



Application of Image Processing and Big Data Science for Flood Label Detection

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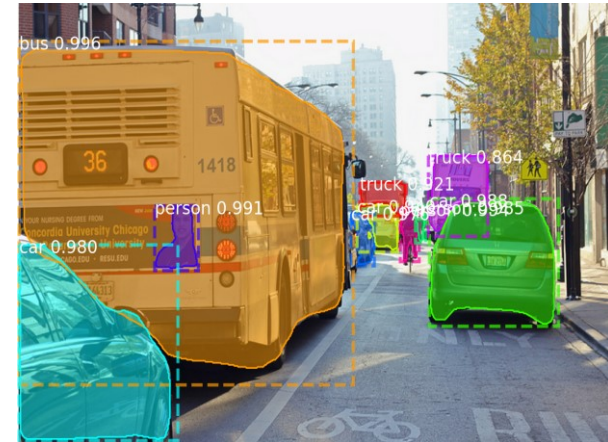
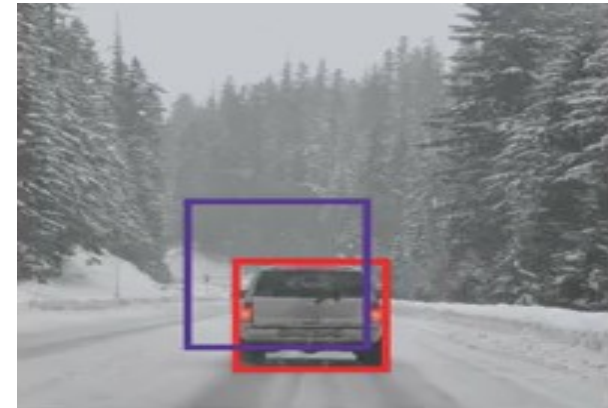
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Why Using Images in Disaster related Research is Important?

- Accurate and efficient flood depth detection is fundamental for rapid disaster management;
- Flood surveillance, social media, and web cameras produce Huge amount of big data;
- Issuing alert and timely information is critical for people safety and real-time decision making.

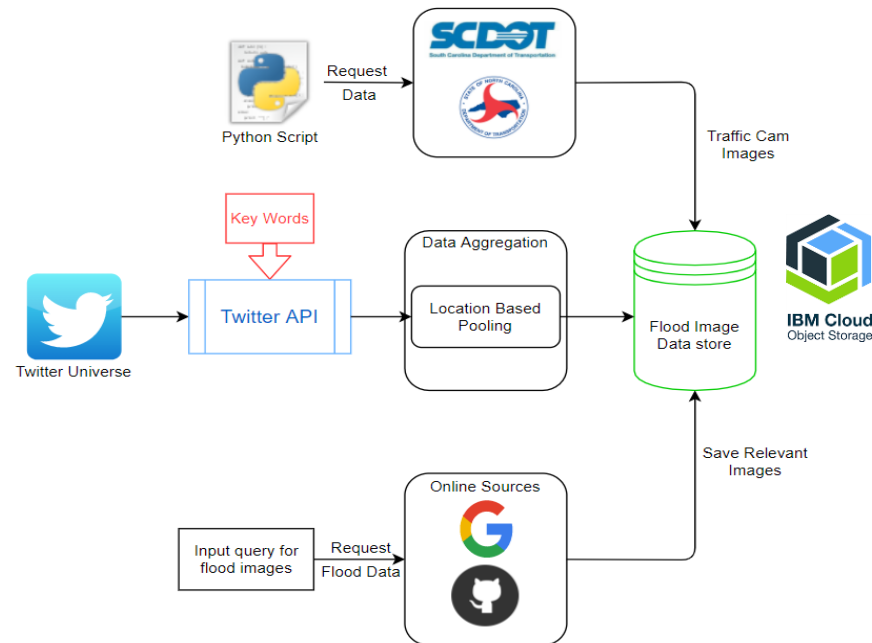
Multimedia images, videos, geotagged texts posted over social media platforms such as Facebook, Twitter, YouTube, Flickr, and other online forums.



