DSE 260B Capstone Project
Wifire Group

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Project Goals

Objective

- Produce a surface fuel map for areas in San Diego County using data from satellite imagery that can be utilized in the WIFIRE fire behavior model

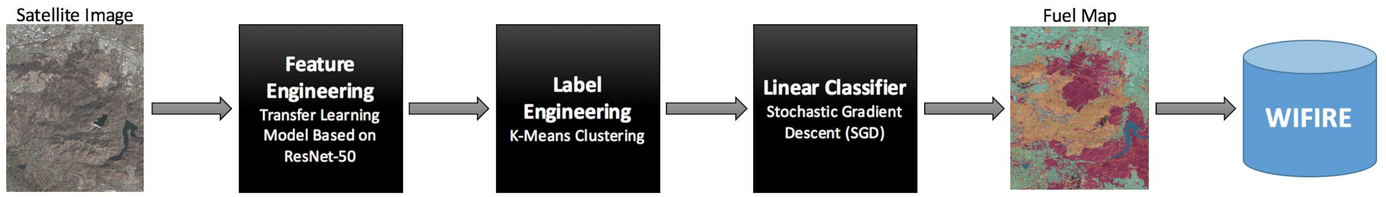
Business Problem

- Current surface fuel maps used by WIFIRE provided by LANDFIRE every two years.
- Vegetation changes rapidly within 2 year span.
- Fuel maps available at higher temporal frequencies are desired
- Need to build a model that can classify surface fuels using satellite images

Proposed Solution

Solution Workflow

- This project did not create a single model but instead a solution workflow that begins with satellite data, performs feature engineering, assigns fuel labels through clustering and finally uses linear classification to model surface fuels



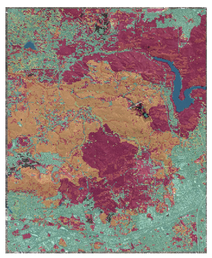
Data Sources

Digital Globe:

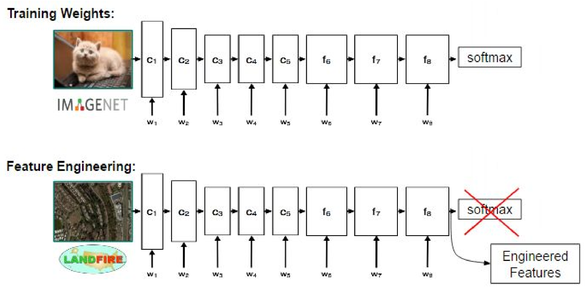
HIgh Resolution (0.5m) Satellite Imagery

LANDFIRE:

Surface Fuel Maps at 30m Resolution



Transfer Learning With ResNet-50



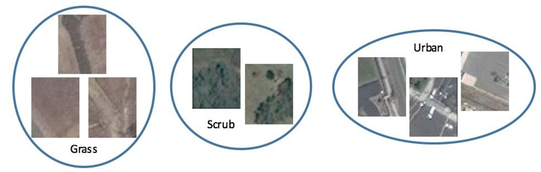
K-Means Clustering

Issues with LANDFIRE

- Inconsistencies within LANDFIRE fuel labels were unconducive for building an accurate model

Label Engineering

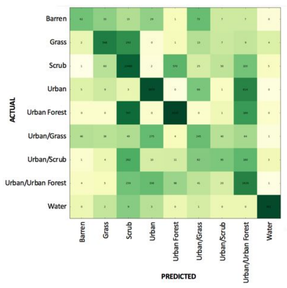
- A series of K-Means clustering rounds enabled team to replace LANDFIRE labels with newly developed fuel categories.



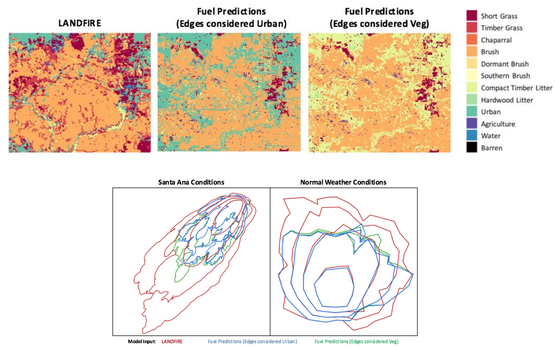
Stochastic Gradient Descent

Linear Classification Model

- A consequence of feature engineering with ResNet-50 is that a linear decision boundary effectively separates the classes
- Fast computational speed and high memory efficiency
- Achieved 83% classification accuracy after parameter tuning and 5 fold cross validation



WIFIRE Fire Behavior Model



Future Work

Potential

- Provide mechanism to improve accuracy at edge cases, such as higher resolution models and human in the loop (HITL).
- Add additional GIS layers for improved accuracy across roads, bridges, and waterways.