Identification and prediction of land status using Satellite images

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Abstract: **- The government is unable to estimate socio-economic status of a remote area and also they are unable to help them. Because government only has their satellite image as a record and they can only see that area through map but through this image they cannot get status about that area. So, considering this satellite image of an area, there is a profound need to detect status of the remote area. In this survey paper, we have three major tasks to design our project. First of all, we have to find datasets related to satellite image and then designing of user-friendly desktop application and another task is to authenticate the user and pre-process the input satelliteimage.**

Keywords: PyQT, NumPy, OpenCV, Satellite Image, LandSat 7, Google Earth, MySQL

I. INTRODUCTION

There are so many regions in the world where humans are exist but they have no facilities for their livelihood. They don't even have basic necessity of life like water, food and so on. Some region has lack of only one factor and some regions have lack of all the factors. Some region has water but not electricity while another region has home but not any other necessities. For such type of regions, some organizations are ready to help them with the support of government of that country but due to lack of communication from that region, the organization knows only the location of that region. They don't even know what the basic necessities of that region are? In that case, the organization can only have the satellite image of the region and they try to determine necessities by observing satellite image. But by only observing that region through satellite image we cannot estimate the presence of the factors on that region. So to solve this kind of problem we are introducing an application to predict socioeconomic status of a region. The system which we are designing has the ability to identify some major factors which are very basic necessities of a region and they are electricity, water supply, agricultural field. One more factors we are using for estimate status of region is roof top of the house. Roof top is a very essential factor for our system.

For prediction of socio-economic status, our system takes satellite image and then this satellite image is compared with our trained model which contains all these major factors present within it and after comparing these factors we get prediction of the status of that satellite image in the form of percentage of presence of factors in the image and by considering this percentages of factors we are predicting socio-economic status. To achieve required result, application is design through python language and using its libraries. So, to design user friendly desktop application, PyQT library method is used in python language. To preprocess datasets of satellite images, we are using OpenCV library method and through preprocessing of image, we converts our input satellite image into grayscale image, contour image and smoothen image. To authenticate the user, we are using MySQL databaseconnectivity.

The datasets of satellite image is collected from LandSat 7 and Google Earth website and along with this platform, there is another application (Magic Puzzle) on which by providing longitude and latitude we get satellite image of that area.Some times, satellite image is downloaded in the form multiple titles and by combining all the tiles, we are getting a single whole image. In this way, we are collecting datasets of satellite image. The overview of survey paper is that it contain literature survey and then it contain System Architecture and then conclusion and references along with URL of datasets of satelliteimages.

II. LITERATURESURVEY

[2] in this paper author proposed, two-step approach for predicting poverty in rural regions of India from satellite imagery. First, we train a fully convolutionary multi-task model to predict three developmental parameters – the roof's main material, lighting sources and drinking water source – from satellite imagery. Using only satellite imagery as input, we can estimate income and starvation near to the real value gathered on the ground through substantial manual effort and monetary-expense.

[3] There is a lack of data on the quality of infrastructure in growing nations and this work use worldwide available remotely sensing information to predict such output. They introduced a deep learning approach using Afrobarometer survey data which demonstrates good predictive ability. Data must form a core issue for all these endeavours. A deep model quality highly depends on equate available data, they major focus on to proper utilizing previous images and survey information, through good cataloging and collages. Nonetheless, they shown results as proper that satellite imagery can be used to forecast the efficiency of the infrastructure.

[5] The findings represent that the current scenario of satellite poverty forecast can be used to estimate good connection in a single nation where some truth reality data are available but can fail to extrapolate across national borders. Using a certain combination of nightlights and projections from the proposed models will bring more improvements.

[6]Satellite Images, With an Application in Mexico Shows the CNN forecasts for urban areas using either Virtual Globe or Planet imagery, using the 10 percent testing sample that was withheld. They present R2 estimates showing the connection between projected poverty and baseline poverty as calculated in the Intercampus 2015. Using the Virtual Globe imagery R2 is estimated to be 0.61 and Planet imagery to be 0.54. Note they could only compare urban areas because Digital Globe lacks rural area coverage.The drop in performance is modest, but not severe, especially given that Planet imagery offers daily landmass revision rates for the earth. Poverty estimates are mapped for urban areas in Mexico.

III. PROPOSEDSYSTEM

We propose a system for prediction of area and calculate economical area with better accuracy and additional parameters.
Following are the parameter of the system for Prediction:

- AgriculturalLand
- WaterResources
- Roadsources
- Structure

In the figure 1, there is flow of our project.
[2]The whole architecture is made by PyQT library used in python language. PyQT library gives all the necessary stuff related to GUI design. PyQT provides us display screen, buttons and so on. So, in this way PyQT helps us in design GUI.