- Our developed platform has several smart AI tools and task configurations
- The tool has the ability to predict the labels for large scale datasets.

Data Collection Module

- We built a flood database infrastructure—Our paper is under review!
- Our primary data sources are: European 2013 floods, the Carolinas floods, US traffic cams, image frames extracted from flood related videos, etc.



We built a huge number of images from social media and citizens-based data



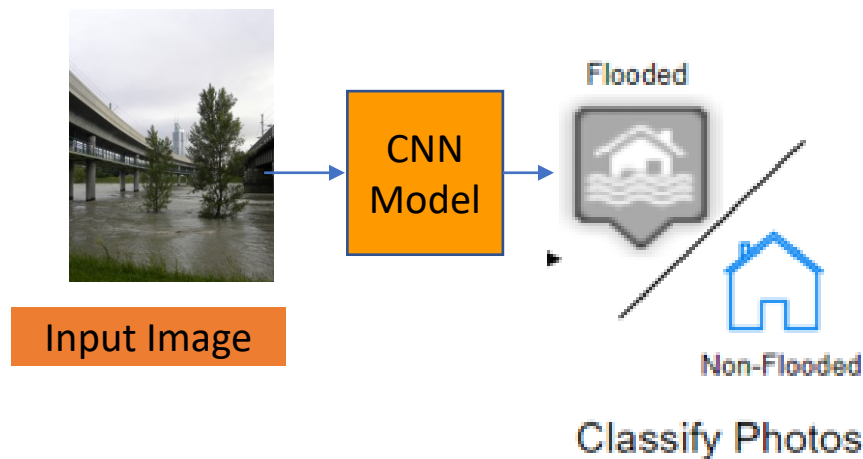
Applications of the Data

- Flood data streamed from various sources is stored in IBM cloud data storage buckets.
- These images are then used to train and test different custom object detection models and the flood image classifier.

What is Flood Image Classifier?

- The goal of the image classification algorithm is to provide appropriate class labels to the images based on the contents.
- Convolutional Neural Networks (CNN) are used for the classification task.

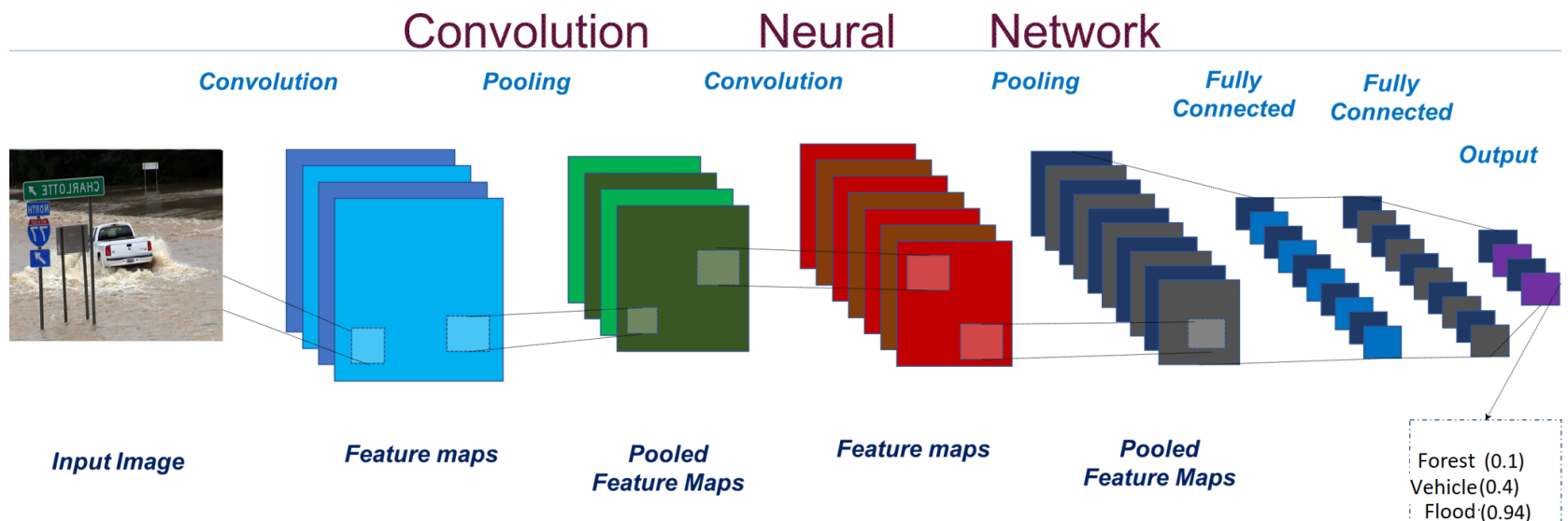
The CNN architecture is used to classify the flooding images and trained for 27 epochs with a batch size of 72.



