Using Google Street View as a baseline for damage assessment.

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What is FEMA?

- **Federal Emergency Management Agency**
- Created in April 1, 1979
- **MISSION**: preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror.
- **VISION** - "A Nation Prepared."

Problem Scenario

- After a huge disaster, quality of life can be seriously affected
  - Katrina Hurricane and flood, Sonoma Fire, Mississippi floods, etc.
  - Every day basic needs can be scarce
    - Food, Clothing, Housing
  - Recovering is a challenge
    - Receiving funds/support is to rebuild is **NECESSARY**

Objective

Our goal is to use photographs that have been obtained from Google Street View pre disaster to gauge an estimate of total damages so that necessary aid can be given to those affected by natural disasters.

Our Solution

- To create a Web/Phone based App for preliminary damage evaluation
  - Easily Accessible by both client and damage surveyors

Big Picture

-Name/Address
-Income
-Property Value
-Insurance info
-Damage Photos

INPUTS → **PROCESS** → **OUTPUT**

-Evaluation
-Grant Amount

Using Google Street View
(Pre-Disaster)

Google Street View is a technology that provides interactive panoramas from positions along many streets in the world.

Street-level imagery **from the past** - 10 year window for most locations (e.g 2008 -2018)

Images (Post Disaster)

We used imagery gathered through Google Search. Properties have multiple stages of damage:

- Fully intact/no damage
- Partially damaged
- Fully damaged/unrepairable
- Rubble
- Weather Conditions

Using Google's Vision API to obtain labels

house_18.jpg

Home	99%
Property	99%
House	98%
Building	94%
Real Estate	92%
Residential Area	86%
Siding	85%
Roof	80%

Googlized Words

|	A	B	C	
1		Image	TRUE	Words
2	0	08_100.jpg	1	['House', 'Home', 'Building', 'Architecture', 'Tree', 'Roof', 'Vehicle', 'Cottage', 'Wheel', 'Shed']
3	1	21_25.jpeg	1	['Property', 'Real estate', 'Facade', 'Building', 'House']
4	2	01_100.jpg	1	['Roof', 'Lumber', 'Property', 'Wood', 'Home', 'Residential area', 'Scrap', 'Waste', 'Land lot', 'House', 'Demolition']
5	3	07_25.jpg	1	['House', 'Property', 'Building', 'Home', 'Roof', 'Shed', 'Architecture', 'Siding', 'Facade', 'Real estate', 'Residential area', 'Window', 'Co
6	4	13_50.jpg	1	['Land vehicle', 'Vehicle', 'Car', 'Luxury vehicle', 'Automotive design', 'Mid-size car', 'Supercar', 'House', 'Personal luxury car', 'Perfo
7	5	11_100.jpg	1	['Earthquake', 'Geological phenomenon', 'Rubble', 'Ruins', 'Demolition', 'Waste', 'Event', 'Building', 'House']
8	6	15_25.jpg	1	['House', 'Property', 'Home', 'Real estate', 'Roof', 'Siding', 'Building', 'Tree', 'Cottage', 'Farmhouse', 'Rural area', 'Land lot', 'Barn']
9	7	01_50.jpg	1	['House', 'Home', 'Property', 'Building', 'Siding', 'Rural area', 'Residential area', 'Roof', 'Cottage', 'Real estate', 'Architecture', 'Sky', 'L
10	8	2_100.jpg	1	['Property', 'House', 'Geological phenomenon', 'Earthquake', 'Home', 'Roof', 'Event', 'Real estate', 'Facade', 'Building', 'Siding']
11	9	23_25.jpg	1	['Home', 'Property', 'Flood', 'House', 'Land lot', 'Roof', 'Event', 'Real estate', 'Cottage', 'Building', 'Rural area', 'Floodplain', 'Geologica
12	10	16_75.jpg	1	['Home', 'House', 'Roof', 'Building', 'Real estate', 'Geological phenomenon', 'Stock photography']
13	11	14_0.jpg	0	['Home', 'House', 'Property', 'Residential area', 'Real estate', 'Building', 'Estate', 'Roof', 'Architecture', 'Mansion', 'Suburb', 'Sky', 'Driv
14	12	flood_1.jpeg	1	['Water', 'Property', 'Flood', 'Home', 'Land lot', 'Watercourse', 'House', 'Event', 'Real estate', 'Estate', 'Building', 'Landscape', 'Floodp
15	13	04_75.jpg	1	['Home', 'House', 'Property', 'Cottage', 'Building', 'Real estate', 'Roof', 'Farmhouse', 'Estate', 'Rural area', 'Land lot', 'Landscape', 'Sh
16	14	09_25.jpg	1	['House', 'Roof', 'Property', 'Building', 'Home', 'Wall', 'Residential area', 'Rural area', 'Architecture', 'Neighbourhood', 'Cottage', 'Faca
17	15	10_0.jpg	0	['Home', 'House', 'Property', 'Residential area', 'Real estate', 'Building', 'Siding', 'Fence', 'Architecture', 'Iron', 'Porch', 'Facade', 'Roo
18	16	14_75.jpeg	1	['Nature', 'Geological phenomenon', 'Vegetation', 'Property', 'Natural landscape', 'Hill station', 'Roof', 'House', 'Real estate', 'Home', '
19	17	10_100.jpg	1	['Geological phenomenon', 'Earthquake', 'Tree', 'Demolition', 'Adaptation', 'Event', 'Shack', 'Home', 'Rock', 'House', 'Village']
20	18	03_50.jpg	1	['Earthquake', 'Demolition', 'House', 'Rubble', 'Ruins', 'Building', 'Shack', 'Home', 'Neighbourhood', 'Event', 'Waste', 'Geological pher

