

# Using Satellite Images to Identify Damage

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Austin, TX

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New Light  
Technologies



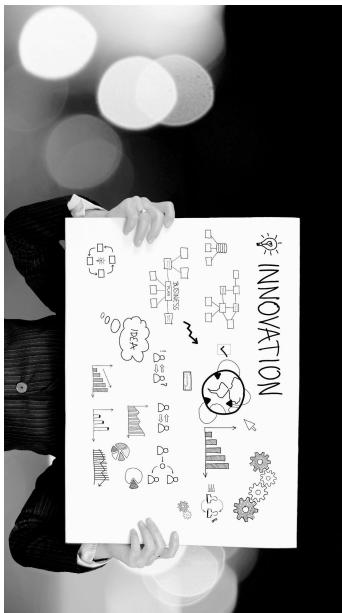
# Partners



**“Helping People, before,  
during and after disasters” -  
FEMA**

**“Building predictive  
analytics that power the  
nation’s federal disaster  
response.”**

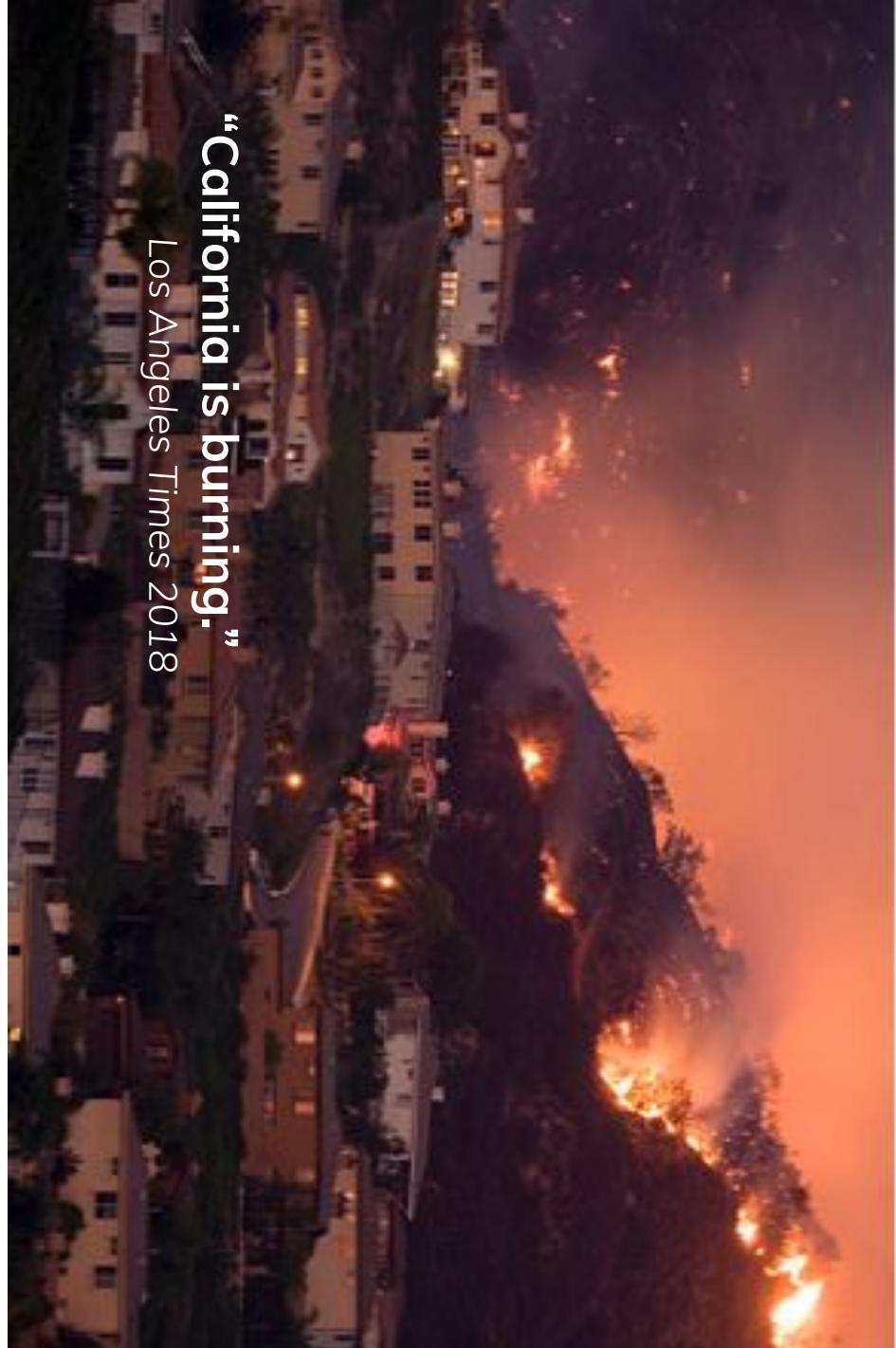
- New Light Technologies



**“... is solution to the global  
skills gap.”**

- Jake Schwartz CEO  
General Assembly

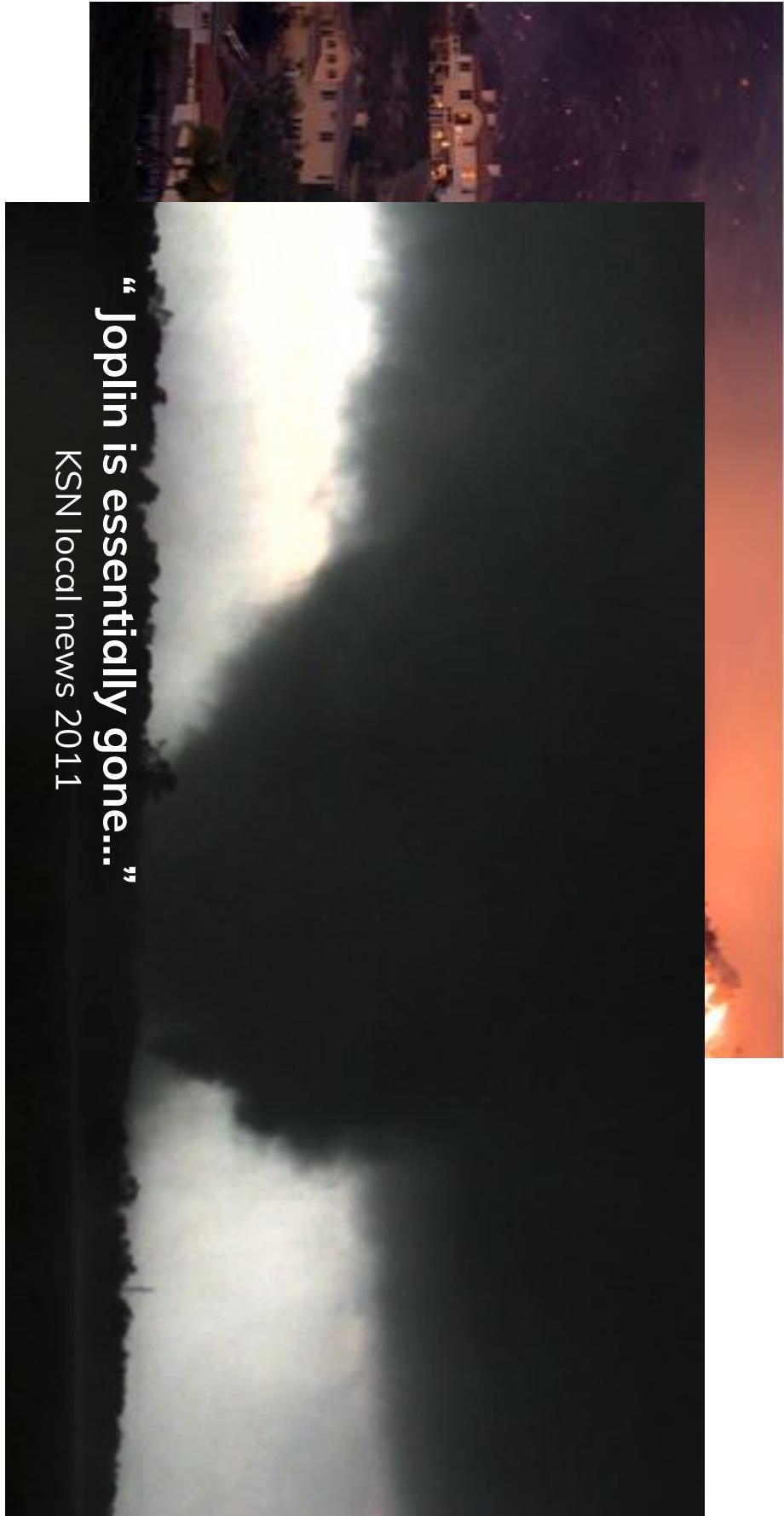




