EARTHQUAKES

PREDICTING BUILDING DAMAGE RISK

By: Bradly Horn

OVERVIEW

A magnitude 7.8 earthquake struck Nepal on April 25, 2015, and 17 days later another hit of 7.3 magnitude.

- 9,000 people died
- 22,000 suffered injuries
- 600,000 homes destroyed
- 288,000 buildings damaged

Hundreds of thousands of people faced poverty and homelessness.

BUSINESS PROBLEM

- Federal Democratic Republic of Nepal
- Avoid Damage
- Reinforcing Home and Building

DATA UNDERSTANDING

Dataset comes from Driven Data and Nepal Earthquake Open Data Portal.

- Largest dataset on earthquakes.
- Over 260,000 rows
- 38 different features

Target: Damage Grade	
Grade 1	Low Damage
Grade 2	Med Damage
Grade 3	Complete Destruction

DATA PREPARATION: Issue

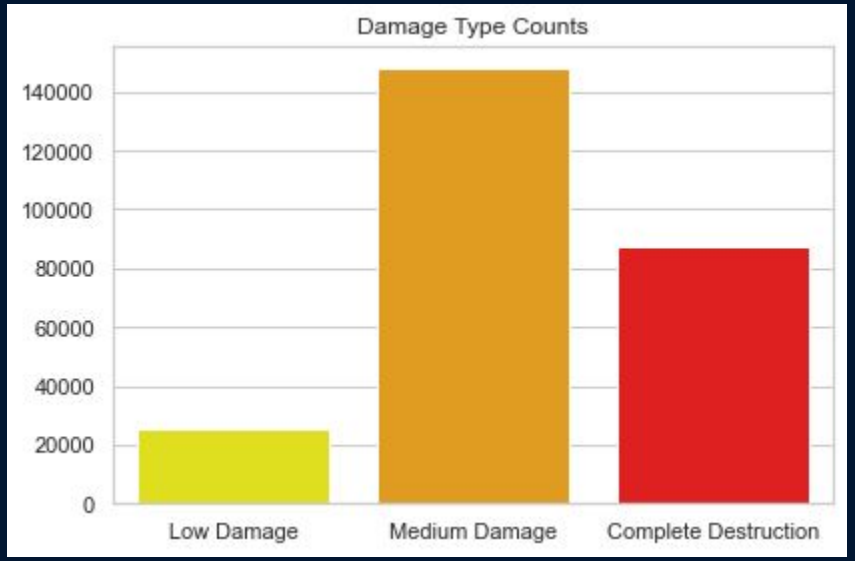
Categorical Features

- Random Obfuscated Variables
- Land Surface Condition
  - Obfuscated Value:
    - t, n, o
  - Plausible Value:
    - Flat, Moderate Slope, Steep Slope

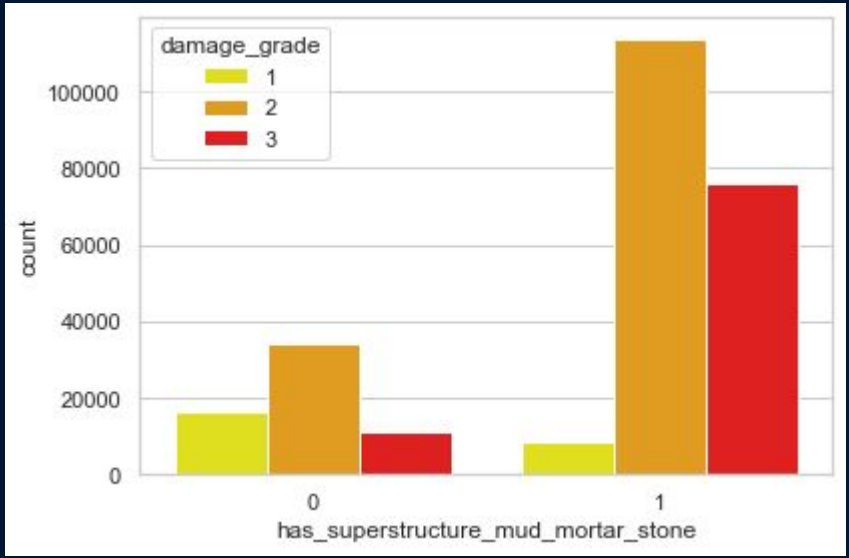
DATA PREPARATION: Solution

	Data Driven	Original	Ratio
1st Value	t	Flat	83%
2nd Value	n	Moderate	14%
3rd Value	o	Steep	3%

