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Poverty Prediction 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 project, we propose an advanced framework to identify socio-economic status of area through satellite image. We are considering some major factors or attributes like water supply, roof tops and agriculture land field and we are going to train some datasets through CNN technique then input satellite image is compare with train datasets and if there is presence of this factors in input image then we classify status of the area as poor, rich or medium.

Keywords: Machine Learning, Malnutrition, CNN, Poverty Prediction

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 database connectivity.

II. PROBLEM STATEMENT

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.

III. LITERATURE SURVEY

They propose a two-step approach for predicting poverty in rural regions of India from satellite imagery. First, they train a multi-task fully convolutional model to predict three developmental parameters – the main material of the roof, source of lighting and source of drinking water – from satellite imagery. Using only satellite imagery as input, they are able to estimate income and poverty close to the true values collected on the ground by significant manual effort and monetary expense. Their main contribution is a two-step approach for poverty prediction. First, they engineer a multi-task fully convolutional model to predict the material of roof, source of lighting and source of drinking water from the satellite imagery of a village. The results presented by them clearly support the effectiveness of their approach. In this way, their experiments

suggest that predicting poverty levels from multiple developmental parameters is more reliable than using a single parameter. Their main focus on only three factors which are the material of roof, source of lighting and source of drinking water present in input satellite image. [1]

Data on infrastructure quality outcomes in developing countries is lacking, and this work explored the use of globally available remote sensing data for predicting such outcomes. Using Afrobarometer survey data, introduced a deep learning approach that demonstrates good predictive ability. Their results demonstrate the proof of concept that satellite imagery can be used to predict infrastructure quality.[2]

Their results show that the current state-of the-art in satellite-based poverty prediction lends itself to predicting relative wealth within a single country where some ground truth data is available, but may struggle with extrapolating across country borders. Using some combination of nightlights and predictions from the proposed models may yield further improvements.[3]

Presents the CNN predictions for urban areas using imagery for either Digital Globe or Planet, using the validation sample. They present R2 estimates that show the correlation between predicted poverty and benchmark poverty as measured in the 2015 Intercessors. The drop in performance is modest but not severe. Poverty estimates for urban areas in Mexico are mapped. Their main focus is on comparing predicted poverty level with actual poverty level. [4]

IV. DESIGN AND METHODOLOGY

Algorithm Steps:

1. Classify dataset under labeled folders such as satellite images
2. Read dataset
3. Read features of all images and label (here name of dataset folder) of it
4. Store it in model file
5. Get input image
6. Read features of input image
7. Compare features of stored features
8. Show label as prediction of nearly matched features.

V. PROPOSED METHODOLOGY

A. Architecture -

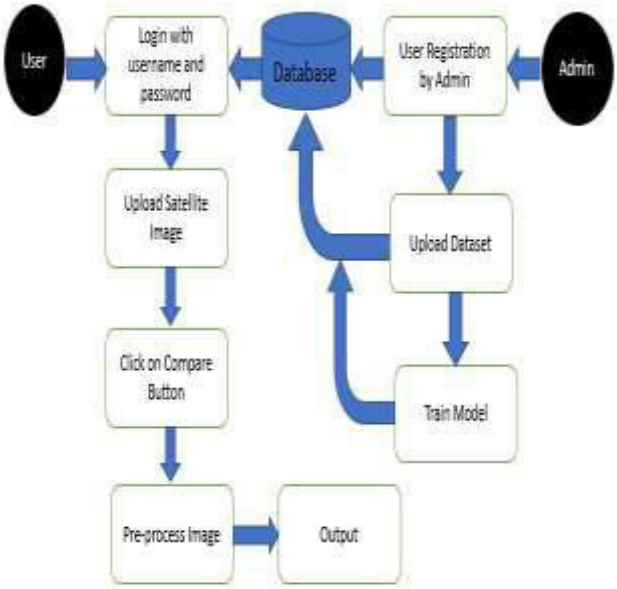

Fig 1. System architecture

Fig 2. Sample Satellite image

B. Mathematical Model

Input:

Function CNN ()

Set V:

V0=Get the satellite image (I)

V1=Visit each image for each interval of I

V2=Load a record from the dataset

V3=Load all Library for analysis

V4=Read all values from image

V5=Compare all satellite image values from dataset

V6=Final poverty prediction

Output:

VALIDATOR: (Here the module is responsible for periodically scans the satellite image computing the dataset values for final prediction.

Success Condition: Success system when final prediction analysis.

Failure Condition: Our system fails when no any prediction get from satellite image.