Object/Label Detection

- The aim of generic object detection is to locate and classify the object within an image and labelling these objects along with there prediction scores to show the probability of their existence.
- Generic object detection methods can be classified into two types: (i) Traditional object detection pipeline, and (ii) Regression or classification approach.

All our developed models were custom trained to predict a total of eight different object categories.



Object Detection

- Using CNN to mask objects;
- Pre trained model was developed to resize the images and to configure batch size;
- Information regarding the location of the objects within the image and annotation are used to train models;
- Prediction scores of the custom trained state-of-the-art object detection models are compared with the prediction scores obtained using models pre-trained on another dataset.



Segmentation models identify the foreground shapes and highlight the objects using bounding boxes as well by drawing a mask on the object.

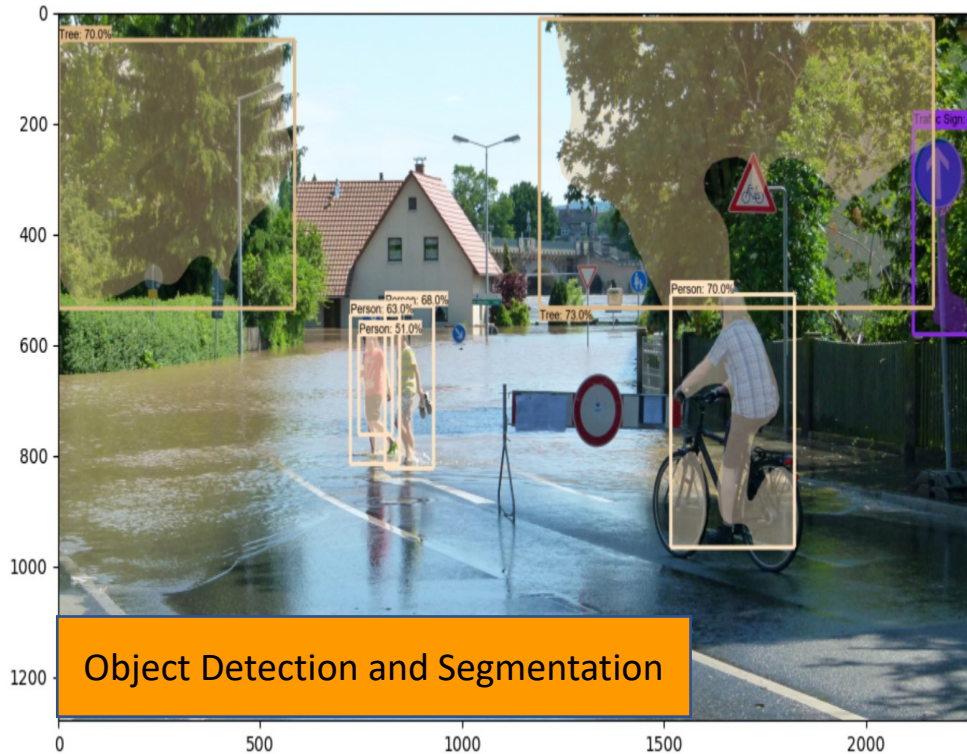
Water Depth Estimation?