**“California is burning.”**

Los Angeles Times 2018

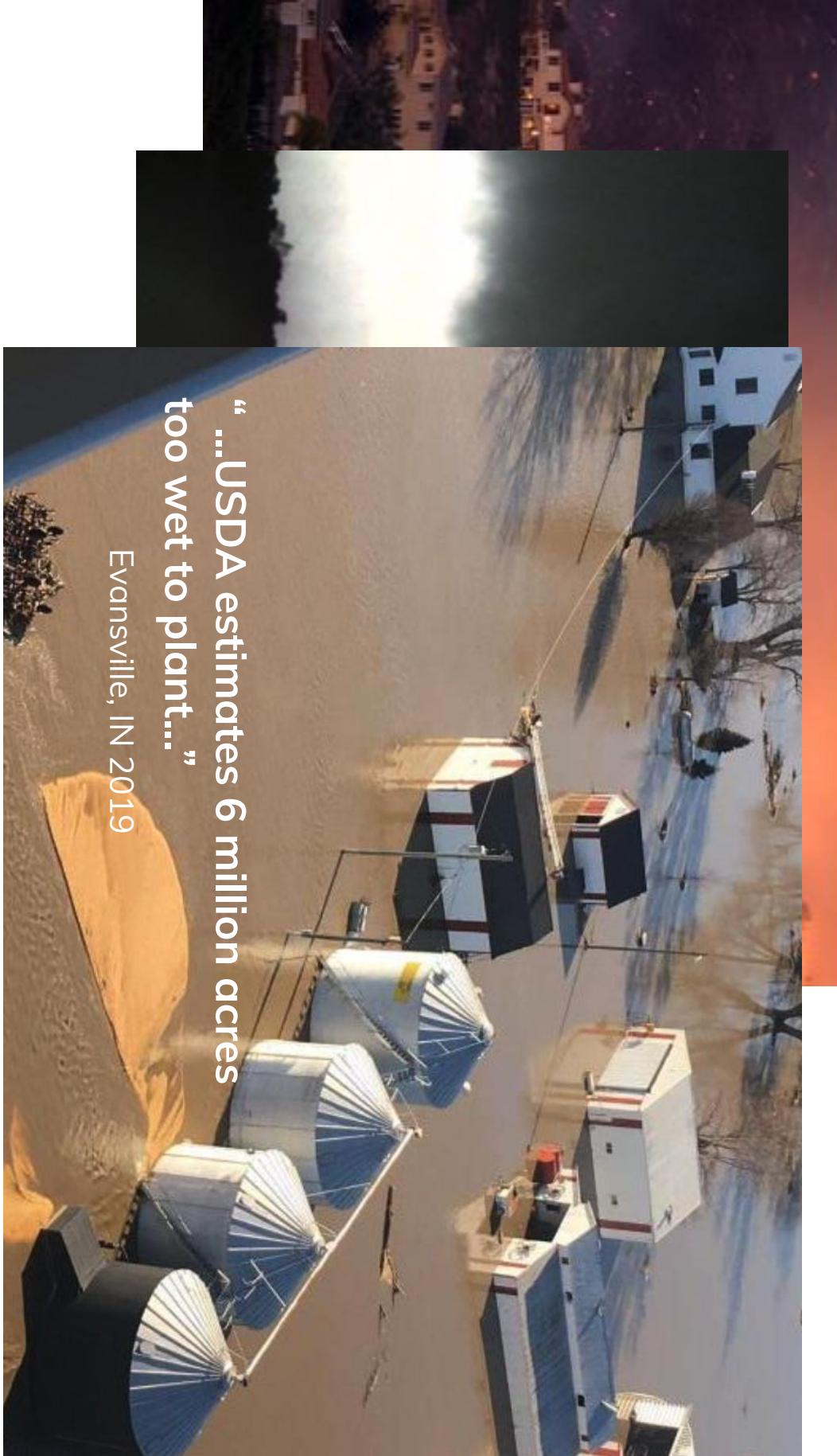




**“Joplin is essentially gone...”**

KSN local news 2011





**“ ...USDA estimates 6 million acres  
too wet to plant... ”**

Evansville, IN 2019

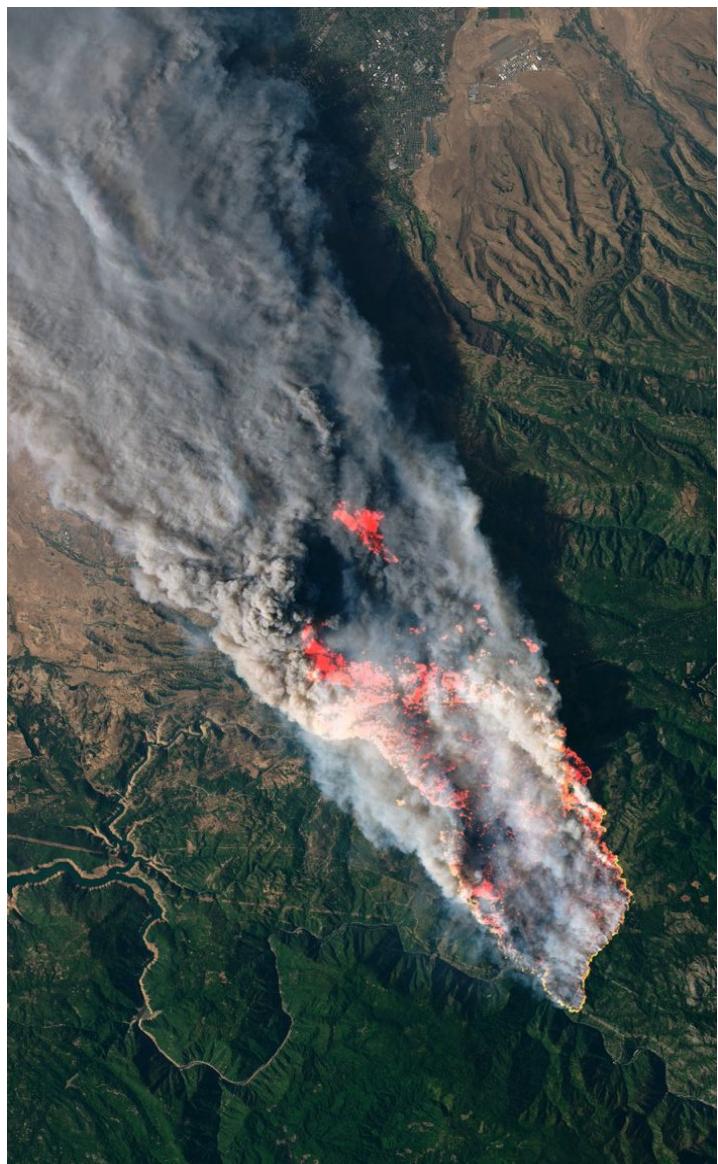


# Problem Statement

Disasters are chaotic. Immediate needs are the search and rescue of survivors.

Knowing how big of an area has been affected is critical to sending necessary resources quickly to where they are needed most.

**We will distinguish affected disaster areas from satellite images.**



The Camp Fire as seen from the Landsat 8 satellite on November 8, 2018



