# Classifying Images Post Hurricane using Satellite Imagery

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### The problem we chose:

#### Problem statement

Classifying
buildings post
Hurricane using
Satellite Imagery
and Deep learning
techniques

#### Context

- Damage
   assessment is vital
   to helpers and relief
   workers, post
   hurricane attack
- It allows resources to be allocated efficiently

### The problem

- This process is manual and hence, laborious
- Hence, there arises

   a need to classify
   damaged and
   non-damaged
   buildings efficiently
   and quickly

# Our approach to find a deep learning solution!

Step 1

Step 2

Step 3

#### Gather and explore data!

Our dataset comprised satellite images from "Geo-satellite sensor" and "Geo Bigdata".

Consists of 128x128 top view images of damaged and undamaged houses.

#### Train, test and interpret!

After training, we evaluated the model on the hold out sets.

Reconstructions were used to increase the CNN's interpretability.

#### **Further enhancements!**

We tried to understand research articles that address this issue.

Transfer learning can improve efficiency

Test the model on Hurricane Delta

### Describing the data









Sample images from the dataset. Each image contains three channels (RGB) with dimensions 128x128

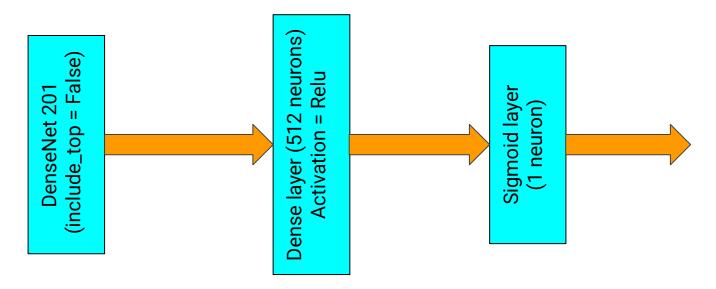
**Train set:** 5000 images in each class with data augmentation

**Validation set:** 1000 images in each class

**Test set 1:** 8000 images in 'damaged' and 1000 images in 'undamaged'

Test set 2: 1000 images in each class

# A peek into the algorithm

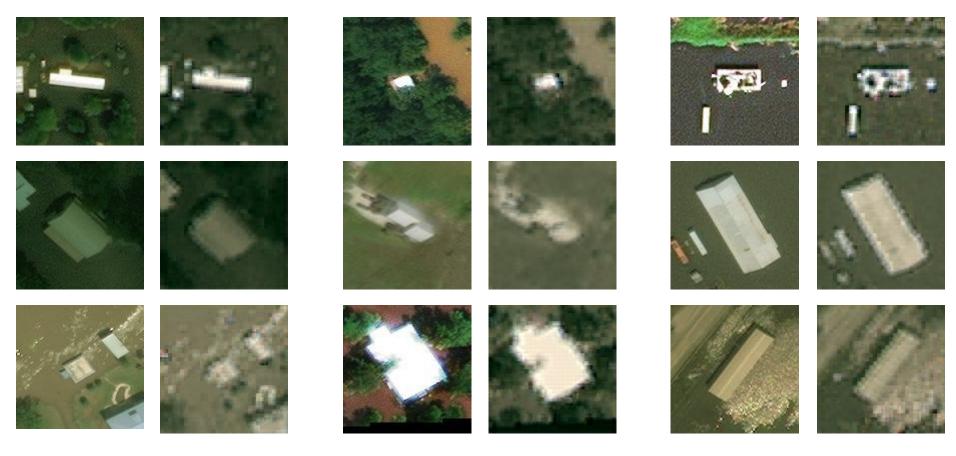


#### **Libraries used:**

- Tensorflow
- Numpy, Pandas, and Matplotlib
- OpenCV
- Tf\_keras\_vis
- Seaborn

# Transpose convolutions as visualisations!

(Original image on the left and the reconstructed image on the right of each column)



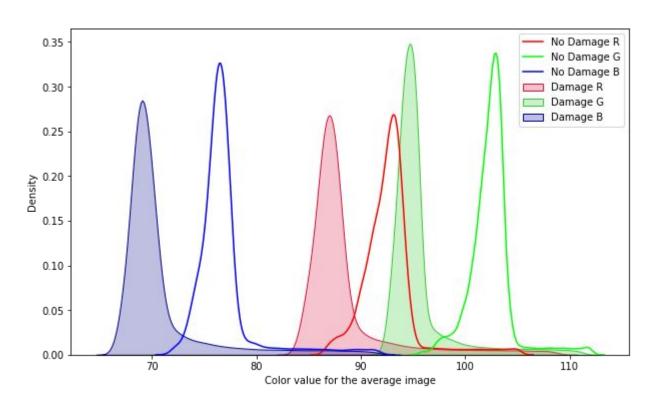
### Result

The model's quality was measured with both true accuracy and Area Under the ROC Curve (AUROC which captures the trade-off between the model's true positive and false positive rates of detection - a helpful tactic when it useful to have more false positives than false negatives.

According to crisis responder feedback, 70% accuracy is the threshold for making high-level decisions in the first 72 hours after the disaster

Category	Accuracy	AUROC
test_another	96.2%	94.6%
test	93.4%	93.9%
validation	93.5%	-

# RGB kde plot



### Future work

- Generalize to different geographies
- Accurately assess damage around the globe
- A system that interacts with local support and expert analysts
- Building localization

### Hurricane Harvey (2017)



Hurricane lota (2020)