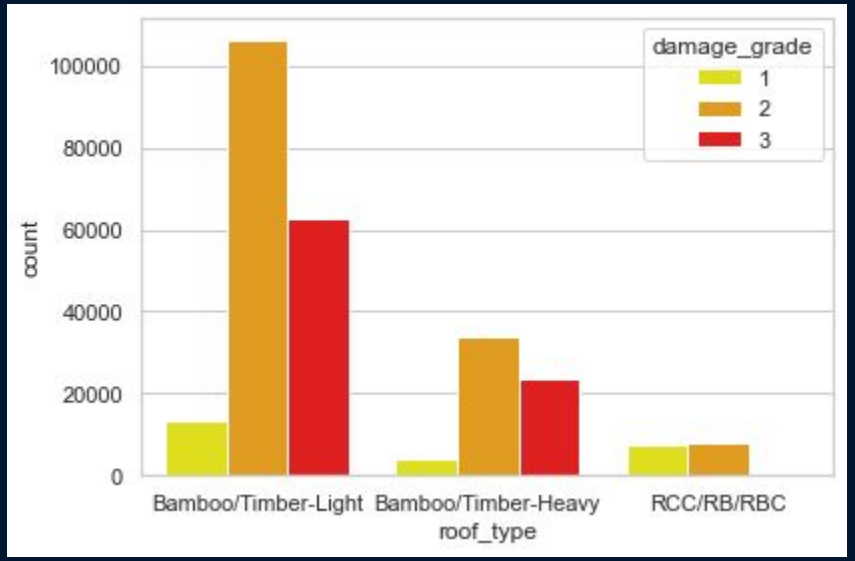
Exploratory Data Analysis: Class Count



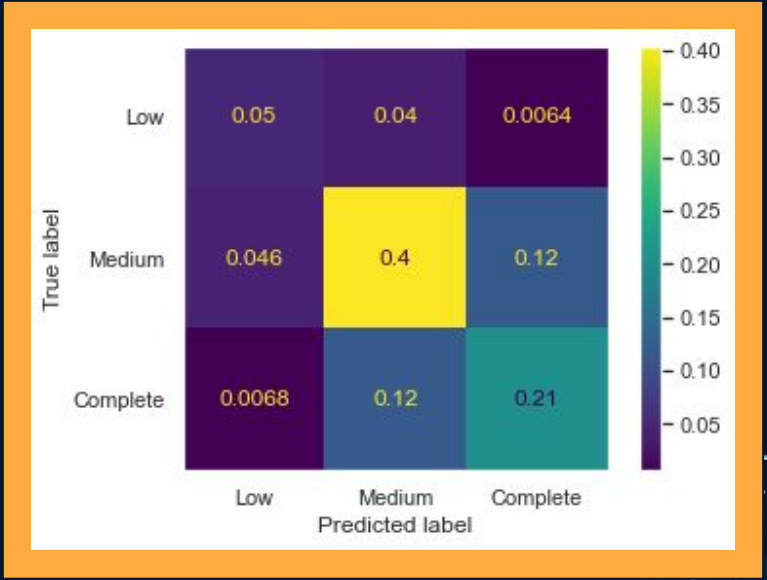
Exploratory Data Analysis: Superstructure Features



Exploratory Data Analysis: Roof Type



MODELING:
First Simple Model



16.5%

False Negative Percentage

61.5%

FSM Recall Score

MODELING: Vanilla Models

64.1%

Random Forest Classifier

68.8%

KNeighbors Classifier

52.7%

Gaussian NB

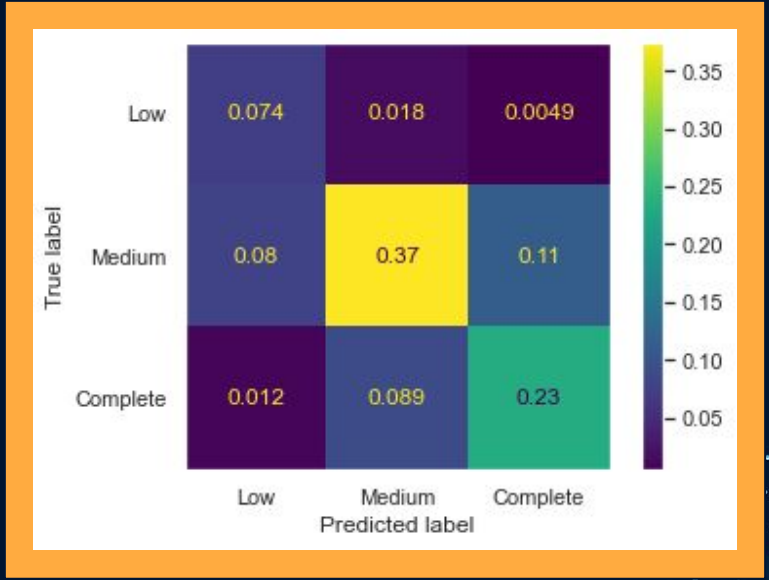
44.7%

Logistic Regression

64.5%

XG Boost Classifier

Evaluation: Final Model



13.3%

False Negative Percentage

70.8%

FSM Recall Score

EVALUATION: Feature Importance

Top 3 Features

Roof Type: 9.7%

Foundation Type: 9.6%

Other Floor Type: 1.3%

Feature	Importance
Roof	9.722%
Foundation	9.610%
Other Floor	1.320%
Position	0.162%
Land Cond	0.114%
Geo Lv1	0.076%
Floor Counts	0.076%
Geo Lv2	0.056%
Plan Config	0.047%
Family Counts	0.045%

NEXT STEPS

For This Model

- Further Model Tuning
- Neural Network
- Front End App

Earthquake Prone Area

- China
- Japan
- United States

THANKS!

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