# Agenda

- ❖ Introduction
- ❖ Image Selection
- ❖ Image Transformation
- ❖ Object Detection
- ❖ Next Steps

# Image Selection

Drinnen Love

# Image Selection Process

Finding all the pretty pictures...



Search



Modify



Evaluate

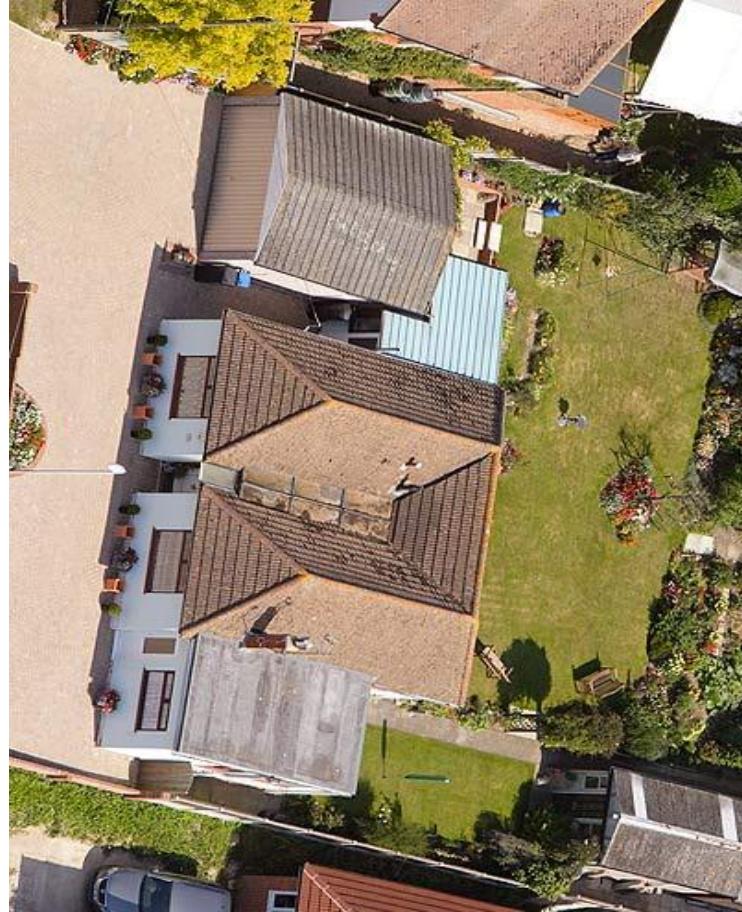
Before and After  
images

Format and  
Resize

SSIM score



Aerial



Satellite



# Image Quality Scores

## SSIM: Structural Similarity Index

An objective quality measurement used for measuring the similarity between two images - a reference image and a processed image.

