Automated Identification of Road Identifications using CNN and Keras

Ms.V.Krishna Vijaya[1], P.Phani Supriya[2], N.Ruthvika [3], K.Susruthi [4], V.Varsha[5]

[1] *Associate Professor Department of Information Technology, KKR & KSR Institute Of Technology And Sciences(A), Guntur, India*

[2,3,4,5] *Undergraduate Students ,Department of Information Technology , KKR & KSR Institute Of Technology And Sciences(A), Guntur, India*

Abstract **-** *Self-driving cars or Driverless cars are widely used nowadays but the only difficult task with them is they can't detect traffic signs effectively. It is very important to follow traffic signs and rules for road safety. To improve their efficiency automatic detection of traffic sign technology is needed. Although the existing one is working nicely, we need one with more efficiency and accuracy. It is a difficult task to detect defective and unclear images or signs. To make it easy we propose a concept. Here we develop a model to detect unclear and defective traffic signs using CNN and keras. Our objective is to develop a model that automatically detects traffic signs even though they are unclear or tampered. Which can be used in self-driving cars. There are several different types of traffic signs and each of them have different meanings. So identifying and following them is necessary to avoid accidents. Hence this model is used to identify those traffic signs and make decisions according to those signs in self driving cars.*

Key Words: Autonomous cars, Traffic signs, GPUS, ROCMS, AMD, Deep Learning, CNN, Keras, intervention, booming, convolution filters, pooling.

1. INTRODUCTION

Proper installation of Traffic signs is necessary for avoiding accidents. Autonomous cars or Self-driving cars use a special mechanism for moving from one place to another palace without human intervention and following traffic signs correctly is a very big task for it. Autonomous cars are a very profitable and booming business nowadays and many companies are trying to produce them in more effective ways. Recognizing and classifying traffic signs is the main task for them. The already existing system for recognizing traffic signs is implemented in deep learning by using Py torch library. Py torch is a python open-source library mainly used to implement machine learning algorithms and for natural language processing. The main problem with the existing system is that it can run only on the Linux operating system as py torch is built of AMD GPUS 's with ROCMs support. Nowadays the most popular operating systems are windows and Linux. Windows operating system is built by using Intel GPUs which cannot be supported by Py torch. So, we developed a model using CNN which is a deep learning algorithm by using keras library.

2. LITERATURE REVIEW

[1] Carlos Filipe Moura Paulo, "Detection and Recognition of Traffic Signs" detection of traffic signs, pp. 4, sep.2007.

The authors, VISHAL KUMAR PAL and KSHITIJ JASSAL and SAYED OMAR SADAT in the document explained that recognition of traffic signs can be done by a machine learning algorithm by using color analysis and shape analysis. In their project they used North American and European data sets for training and testing the model. Here the main problem is with the different

[2] Zhang, Z.J.; Li, W.Q.; Zhang, D.; Zhang, W. A review on recognition of traffic signs. Proceedings of the 2014 International Conference on E-Commerce, E-Business and E- Service (EEE), Hong Kong, China, 1–2 May 2014; pp. 139–144. In this document the author proposed an algorithm that is used for detecting different signs based on sensor and vision-based recognition techniques using CLSR method which is a traditional machine learning based method. For classification of images, they used feature extraction and feature reduction methods. Achieving high accuracy is the main advantage of using this method.

[3] Arunima Singh | Dr. Ashok Kumar Sahoo "Traffic Sign Recognition" Published International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-2 | Issue-4, June 2018, pp.122-126, URL: The authors Arunima Singh and Ashok Kumar Sahoo developed a model that can be used for recognizing the traffic signs in India by using feature extraction techniques like Scale Invariant Feature Transform (SIFT) and Support Vector Machine (SVM). Key point localization and Assignment of orientation and Key point Descriptor the major steps of classification. The main advantage of this approach is effectiveness of framework and classification accuracy.

