



FLARE

Fire Likelihood and Risk Estimation

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The Problem



7.4 million acres burned annually



\$2.4 billion in damages a year



Thousands of lives affected

Goals



Research

different machine learning models



Develop

accurate approaches to wildfire prediction



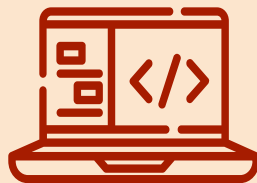
Visualize

fire risk for individual or professional use

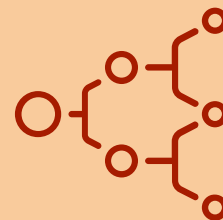
Existing Solutions



Mathematical
Models



Traditional Machine
Learning



Deep Learning
Approaches

Datasets



UCSB

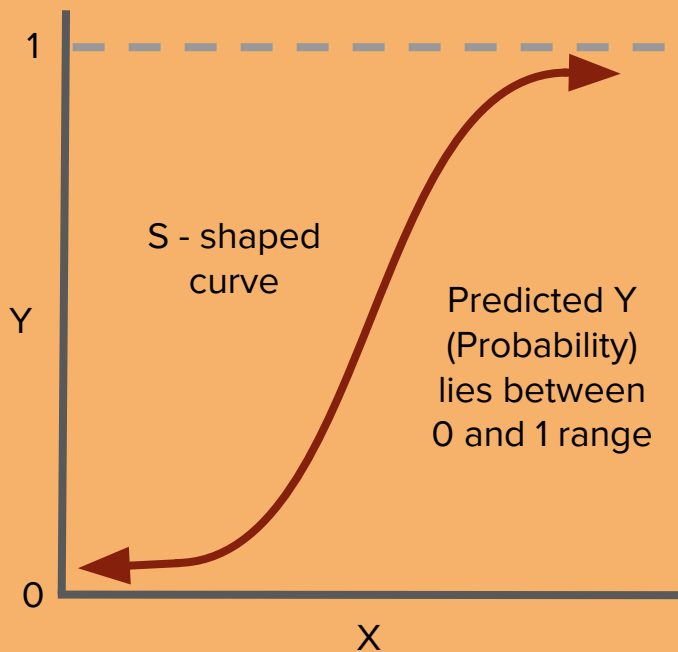
Special thanks to
Dr. Isaac Park



Google
Earth
Engine

Logistic Regression

Baseline Model



Trained from 2003-2013



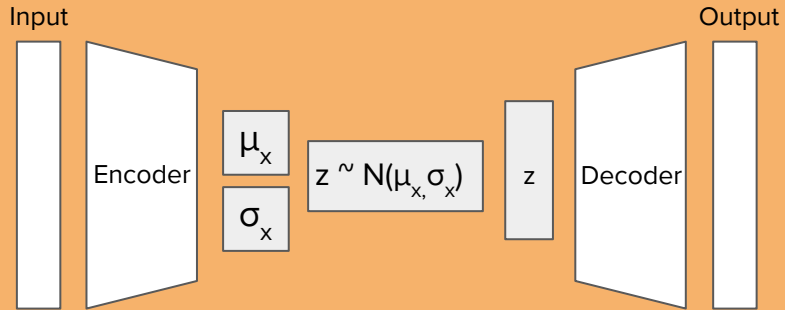
Predictions for 2014-2017



Average ROC/AUC Score: 0.68

Variational Autoencoder

Spatial Dependencies



Preprocessed data into images



Average AUC: 0.75

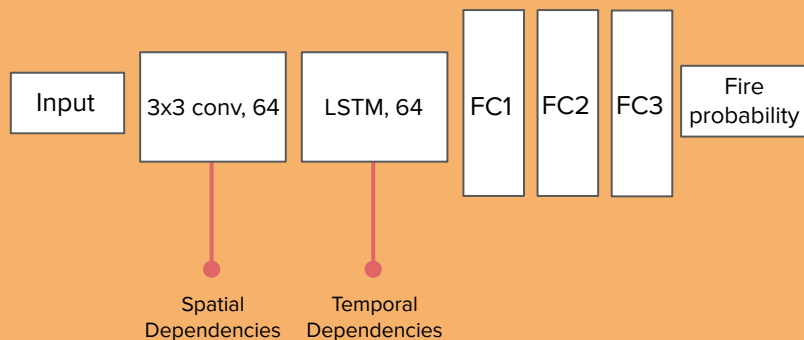


10% improvement over LR

LSTM + CNN Hybrid

Spatial & Temporal Dependencies

Model Architecture



Loss function

$$L = |y_{\text{true}} - y_{\text{pred}}| \times \min(10^5, \max(1, 10^{(y_{\text{true}} - y_{\text{pred}})} \times 100/k))$$

Average AUC: 0.79



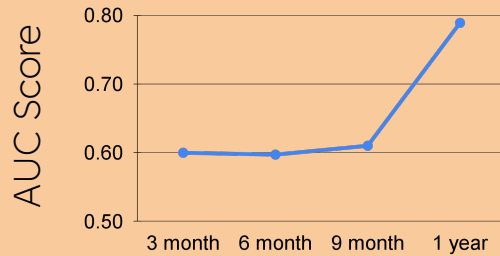
5% increase over VAE



16% increase over LR

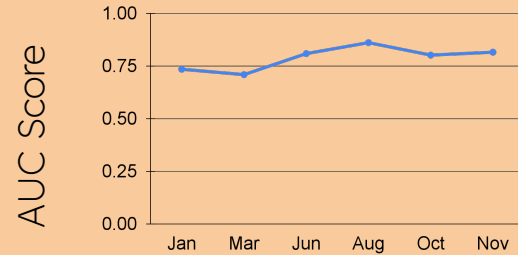
Further Analysis

Effect of Varying Sliding Window Sizes



Sliding Window Size

Effect of Time of the Year on Model Performance



Evaluation Month

The image features a solid orange background with a white outline map of the world. The map is centered and shows the continents of North America, South America, Europe, Africa, Asia, and Australia. In the center of the map, the word "DEMO" is written in a large, bold, white, sans-serif font.

DEMO

Conclusion



- Outperformed existing models by 2.6%



- Applicable for property/area fire risk assessments



- Interactive visualizations for California



THANK YOU

Be aware, be prepared, trust Flare