FEATURE EXTRACTION OF SATELLITE IMAGES USING MACHINE LEARNING

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Abstract:- In our project, machine learning will be This is the image where the prediction is done processing their images and producing respective valid data for the same. The high resolution satellite images are being provided by RRSC- C ISRO, Nagpur. In order for autonomous systems to interact with their environment in an intelligent way, they must be given the ability to adapt and learn incrementally and deliberately. This project focuses on extracting and identification of objects from the high resolution satellite images which will be provided as an input from the satellite to extract the features of the image which is then converted into machine valid data. This valid data is then fed to neural network model. The neural network model analyzes each image and classifies it with the feature label. This will generate the output screen which displays the extracted feature from the original image which is given as input to the system.

1.INTRODUCTION

Machine learning is the scientific study of algorithms and statistical models that computer systems use to perform a task without using explicit instructions, relying on patterns and inference. In our program, machine learning algorithms are applied to achieve image processing.

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In ISRO, to perform image processing the scientists have to first convert the image into data frames and feed this information into a system application where manually they have to change the bands depending on the image and identify objects in the image. This process is time consuming and sometimes can lead to errors as the data is not precise which can lead to inaccurate processing of the data. Our projects builds a system that can identify the number of bands of the image and create precise data that can be fed to the system.

This data is then processed using the concept of convolutional neural network to obtain feature extraction and object recognition without any manual effort.

The primary concept of the project is to focus on the information which will be obtained by processing of the images or datasets that are made available from the sensor. The sensor that is used for the purpose of our project is LINEAR IMAGE SELF SCANNING SENSOR – IV, also known as LISS-IV. The images on the satellite are captured by the sensor which takes high resolution images. The high resolution satellite images are being provided by RRSC- C ISRO, Nagpur.

2.LITERATURE SURVEY

Remote Sensing is a technique introduced in early 1960's for data analysis and interpretation. Remote sensing collects huge amount of satellite data. Satellite remote sensing imagery covers large geographical area with high temporal frequency as compared to other imagery. Interpretation of these satellite images helps in a variety of applications as environmental conservation and management, water resource research, soil quality studies, environmental study after natural disasters, meteorology simulations, deriving land use and land cover information, preventing natural disasters, studying climatic change evolution.

Different techniques are used for data extraction from remote sensing images.

Classification technique is the most useful technique for image interpretation and information extraction [2]. Satellite image classification groups together the pixels of the image into number of different defined classes. The classification helps in extracting the information contained in different bands [3] of the satellite sensor and the information is extracted in terms of digital numbers which is then converted to a category.

S. Muhammad et al., [4] proposed a supervised satellite image classification method using decision tree technique. This method extracts features from satellite image based on pixel color and intensity. Extracted features assist to determine objects reside in the satellite images.

The methods classifies satellite images using decision tree with the support of identified objects. In paper,

"Very High Resolution Satellite Image Classification Using Fuzzy RuleBased Systems", J. Shabnam et al. [5] introduced supervised satellite image classification method to classify very high resolution satellite images into specific classes using fuzzy logic.

3.PROPOSED SYSTEM

In ISRO Dataset, to perform image processing the scientists have to first convert the image into data frames and feed this information into a system application where manually they have to change the bands depending on the image and identify objects in the image.

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In our project also we will be training the machine to classify water body, land, forest, roads. Also we will be making python scripts to convert the images into different bands so that an image can be taken in RGB format.

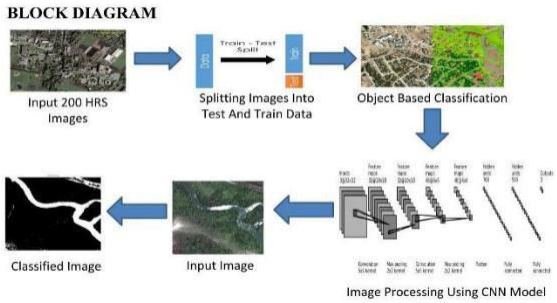


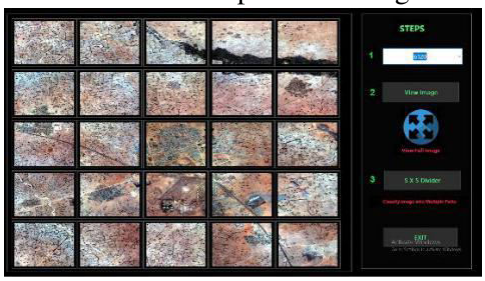
Fig.3.1. Block Diagram of the system

In the above figure the flow of the project is given. The image which is taken as the input image is of 1x1 km area, then this image is splitting into numbers of small images. The classification of the image is based on the object, means the image is classified according to the objects. The classified image is then send to perform the CNN algorithm on it. After the completion of the CNN process the input image is classified as according to our project.

