Segmentation of Flooded Areas

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1. Abstract

FloodNet is a high-resolution image dataset by a small UAV platform after Hurricane Harvey. The dataset provided high-resolution post flood images that can advance damage assessment using limited labeled data. This will help in quick response and recovery on a large scale after a natural disaster. Small unmanned aerial systems(UAS) provide inexpensive data and can access hard-to-reach sites. We will focus on classifying the images and further semantic segmentation.

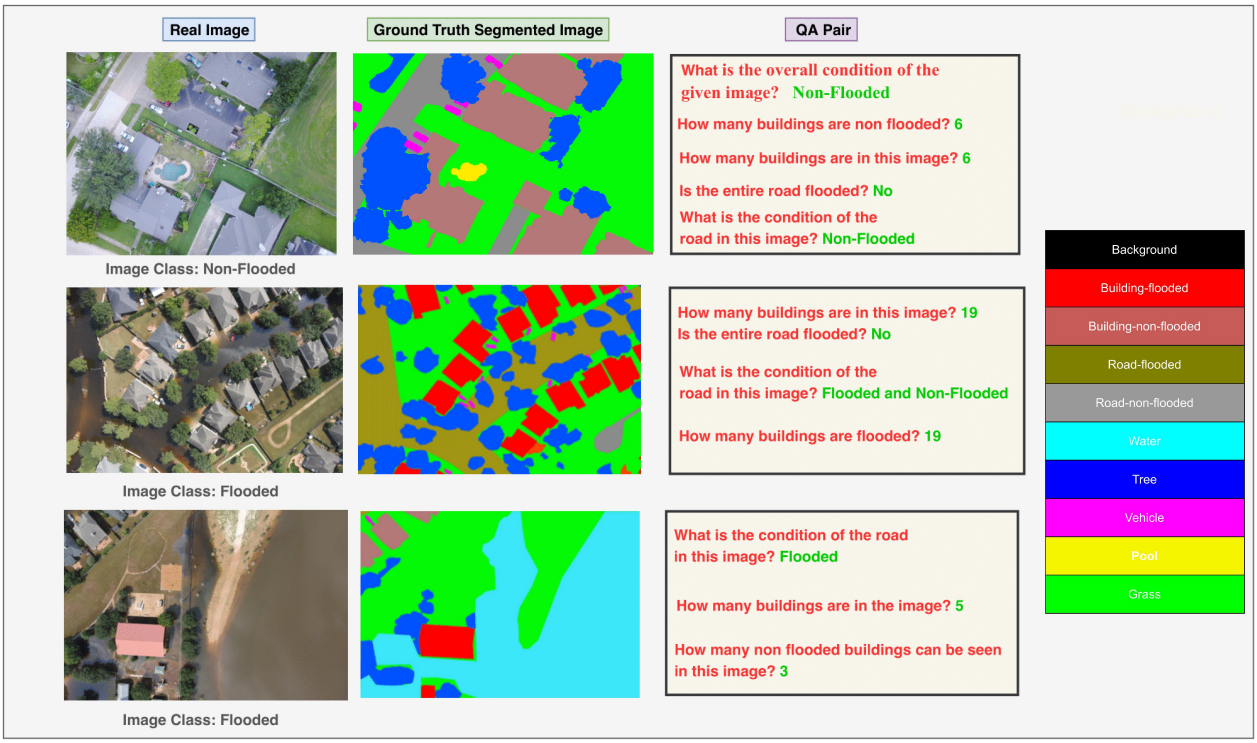

Figure 1: FloodNet dataset overview for Classification and Semantic Segmentation

2. Introduction

Images can help us better understand a scene like the overall category, the individual objects and their relationships. Deep learning is commonly used to tackle these problems using techniques like semantic segmentation, object detection and classification of images. Damage assessment after natural disasters is one such problem that can help in future

calamities in providing timely resources, tackling high priority areas and quick recovery of the population. However, there are certain challenges in this problem; like having a large enough annotated dataset for an accurate deep learning algorithm and annotations of objects other than classical classes like flooded street, non-flooded street etc. Floodnet provides us with data for this exact problem. The samples are sufficiently annotated with all required classes, and the images are high resolution so have better classification and object detection accuracies.

3. Motivation

This problem is crucial to humanity in the current times. With the severity of natural disasters increasing due to climate change, it's important our response gets better and more efficient as well. With better segmentation and classification, we can analyze the impact of a disaster and can make a precise understanding of the affected areas.

4. Materials and Methods

The dataset is provided based on two separate tasks:

a. Classification and semantic segmentation.

b. Visual Question Answering

For our task a). We are provided with high-resolution images split into train, test and validation sets.

Steps:

1. First, we will perform Classification, into "flooded" and "non-flooded "classes using Resnet model.

2. For Semantic segmentation, we will use Unet or DeepLab to train our model on annotated data.

Classes in Classification: Flooded, non-flooded.

Classes in segmentation: Background, Building-flooded, Building-non-flooded, Road-flooded, Road-non-flooded, Water, Tree, Vehicle, Pool, Grass.

5. Evaluation

The output aim is as follows for both tasks:

1. For classification, we will use metrics like classification accuracy to verify the number of correctly classified images for each class.

2. For semantic segmentation we will use several metrics like loss, IoU(Intersection-Over-Union), Dice(F1 score) etc.

References

[1] FloodNet: A High Resolution Aerial Imagery Dataset for Post Flood Scene Understanding

[2] FloodNet dataset

[3] Semi-Supervised Classification and Segmentation on High Resolution Aerial Images