We were able to **repurpose** the use of the SSIM score to compare the before and after photos.



# Image Processing

Angela Kunanbaeva

# Image Processing Workflow

Using OpenCV, Scikit-Image

Resize & Crop

01

Bounding  
Contours

02

Compare  
Absolute difference

05

04

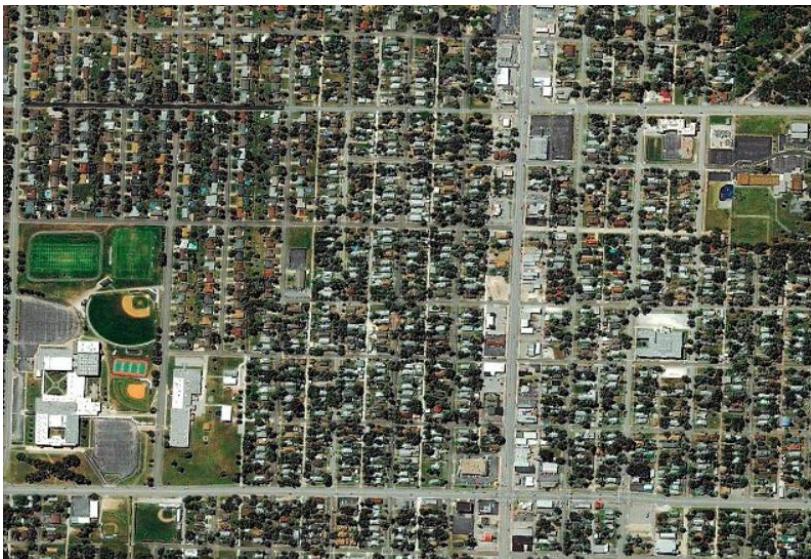
Greyscale

Threshold / Edge

Binary Image



# Step 1: Resize



# Step 2: Compare

Hurricane Harvey in Texas 2017



# Step 3: Threshold

Binarize image