Following steps are implemented in the project

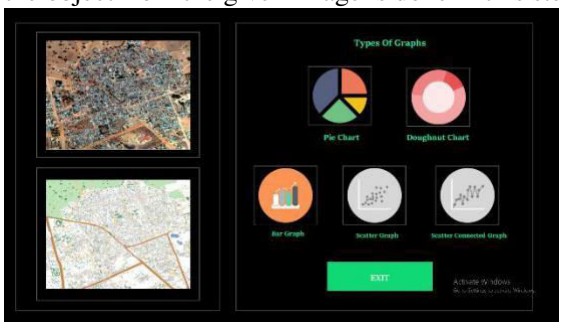
Step1: In the first step there is a selection of image id from the list of images.

Step2: In the step 2 the 1 km x 1 km area images is classified into multiple small images.



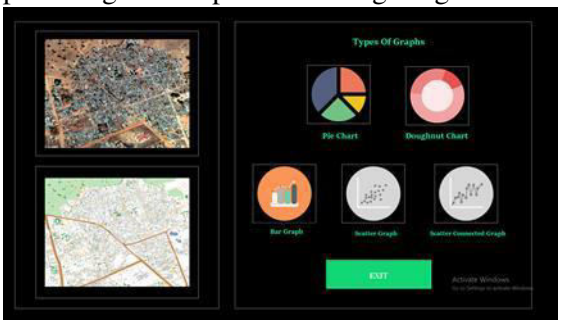
Step3: In this step select the one image from the multiple image.

Step4: The object selection in which the user wants to find the object from the given image is done in this step.



Step5: Image prediction is done in the step5.

Step6: There are different types of graphs where the percentage of the predicted image is given.



4.METHODOLOGY

In neural networks, Convolutional neural network (ConvNets or CNNs) is one of the main categories to do images recognition, images classifications. Objects detections, recognition faces etc., are some of the areas where CNNs are widely used

Basically CNN consist of three different layers such as Input Layer, Hidden Layer, Output Layer. Where,

Input Layer holds the input from test data

Hidden Layer perform all Machine Learning Calculation

Output Layer holds the output generated from hidden Layer.

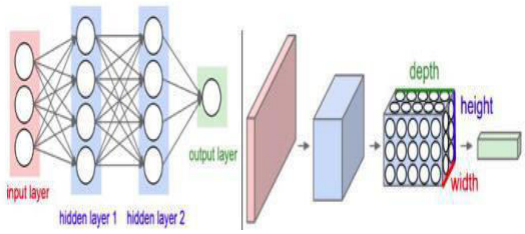


Fig.4.1. Layer of CNN

1.Input Layers: It's the layer in which we give input to our model. The number of neurons in this layer is equal to total number of features in our data (number of pixels incase of an image).

2.Hidden Layer: The input from Input layer is then feed into the hidden layer. There can be many hidden layers depending upon our model and data size. Each hidden layers can have different numbers of neurons which are generally greater than the number of features. The output from each layer is computed by matrix multiplication of output of the previous layer with learnable weights of that layer and then by addition of learnable biases followed by activation function which makes the network nonlinear.

3.Output Layer: The output from the hidden layer is then fed into a logistic function like sigmoid or softmax which converts the output of each class into probability score of each class.

WORKING OF CNN

This section explains the working of the algorithm. The input is provided with the 2D image. The input layer takes the 2D image as input and the output layers is the layers from where we get the trained output. The hidden layers are the intermediate layers.

Each hidden layer is made up of a set of neurons and each neuron is fully connected to all the previous layers neuron. Convolution neural network algorithm works as a series of convolution and sub-sampling layers.

A. Convolutional Layer

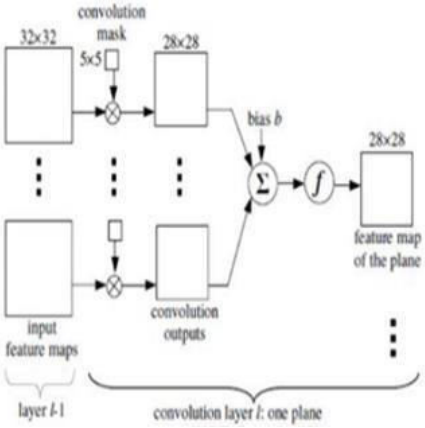


Fig.4.2. Convolution layer working The convolutional layer is the first layer of the convolution neural network algorithm. The structure of this layer is shown in the fig . It consists of convolution mask, bias terms and a function expression. All this unit together generate output of the layer.

The figure below shows a5x5 mask that performs convolution over a 32x32 input feature map. The resultant output in an 28x28 matrix. After obtaining the

matrix the bias is added to it and then the sigmoid function is applied.

B. Sub-Sampling

A pooling or sub-sampling layer often immediately follows a convolution layer in CNN. Its role is to down sample the output of a convolution layer along both the spatial dimensions of height and width. For example, a 2x2 pooling operation on top of 12 feature maps will produce an output tensor of size [16x16x12]. The primary function of a pooling later is to reduce the numbers of parameters to be learned by the network. This also has the additional effect of reducing overfitting and thereby increasing the overall performance and accuracy of the network.