- Object Removal System;
- Detection and inpainting pipeline led to the water depth estimation;
- low or high depths



Currently we are working on the inundation area!!! We be reporting the results soon!

Inference Results Using Custom Trained Object Detection Models

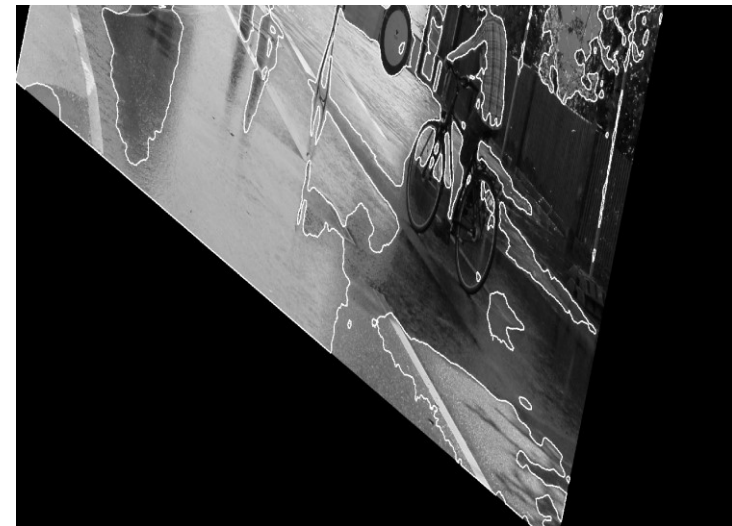
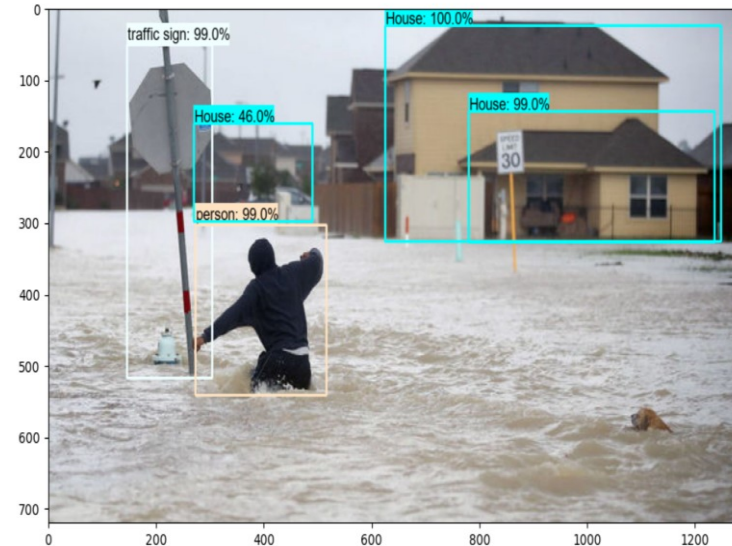


Summary

- ✓ Collection of flood related image from online forums, social media platforms and various other sources;
- ✓ Perform binary classification on an image and assign appropriate class labels (i.e., flooded or non-flooded) to an image based on its contents;
- ✓ Accurately detect various object categories of interest, edges or contours which can be manually adjusted by a threshold setting so as to best segment the image;
- ✓ Estimate the area of the flooded portion of the image and the approximate depth of water;
- ✓ A big data service of > 1000 images was developed to further advance image segmentation in flood related research.

Applications of our Developed Tool

Improve forecasting and prediction systems by integrating the tool with surveillance camera networks!





THANK

YOU !