International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

Flood detection using Remote sensing images

Pavan kumar y

Student of Computer Science and Engineering, R V College of Engineering

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Abstract – Flood is one off the disorders. Deep learning (DL) based flood detection mechanisms have proved their significance to anticipate in perioperative outcomes to improve the decision making on the future course of actions. The DL models have long been used in many application domains which needed the identification and prioritization of adverse factors for a threat. Several prediction methods are being popularly used to handle Detection problems. This study demonstrates the capability of DL models to Detect the flood. We are using Deep Learning algorithm name called Convolutional neural network for detect the flood and we able to achieve the best accuracy

KeyWords: Contiguous Deep Convolutional Neural Network, Flood Detection, Remote Sensing Images.

1.INTRODUCTION

Deep learning technique has huge improvement within the era for identifying and categorizing objects present on earth. Catastrophic events, like floods, landslides and tsunamis, have a significant impact on living being lives thanks to this disaster causes an enormous loss of life and property. Flood disasters are the foremost frequent natural misadventures within the worldwide and may become a crucial area of concern for the results of future global climate change . this type of consequences, are mainly supervised including flood monitoring, to be an important issue for the country. Flood monitoring requires quick access to big information about the extent of flooding and changes in land cover. Using remote sensing data, they're techniques for detecting information change on objects or phenomena obtained without direct physical contact, and each one are often used to estimate information in rapid time frames for flood monitoring. From the analysis of detection process can identifying various quite state of an object or phenomenon by observing at different times. In mean solar time an accurate detection of flood change provides a much better understanding of the disaster situation and helps establish the thought for disaster recovery plans. the supply and quality of multi¬temporal remote sensing data has been developed, availability and quality of multitemporal remote sensing data has been developed, and the progress of change detection technology has increased for flood monitoring using mult itemporal satellite images in recent years with a growing interest in monitoring.

This work is an outcome of the project "Flood and damage assessment using very Multi-Temporal - Remote Sensing Images (MT-RSI) data". Remote sensing technology has played an important role flooding monitoring in recent years. This development (optical/aerial to radar remote sensing) offers all weather capability as associated with the optical sensors for the aim of flood mapping. Flood mapping could also be a way used for flood monitoring, during which the front and rear flood images are compared to classify an updated (not flood) and flood area. Initially, flood monitoring was restricted to satellite and aerial images. But terrestrial data classification uses the Remote sensing image classification. The Classification model supported first-order statistics, texture measures supported the classification model, cluster-based classification model, convolutional neural network model, mainly component-based classification model and multisensory fusion supported may be on is a general classification model that uses different software programs

In response to this outbreak of flood detection, deep learning has played an indispensable role, which makes it possible to accurately judge and respond to the epidemic. Our system going to develop an detection capabilities of deep learning on images based on the CNN. This model aims at the detection of flood using varies technique.

We proposed a model with deep learning algorithm name called Convolutional neural network (CNN) with some basic layers. For flood detection we used images, make use of all this we build this project and we achieve the high accuracy

2. LITERATURE SURVEY

There is different kind of techniques used for image enhancement, segmentation, feature extraction and classification are used for Flood detection system which are described within the literature. Also discussing existing techniques and its limitations. The complexity of remote sensing data processing is explored; there's an important need for a far better classifier is absorbed for the proposed ideology.

Ohki, M., The analysis of Flood disasters in the Kanto and Tohoku regions, Japan's investigation of flooded areas that obtained PALSAR2 interference data during the detection of urbanized areas. The results show that threshold flood detection through phase variance (PSD) images is more accurate than consistent. Our continuous work is to use more new technologies to further improve the accuracy of interferometric phase details. Another imminent issue is the misidentification of disasters not related to seasonal and time changes. It requires more data, and therefore the study currently uses only a statistic analysis of a pair of interference data.

Chenwei Deng, Cloud detection is an important task for RS image processing. Several cloud detection techniques has been created. However, most conventional system eliminate the consequences of the skinny cloud layer and don't have the power to discern areas where clouds are metrically methods for detection similar, like buildings and snow. This system uses a new cloud detection techniques for RSI, the test images are divided into three categories: thick clouds, thin and noncloudy clouds. First, an easy linear iterative grouping algorithm uses the potential to segment clouds, including small clouds. Then, a statistical system of aRSI is applied to differentiate superpixel clouds from surface buildings.Finally, Gabor's characteristics are calculated on each super pixel and a support vector machine is used to distinguish clouds from snowy regions. This simulation outcomes show that the implemented model which is superior to cutting-edge .