Difference between Images Threshold



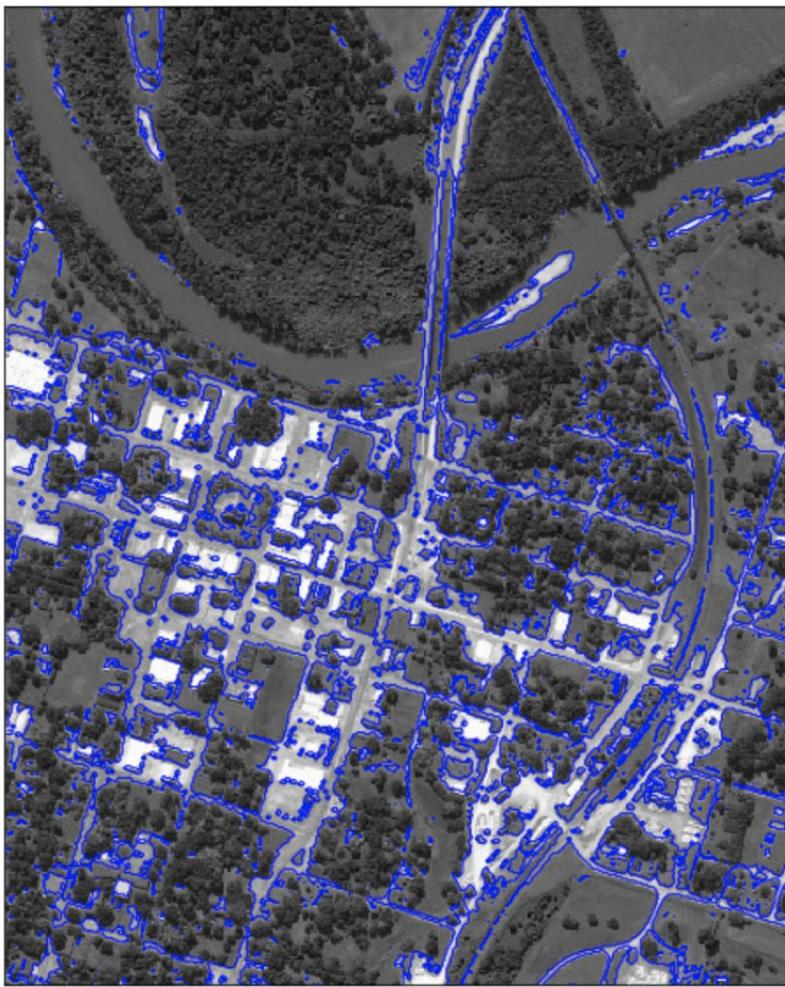
Before Image Threshold



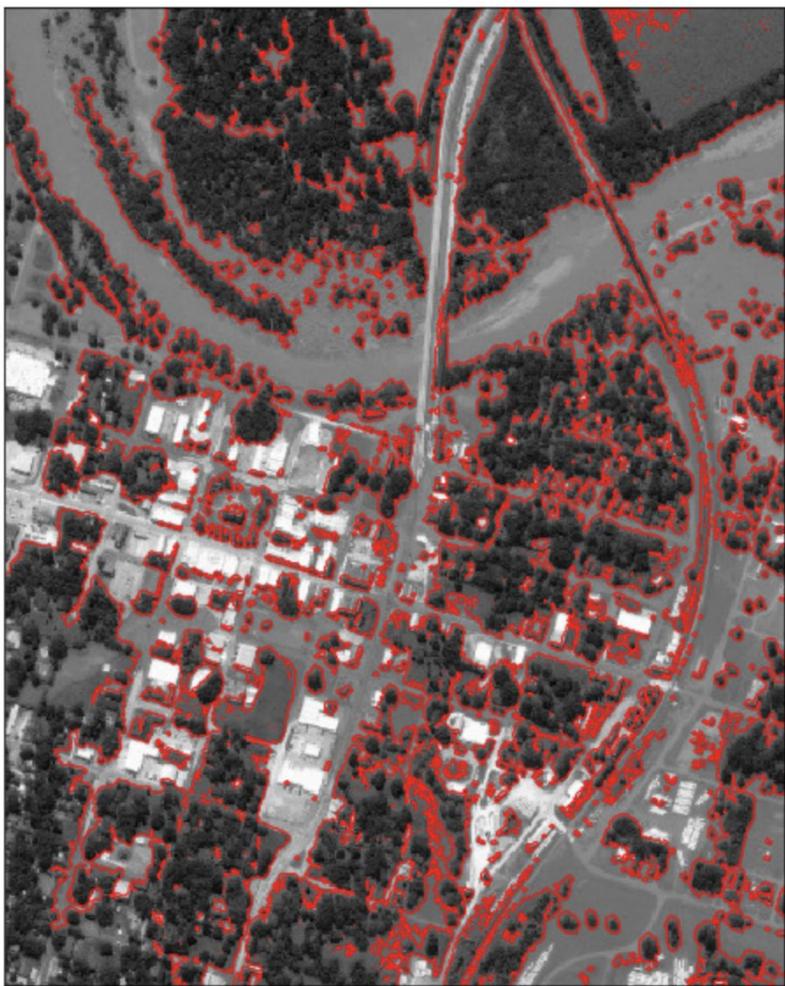
After Image Threshold



# Step 4: Creating contours



Before disaster



After disaster

# Object Detection

Chris Birch

# Model Training for Object Detection



**SVM**  
Binary Mask vs.  
Annotated Image



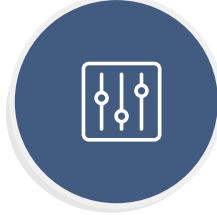
OpenCV

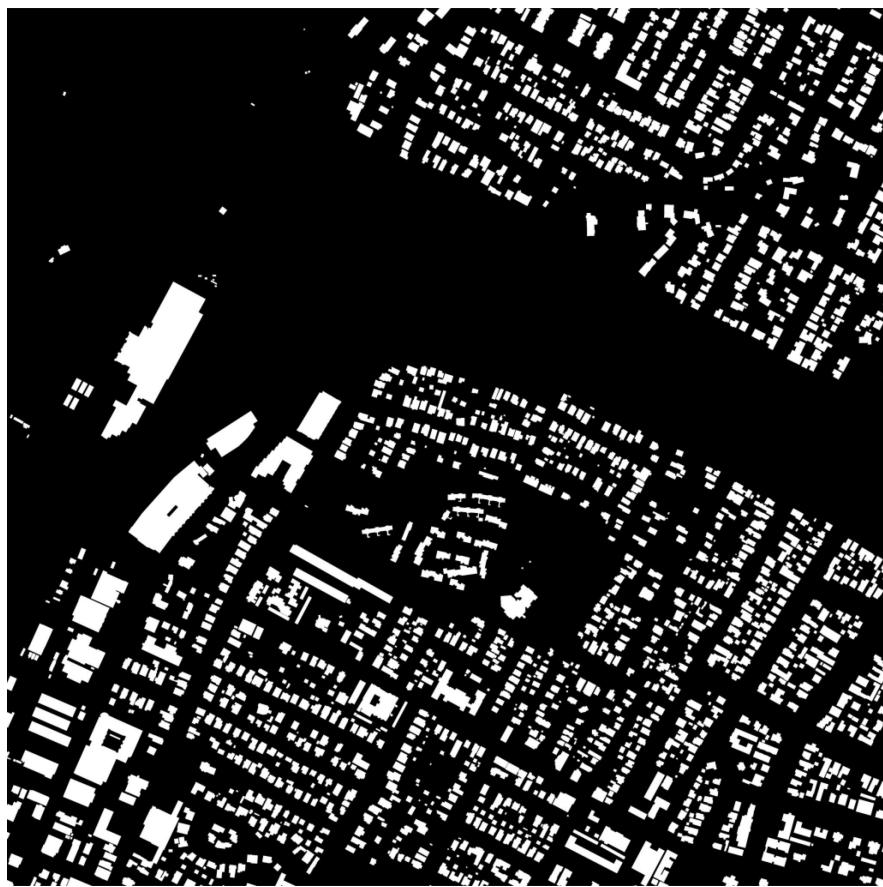
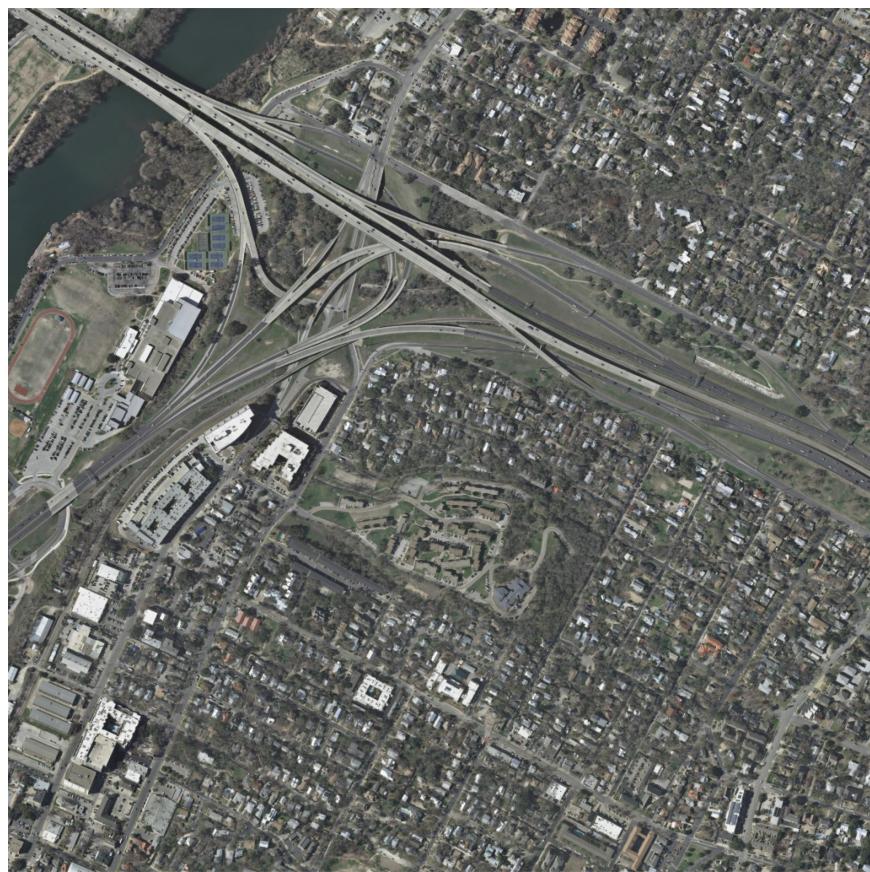