VI. RERULTS

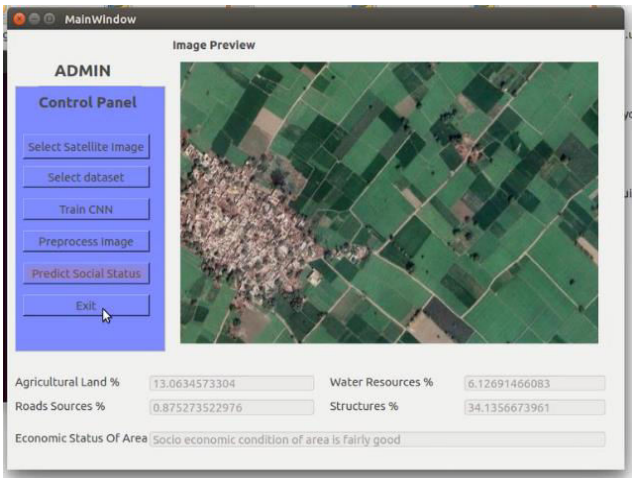

Fig 3. Economic status of area displayed

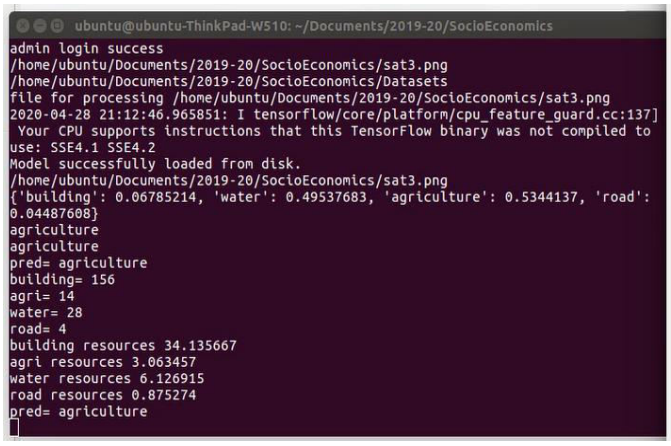

Fig 4. Textual Presentation of data

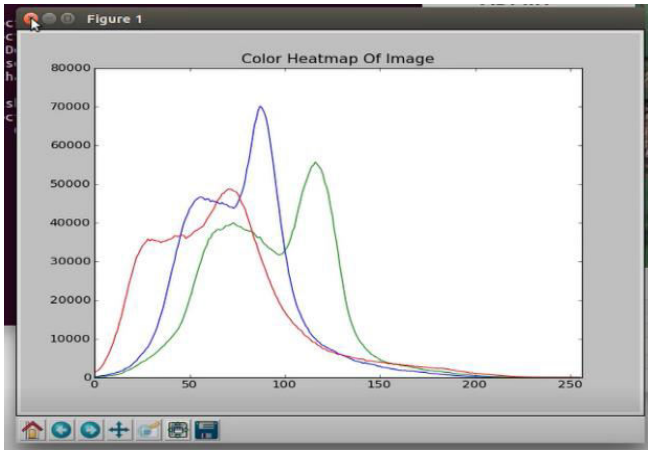

Fig 5. Color Heatmap of image

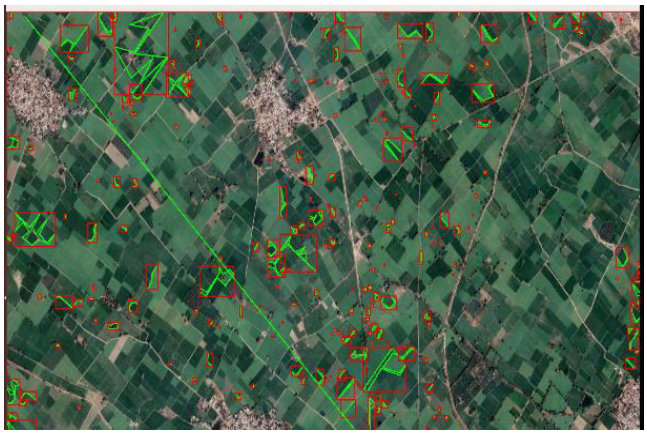

Fig 6. Edges Detected

VII. CONCLUSION

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.

To predict status of a satellite image, we have use preprocessing of an input image and in the training and testing, the dataset of satellite images were used to train the model.

For training and testing of models CNN method is used where only 3 rounds are sufficient to predict accurate result of socio-economic status. In this way, we have successfully predict socio-economic status of an input image.

VIII. REFERENCE

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