YoungJoo Kwak, For improving the exact region based flood mapping the Support vector machine (SVM) is implemented, Integration of multiple satellite data sources is essential Maximum capacity and compensation for sensor with the filters restricted for Optical data and SAR. The main objective of SAR research is Uses the algorithms that Flood mapping and synthetic aperture radar (SAR) images Compare and combine two different statistical thresholds Focus to increase flood detection regions, images Survey fusion technology is enlarge the Calibration and optimization of floods using mapping as Integral approach to detect flood. To point out operational characteristics of MODIS Landsat8 data Acquisition.

3. METHODOLOGY

In response to this outbreak of flood detection, deep learning has played an indispensable role, which makes it possible to accurately judge and respond to the epidemic. Our system going to develop an detection capabilities of deep learning on images based on the CNN. This model aims at the detection of flood using varies technique.

3.1. data collection

Data in the form of remote sensing image of flooding and no flooding images is acquired by using the Python library “floodpy” which provides a package for simple flood detecting API..

3.2. Data Pre-processing:

In this step the following processes are carriedIt is a process to seek out for normal regions in an image and pre processing these noise regions. Mainly pre processing technique considers Image Enhancement that provides an accurate color variation in the image processing.

Preprocessing Steps are as follows

Step1: Start

Step2: Read the input image Data, Image height, Image width, Training data.

Step3: The filter mask of the improved mask is primarily a square mask or a mask cross. Considering the symmetry of the mask, n is typically odd ranges.

Step4: Construct an image . The array of 256 values that comprises the quantity of pixels with the price x

Step5: Calculate the density function (f[x]). this is often often a 256 value array containing the quantity of pixels with value.

Step6:for every pixel i (with grey level) within the image do.

Step7:compute objective function

Step8:Based on the standard and improved algorithms, impulse noise filtering algorithms with a density of 10%, 35% and 45% were added to the primary image analysis

Step 9: Stop

3.3 Image segmentation:

In this step the following process is carried:

These techniques are utilized in images associated with objects for pixel segmentation. Threshold technology is linked to region-based segmentation, which can easily detect flooded areas by recognizing color images.

It adjust the image in to equal size and convert it into gray color image.

3.4 Image classification:

The project uses the CDCNN architecture in the literature, but its basic constituents are very similar. The characters recognized by a typical convolutional network architecture. CDCNN are multilevel trainable architectures and each stage consists of multiple layers. The entry and exit of each stage is a set of matrices called feature maps. In the case of color images, each feature map will be a color channel that contains the input image, a 3D matrix for video and a one-dimensional matrix, and a 2D matrix for audio input

CNN technique

Step 1:Select the Input image.

Step 2:Apply Gaussian filter for preprocessing

Step 3:Apply multi model clustering segmentation method for image segmentation input

Step 4:Get the comparable feature elements

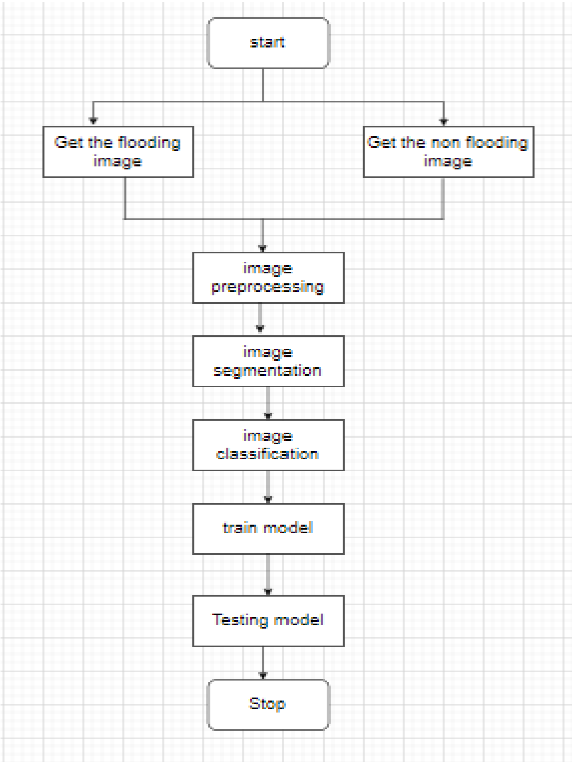
Step 5:Apply the Convolutional Neural Network (CNN) Classification method to train the model.

Step6: Check the threshold range with Discovered Structural analysis.

a) Arrange every pixel to interface the parts and to consolidate the districts.