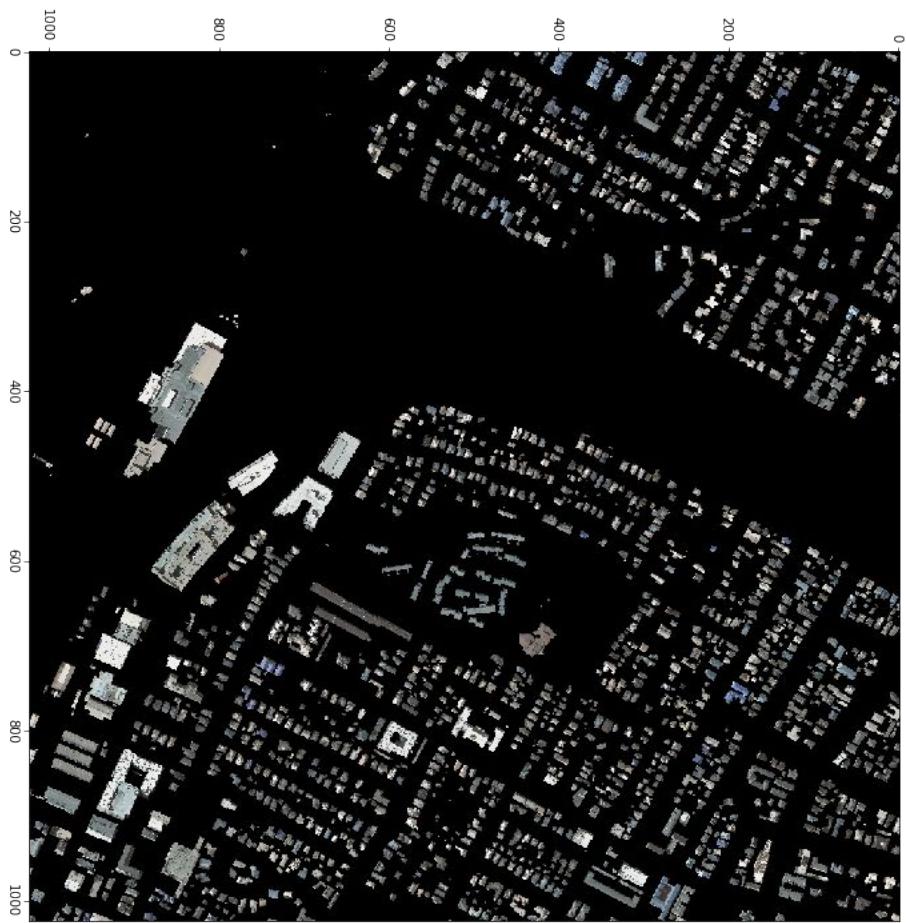
Keras  
Convolutional  
Neural Network