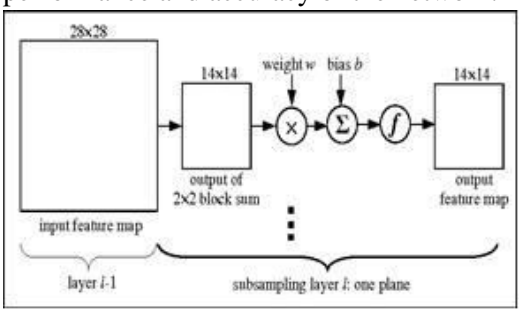


Fig.4.3. Sub-sampling layer working

5. EXPERIMENTAL RESULT & DISCUSSION

1.Satellite Project Opening Page

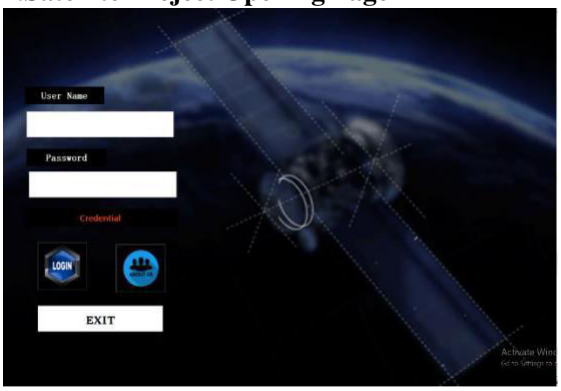


Fig.5.1. Login Page

This is the starting login page of our project. In this page we enter the user name and password and then enter in the main project.

2.Selection of Satellite Image

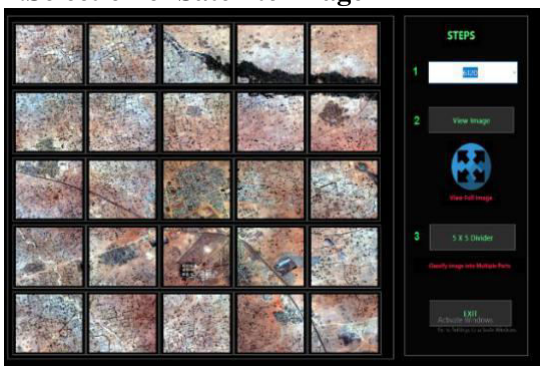


Fig.5.2. Image Selection

In we have to select the Image ID where it gives area 1km x 1km area of particular place. Further this image is divided into multiple parts.

3.Prediction of Selected Image

Fig.5.3. Image Prediction

In this we have to select the types of object that we want to detect from image and have to click on the image to make prediction. Then click on the button to predict object from image.

4.Graphs of Resultant Image

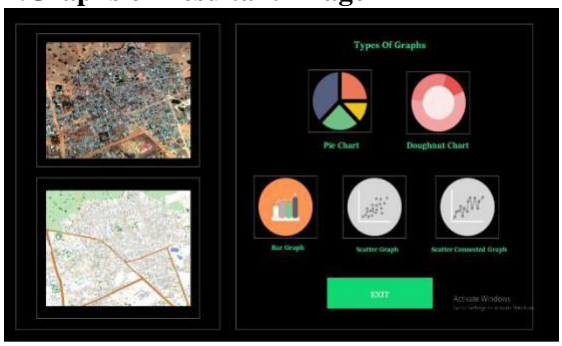


Fig.5.4. Graphs

In this we will able to see the detected object count in graphical view representation in different charts.

5. Final Output of Predicted Image

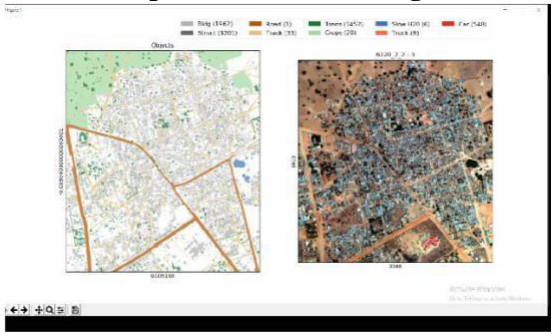


Fig.5.5. Output image

This is the image where the prediction is done and the objects which are being predicted.

6. Graphical Representation of Output

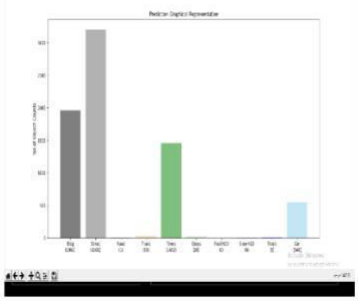


Fig.5.6. Graphical Representation

The number or the percentage of the objects which are predicted is shown in this types of graphs.

6. CONCLUSION

In this paper, we present helpful models for satellite picture classification that are based on convolutional neural system that is used for feature component extraction and object detection using high resolution satellite images is being designed. It helps in extracting the information contained in different bands of the satellite sensor.

The data are present in form of image which is captured by satellite in our dataset and the image captured by satellite is converted into tiff format.

In our neural network model is used for the segmentation to get the predicted pixels for each class. The output screen displays a black image with white pixel sized polygons which refers to the class in the program. Hence, the output of the program is obtained. The currently developed system can further be trained to give more efficient result for different band images. The second thing which should be possible is making the site in which legitimately the picture will be imported and the remainder of the procedure is executed naturally.

7. REFERENCES

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