Step: Go to step 5

3.5: Flowchart



4. Findings & Results

The confusion matrix is the evaluation measure used for assessing flood detection performance. Table 1 shows the confusion matrix used in this experiment.

confusion matrix		Predictions	
		Flood	Non flood
Truth	Flood	True Positive (TP)	False Negative (FN)
	Non Flood	True Positive (TP	False Negative (FN

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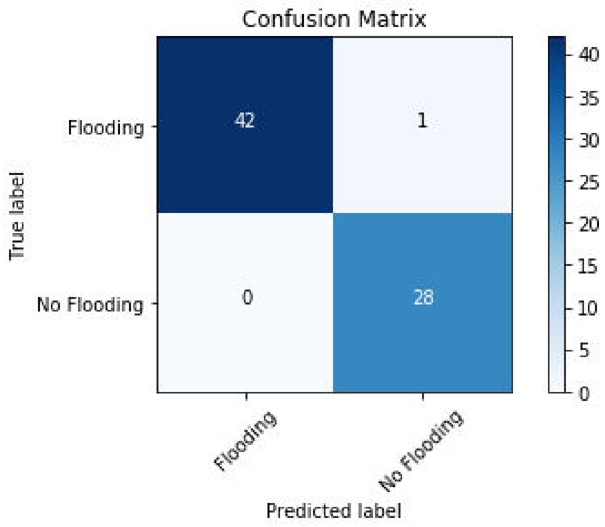
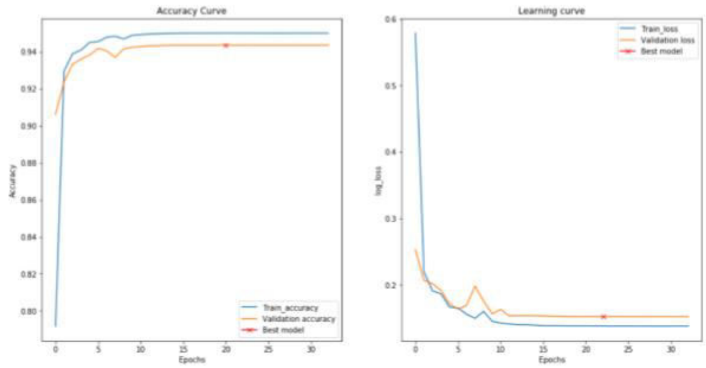


figure 14 shows the accuracy and loss results for the training phase



The matrix has four simple criteria based on it that measure how the predicted values are close to the true values:

- The accuracy A that calculates the accuracy of correctly labeled pixels within the total number of pixels. Its mathematical expression is:
  $A = (TP + TN) / (TP + TN + FP + FN)$
- The recall R that determines how many flood pixel are correctly classified. Its mathematical expression is:
  $A = TP / (TP + FN)$
- The precision calculates the fraction of pixels correctly as labeled as flood pixel. Its mathematical expression is:
  $A = TP / (TP + FP)$
- F1 score measures the balance between the standards R and P. Its mathematical expression is:
  $A = 2 * R * P / (R + P)$

The data was split into training, validation and testing sets with the percentages 64%, 16%, 20% respectively.

The model parameters are initialized with a normal distribution centered at 0. The optimization of the parameters is done by using the binary cross-entropy function to compare the predicted values with the ground truth. The parameters are then optimized using Adam technique The learning rate is initially set to 0.00001 and it is reduced by a factor of 0,1 when the validation accuracy is not increasing after 3 epochs. The flood mapping using optical data was trained for 33 epochs and

	CDCNN for Flood detection in Remote sensing image	CNN for Flood detection in SAR data
Accuracy	95.02%	80.43%
Accuracy of flood class	85.02%	73.40%
Accuracy of non flood class	95.26	82.24%
Recall	95.02%	80.43%
precision	95.90%	84.04%
F1 score	94.67%	81.00%

Figure:Evalution results

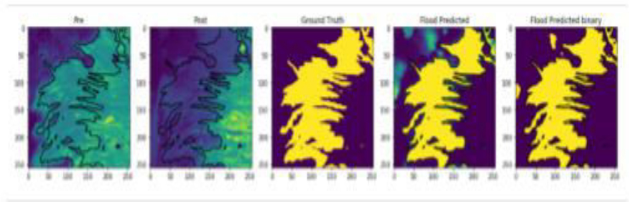


Figure 16: Flood detection results.

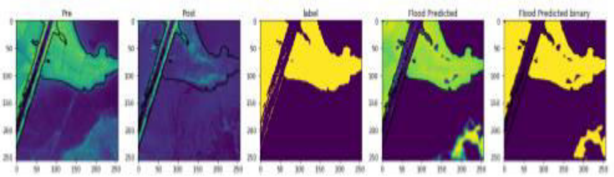


Figure 17: Flood detection results

3. CONCLUSIONS

This paper developed the implementation of labor Contiguous Deep Convolutional Neural Network (CDCNN) classification is employed for recognize the flood region using remote sensing image. The proposed system Images classifier has produced accurate flood detect with less false classification ratios2%. The performance of the proposed system has been confirmed by simulation using MATLAB software.

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