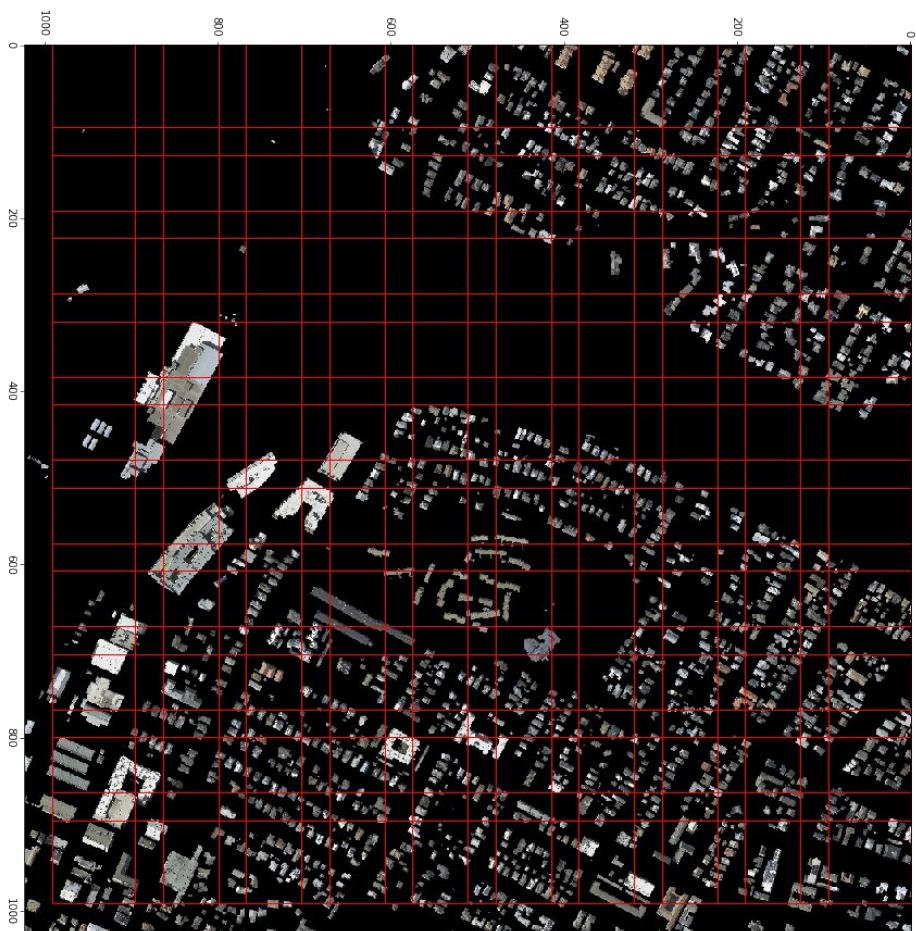
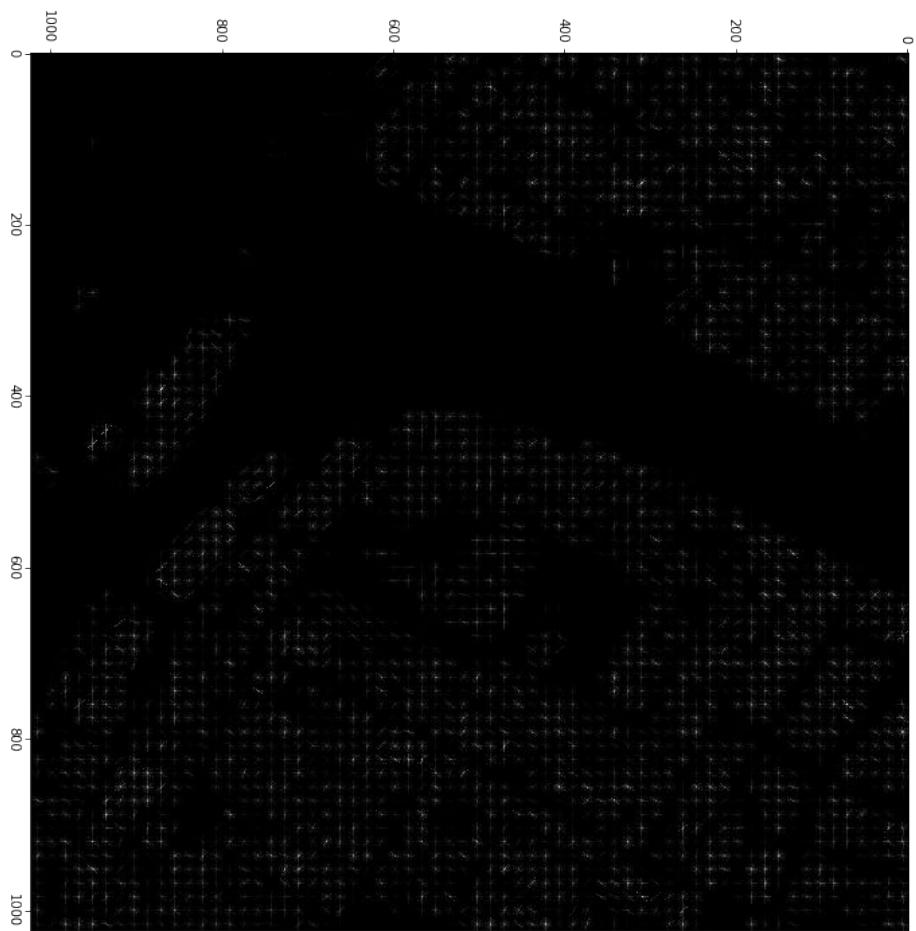