[3]After designing of GUI, another task is to authenticate valid user for operating application. To deal with this task, we are using MySQL database to store data of username and password and through this, user can authenticateeasily.

[5]Another task is to pre-process the input image which can be done by OpenCV library of python. By using this library, image is converted into grayscale image, contour image and smoothenimage.

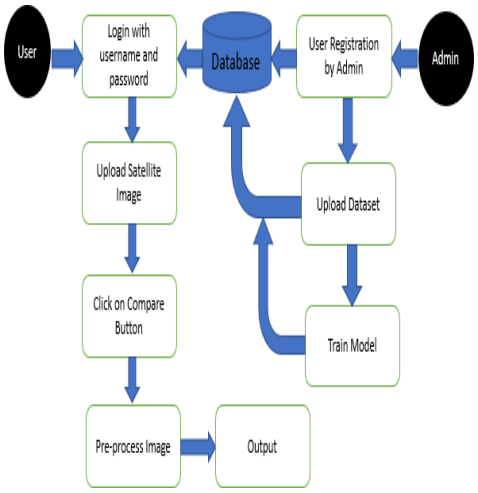

Fig.1: - System Architecture

[6]The major task of this survey paper is to collect datasets of satellite image and to achieve this result, we are working on google Earth images, LandSat 7 images and also take help of magic puzzle application on which, we are providing latitude and longitude of a particular area and as a result, we are getting satellite image of thatarea.
In this way, we achieve our all the tasks to achieve our project goal.

METHODOLOGY (CNN):

Convolutionary neural network is a deep learning method that is most widely used for visual imaging research.. CNNs use a multilayer perceptron variation establish to require least pre-transformation,Which is also called as shift invariant or space invariant artificial neural networks (SIANN), depend on the characteristics of their shared-weights architecture and invariance movement. Convolutionary networks were motivate by biological processes, where the pattern of connectivity between neurons collection the visual cortex of an animal.seperate cortical neurons only reply to stimuli in a small portion of the region of vision which is called the receptive zone.
The receptive zone of the various neurons slightly overlap so that it span the whole region of vision. Compared to other algorithms for the image classification, CNNs use very little preprocessing. It means the network knows the filters that were made by person in conventional algorithms. An important advantage of this individual from pre informed and human effort in feature design. These have image and video recognition tools, suggest framework, image detection, medical image analysis, and processing of natural language. A CNN consists of an input and output layer, and several hidden layers. A CNN's hidden layers typically consist of convolutionary layers, pooling layers, fully connected layers, and layers for normalization.

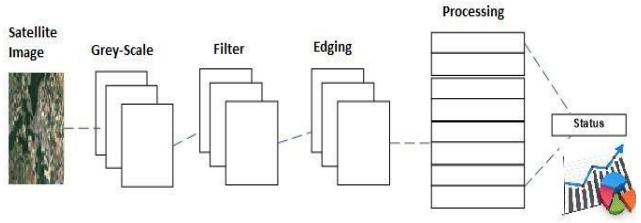

Fig2. Simple ConvNet

In system modeling, the CNN in Fig.2 is match of given imagel LeNet and it is classifying given picture for 4 types:, cat, bird, dog or boat They are four main operations in the ConvNet :-

1. Convolution
2. Non Linearity(ReLU)
3. Pooling or SubSampling
4. Classification (Fully ConnectedLayer)

An Image is a pixel matrix. Any picture could essentially be display of pixel value matrices which is a traditional word to known to a certainelement of picture. Camera take 3 channel namely–– RGB –which is known 2d-matrices, their range from 0 to 255.

The Convolution Step:

ConvNets derives its known as the operator, "convolution." Convolution's main motive in the event of a ConvNet is to retrieve attribute from the given picture Convolution conserve dimensional relation in values by helping small blocks of given data to learn image features. They will not go into Convolution's statistical details here and will attempt to understand how things work over images As discussed earlier in the thread, each picture will be treated as a pixel matric. Consider a five by five picture whose pixel representation are only 0 and 1.

