas.

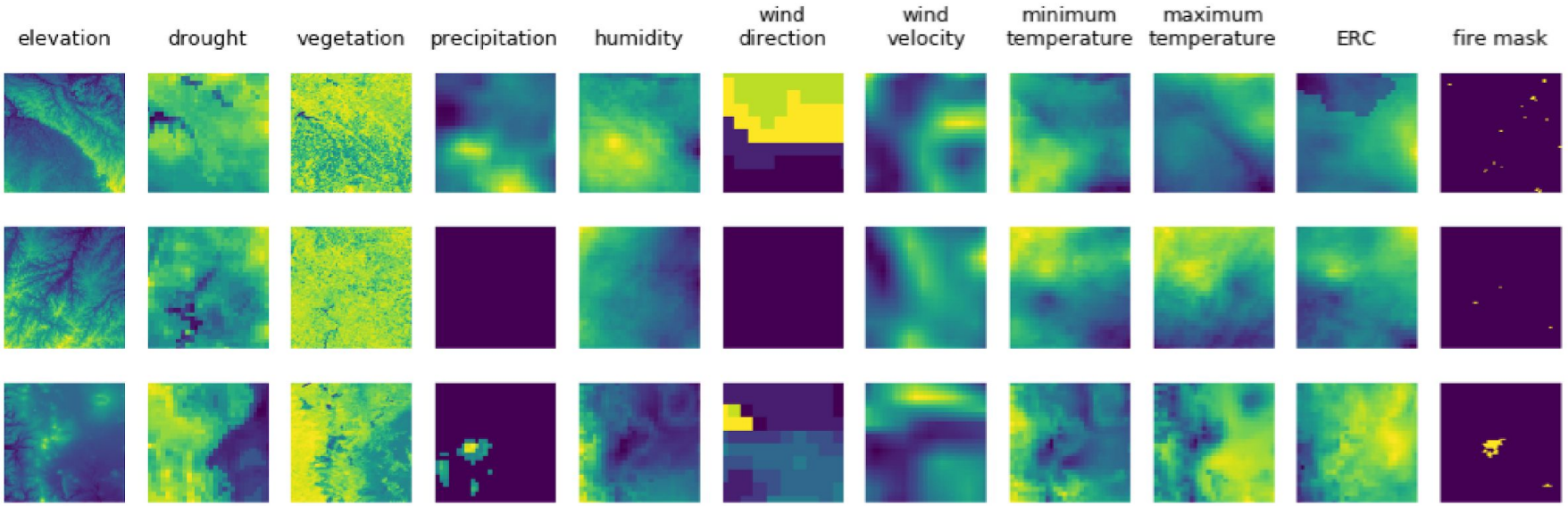
Evaluation (cont'd)

NASA Historical Satellite Images



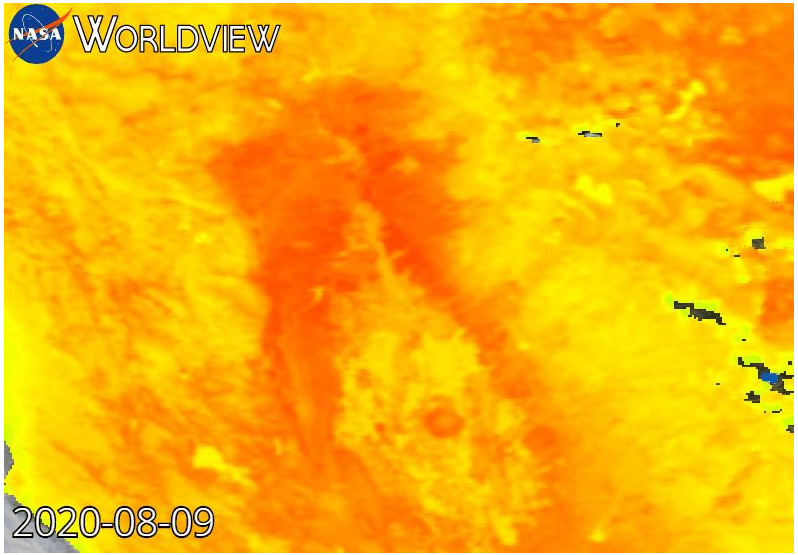


Next Steps:



Source: Images are from a Google/ Standford University partnership study.
https://arxiv.org/pdf/2010.07445v1.pdf

Surface Temperature



Vegetation Index

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