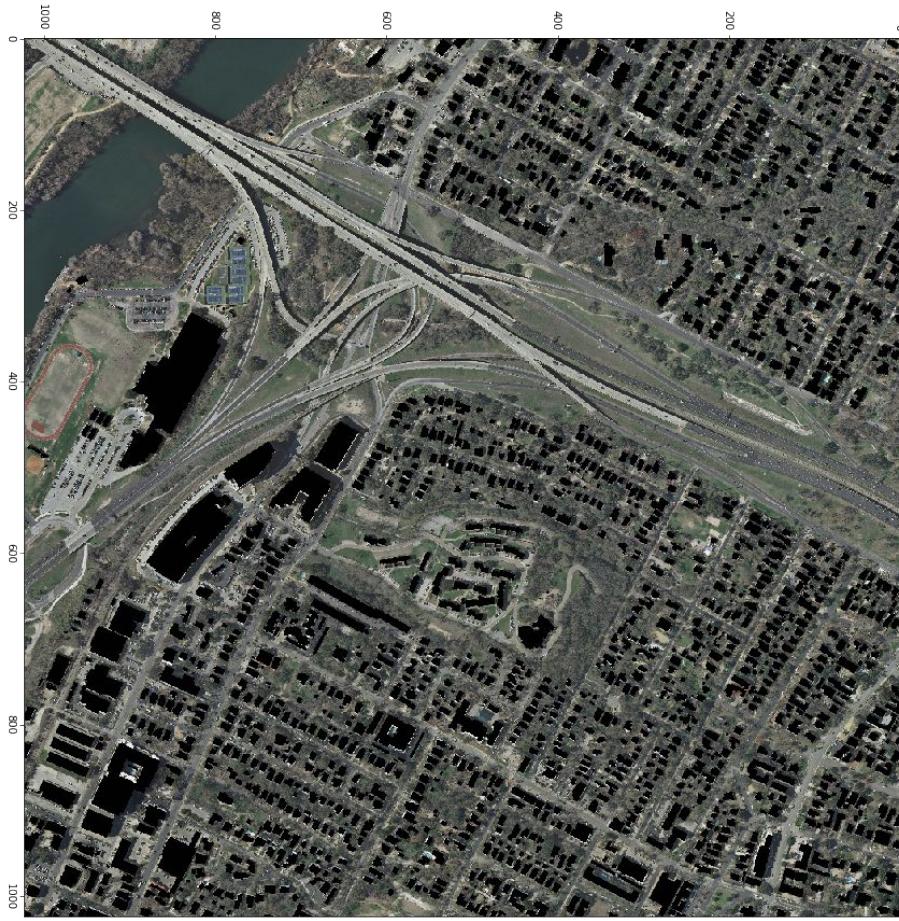
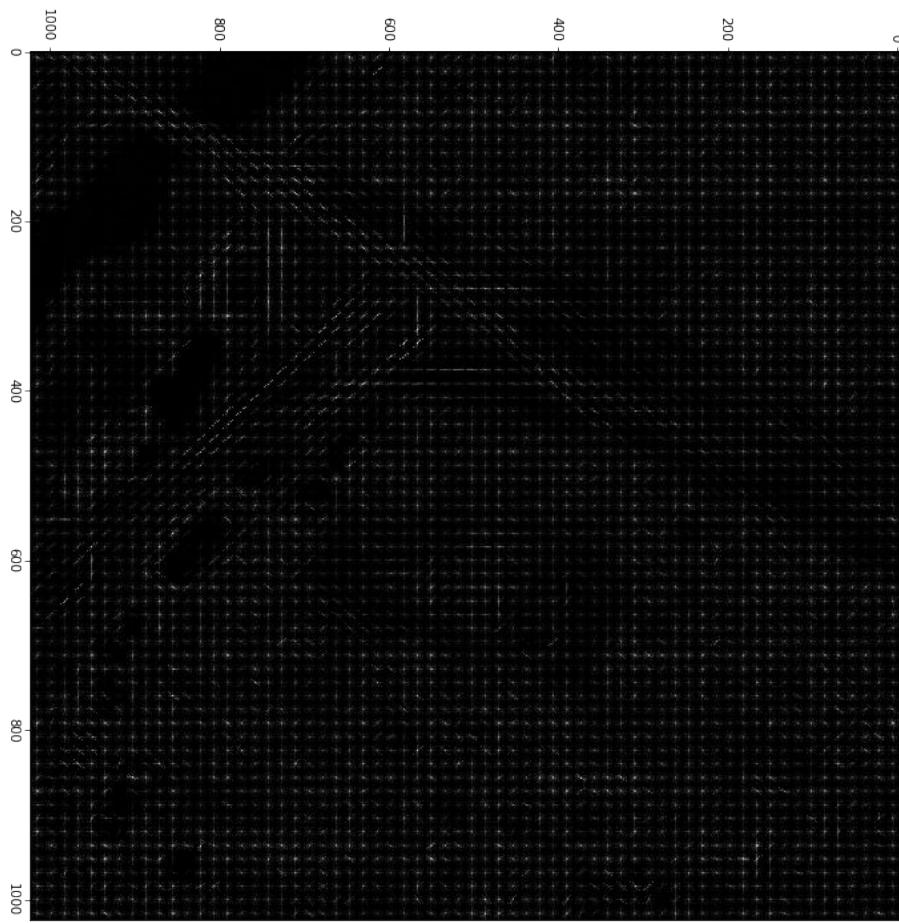
SGDClassifier











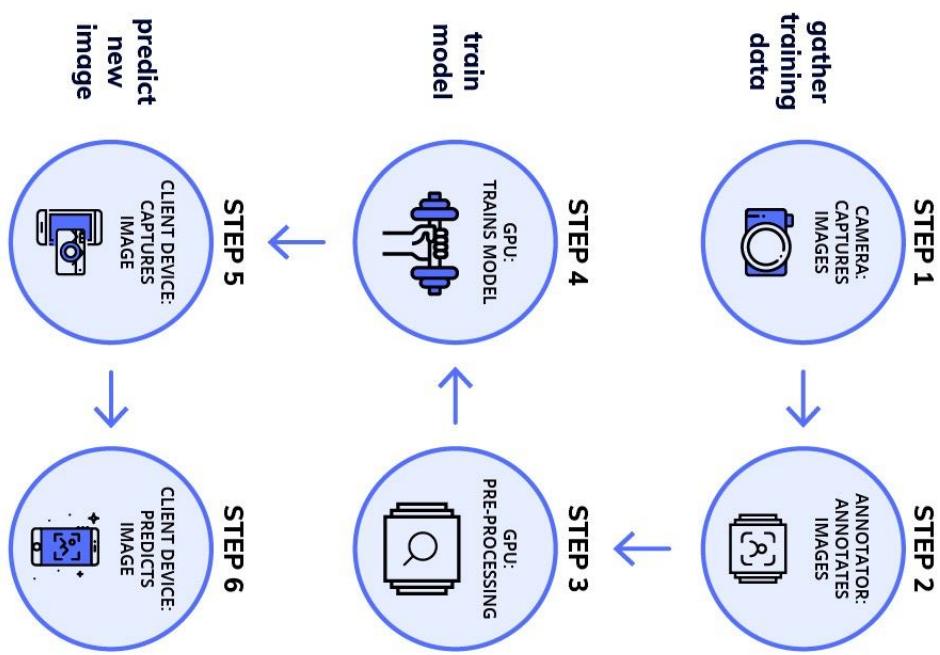


Image source: <https://devblogs.nvidia.com/exploring-spacenet-dataset-using-digits/>

Stroke of:

Genius (Luck)  
((Dumb Luck))



# Wrap Up

Introduction

Image Selection

Image Transformation

Object Detection

Next Steps

# Final Vision



... distinguish affected  
disaster areas from satellite  
images..



Disaster



Decision Makers



On the Ground

# Q & A