1	1	1	0	0
0	1	1	1	0
0	0	1	1	1
0	0	1	1	0
0	1	1	0	0

1	0	1
0	1	0
1	0	1

Remember also another matrix of 3 x 3, as shown. Therefore, the five by five picture Convolution and the three by three matrix can be determined as mentioned in the below in Fig:3

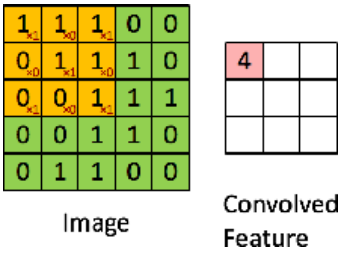

Fig3. The Convolution Methodology

The outcome matrix known as Convolved Function or Feature Map. Suppose to consider how the above measurement is done. Then move orange matrix over our green image by one pixel which known as stride and we measure perceptive multiplication of elements using the two maxtrix for each position and enumerate previous result to get the integer outcome that looks pink matrix which is output.please mentioned in each step, the three by three matrix "sees" only a part of the input image. In Convolutional neural network terminology, the three auxiliary three matrix is called a feature detector.

From the picture above it is evident that several filter matrix measurement can produce several feature maps for the similar input image.take the input image as an example: It is obvious of previous picture that several values can be produce by feature detector to feature map will similar to given picture.

Fig4. Satellite Image

The following table shows the convolution effects in image with various filters.

As Mentioned ,we could execute arbitrary such as Edge Detection, Sharpen, and Blur simply by adjusting the dimensional befor applying method such as edges,curves etc.

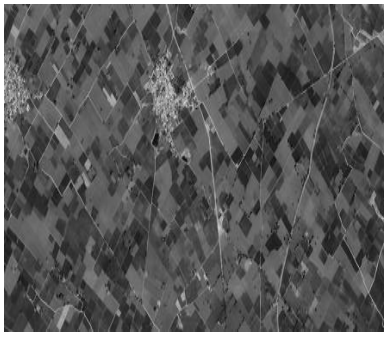

Fig5.GrayScale

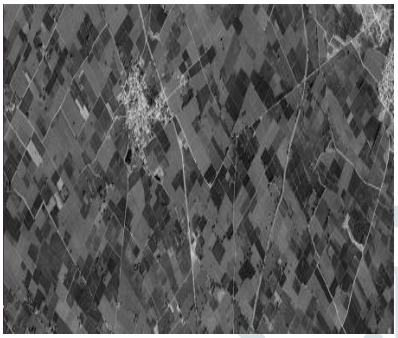

Fig6.Bilateral Filter

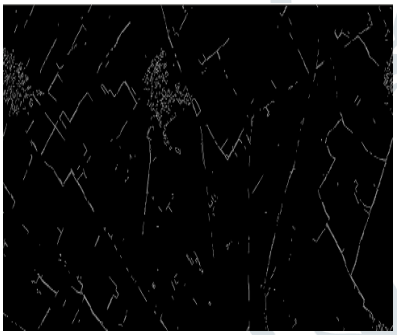

Fig7.Edging

Introducing Non Linearity (ReLU):

Then next step, in Figure above, an additional operation named ReLU was used. ReLU stands for the linear rectified unit and is a non-linear operation.

The Pooling Step:

Spatial pooling decreases each function map's dimensionaly, but preserves the vital information Spatial poolingshould have be of various types: Max, Mean, Total

In this scenario of Max Pooling, developer mentioned a dimentional value and take the largest element within that window retieved from corrected feature map.developer can put mean or total of component within that window instead of taking the largest element. It is given better accuracy in real time.

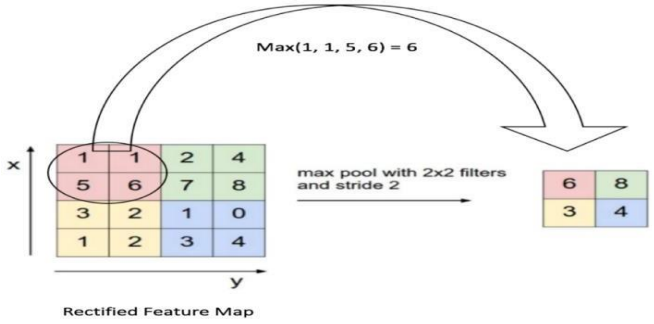

Fig8. Max Pooling

We slide two by two window by two cells and take in each area the maximum value.This reduces the spatial of function diagram, as shown in Figure 8.

IV. ACKNOWLEDGEMENT

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V. CONCLUSION

Prediction of socio-economic status by using satellite image. In this type of application, we have first collect datasets of satellite image and after that make a desktop application so that user can able to predict socio-economic status. To predict status of a satellite image, we have use preprocessing of an input image so that features can be easily detected from input mage and to achieve this we are using opencv library. In this way, we are successfully implement all the tasks of the surveypaper.

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