**MSNet: A Multilevel Instance Segmentation Network for Natural Disaster Damage Assessment in Aerial Photos**

[Source Paper](https://paperswithcode.com/paper/msnet-a-multilevel-instance-segmentation)

**Problem:**

The overall problem is about taking a high-level assessment of damage caused by natural disasters using aerial photos. The problem involves training different models to identify structures in an image and then quantify the severity of damage detected. These image data are first segmented to identify the objects in the image and classify them as to the category of potential type of structure. These data are transformed using a series of models to then solve a regression problem of quantifying the observed damage. This paper only determines damage assessment for buildings but lacks classification for different categories.

**Background:**

With new technologies available the way disasters are evaluated has been transformed. Things like cell phones, drones, and social media have made it easier to capture videos and images of damage. Most data are classified into two sources, ground level and aerial/satellite. Many related works utilize three techniques for damage detection: supervised, unsupervised, and semi-supervised ML methods. Another adjacent task to damage detection is determining where to place bounding boxes to identify objects and size the bounding boxes appropriately. Navigating the spatial feature space can be an iterative and time consuming process. A previously developed convolutional network is deployed in order to achieve this task. Finally comes the notion of assigning a score for not only quantification of damage, but also for object identification via a bounding box. The bounding box scoring has many potential algorithms that can be employed. The scoring of the damage, often referred to as the mask, can be performed using a number of different algorithms.

**Motivation:**

The number of environmental catastrophes and subsequent economic impact annually is on the rise. The disaster relief methods traditionally employed are timely and costly; the inefficiency of these methods leads to additional costs and can impact the quality of a damage assessment. The use of more efficient techniques to analyze damages cause by disasters can lead to better response for centralized governments and related organizations, allow insurance companies and adjustors to settle claims with higher accuracy and faster, and lead to faster solutions for impacted people.

**Proposed Improvements:**

We propose categorizing and quantifying the damages using fixed categories. We attempt to improve the MSNet model by expanding upon the types and levels of classification available. Expanding types of classification can then allow MSNet to assess damages for more than buildings and expanding the levels of classification can lead to better interpretation to the severity of the observed damage. This can better improve the opportunity for MSNet to be used in a wider and more informative context.