Flood Impact Detection on Areas Using U-Net

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***Abstract*—Floods are common in much of the world, this is due to different factors among which climate change and land use stand out. In Mexico they happen every year in different entities. Tabasco is an entity that is periodically flooded, causing losses and negative consequences for the rural, urban, livestock, agricultural and service industries. Consequently, it is necessary to create strategies to intervene effectively in the affected areas. Therefore, different strategies and techniques have been developed to mitigate the damage caused by this phenomenon. Satellite programs provide a large amount of data on the earth's surface as well as geospatial information processing tools that are useful for environmental and forest monitoring, climate change impacts, risk analysis, and natural disasters, among others. This paper presents a strategy for the classification of flooded areas using satellite images radar of synthetic aperture and the U-NET neural network. The study area is centered on Los Rios, region of Tabasco, Mexico. The partial results show that U-NET performs well despite the limited amount in the training samples. As training data and epochs increased, its accuracy increased.**

***Index Terms*—Deep learning and SAR, sentinel-1 SAR, flood detection.**

I. Introduction

The floods have become more and more frequent and intense across the globe leading to immense property and crop damage, environmental degradation, and death toll. Ideally, the locations that floods have impacted should be identified adequately in order to prevent loss of lives and property, assess the impact, and finally assess the best and applicable methods of preventing such scenarios from recurring in the future. The innovations in flood mapping include the basic ways like surveying and analysis from the satellite images which take a lot of time and may be prone to errors from the human being or lack of access to the region.

Computer vision has been among the areas that have greatly benefited from developments in deep learning over the last couple of years. We also find that the Convolutional Neural Network architecture, namely U-Net, which has been used for biomedical image segmentation and has been tested for other segmentation tasks, such as semantic image segmentation of natural images has provided optimal results. This paper focuses on flood impact, which is predicted and detected with the help of aerial or satellite images, based on the U-Net.

Using U-Net as the framework for the proposed approach, we thus seek to design an effective and reliable system for flood detection from very high-resolution image data. The research provides benefits to constructing a system for automating the identification of flood occurrences to improve flood response and intervention systems.

Leveraging the power of U-Net: Due to the encoder-decoder structure of U-net, it can be used for the applications which need an accurate localization and segmentation of floods on buildings. Developing a robust and accurate model: The evaluated U-Net model will be trained on a significant number of flood and non-flood areas and high accuracy of the detection of the features relevant to the flood.

Addressing the challenges of flood detection: The model will be built to accommodate intricacies of Flood imagery for example, changing water depth, cover types and lighting.

Enabling timely and efficient disaster response: As such, the proposed system can enable decision making and proper resource allocation during floods as it gives accurate near real-time estimates of the impacts.