Modeling - What **DIDN'T** work

- OpenCV
- Neural Network
  - Convolution Neural Network

Modeling and Evaluation
- What **DID** work

- CountVectorizer
- Logistic Regression using kfolds and Grid Search

The App: https://fema-damage-report.firebaseapp.com
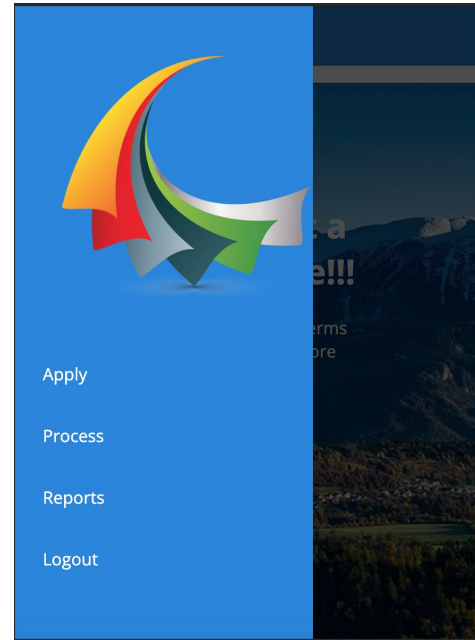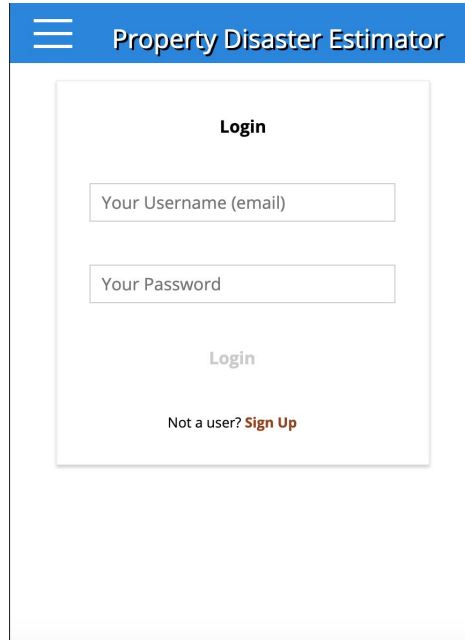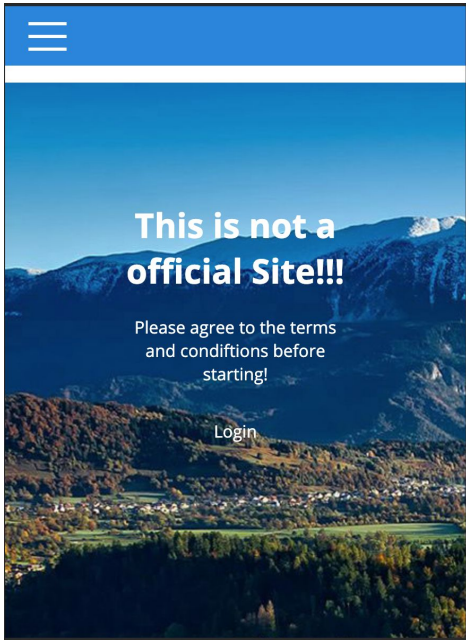
App reports

Property Disaster Estimator   Apply   Process   Reports   Logout

Processed Application Reports

APPID	NAME	ADDRESS	PROPERTY VALUE	INSURANCE	ANALYSIS
1582275478724	Gouri K	2059 Vincenzo Walkway, San Jose, California, 95133	1000	100	Total Loss: 900
1582291679930	Gouri K	331 Destino Cir, San Jose, California, 95133	20000	10000	Property not damaged
1582291889042	Casey	253 Esfahan Ct, San Jose,	100000	120000	Property Damaged,

Technologies used:

- **React**
- **Node.js**
- **Java Script**
- **React Redux**
- **firebase**

- **Google Vision API**
- **Rest API**
- **Rest Server**
- **Python**
- **Flask**
- **Bootstrap (CSS)**

Next Steps

Demo to the client

Gather more data

Test App in situation

Develop APIs to extract data from app for further analysis.