[4] Rubén Laguna*, Rubén Barrientos*, L. Felipe Blázquez*, Luis J. Miguel**, "Traffic sign recognition application based on image processing techniques",Preprints of the 19th World Congress the International Federation of Automatic Control Cape Town, South Africa, background of study on traffic signs, pp.104,

Aug 24-29, 2014. Ruben Laguna et al. suggested a method to classify the traffic signs based on image classification and regions of concentration. The author used a graphical user interface (GUI) to interact with the users and along with the output the graph plots of success rate and loss function. The 91.1 % success rate is the main merit of this approach. But due to low resolution and wrong orientation of images it faces some difficulties while detecting the images.

[5] Mahammad A. HANNAN1, Safat B. WALI*1, Tan J. PIN1, Aini HUSSAIN1, Salina A. SAMAD1, "Traffic Sign Classification based on Neural Network for Advanced Driver Assistance System" classification of traffic signs, pp.169, Nov 2014. For detection of traffic signs, the author proposed a methodology which can be divided into 3 major parts: image pre-processing, feature extraction and classification. The used data set has more than 300 train images and 180 test images of traffic signs. Along with the predicted output confusion matrix is also displayed. In this approach it takes more time for normalization.

[6] Fleyeh, H., "Road and Traffic Sign Color Detection and Segmentation - A Fuzzy Approach" Machine Vision Applications (MVA2005), Tsukuba Science City, Japan, 16-

18 May 2005. Fleyeh implemented a recognition process for identifying traffic signs using color variations and color segmentation algorithms based on fuzzy sets. For identifying the colors in the images, they used a set of fuzzy rules. The output is shown in the form of a graph that shows the possibility of a given input image. Here European data sets are used.

[7] G.K. Siogkas, and E.S. Dermatas, "Detection, Tracking and Classification of Road Signs in Adverse Conditions", MELECON 2006, pp. 537-540, May 2006. In this paper the data sets used are from Portuguese roads and they are classified by analyzing color information and then classified according to their shape. Detection of circular shape images is the main merit of the, but the demerit is detecting the large size images. In future this algorithm can be improved for critical illumination conditions.

[8] Sardar O. Ramadhan1, Burhan ERGEN 2, "Traffic Sign Detection and Recognition", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, recognition of traffic sign, Vol. 6, Issue 2, February 2017, pp.960. In this approach the author prepared a computer-based system that can detect traffic signs using a Blob analysis. For recognizing traffic signs, the author concentrated on two main categories they are extracting the attributes and classifying the images. For this approach proper illumination is very important. For reducing the number of distinct colors quantization of colors is used. Coming to the output a small daily box will appear along with the predicted value of the given input image.

[9] S. Vitabile and F. Sorbello, "Pictogram Road signs detection and understanding in outdoor scenes," presented at Conf. Enhanced and Synthetic Vision, Orlando, Florida, 1998. In this paper the author opter neural networks to recognize the traffic signs. Data set used here is a Swedish traffic sign. For eliminating the effects of shadows and illumination a new kind of color detection algorithm is used. It converts RGB images into HSV base for classifying them. The main advantage of this approach is high robustness and correct segmentation. For training the more correctly we can use a greater number of images to get more accurate results.

3. METHODOLOGY PROPOSED

3.1 Deep Learning

A subset of machine learning that tells computers what to do in any way like how humans do is called Deep learning. It is the main technique behind many new technologies like autonomous cars which make decisions while driving without humans. In phones or tablets deep learning is used for voice control and many other features. It is mainly used for classification tasks. It has the capability to classify or identify various images, texts or sounds. Different models based on deep learning achieve higher results and accuracy compared to humans. All these models are trained by using large datasets. Nowadays deep learning is used in many fields like Aerospace, Electronics, Medical Research and We can see the future in Deep learning.

3.2 Conventional Neural Network (CNN)

For classifying images Deep Learning uses an algorithm called CNN which is an acronym for Conventional Neural Network. Generally, it consists of input layer output layer and many hidden layers. The main aim for having these many hidden layers is to detect and learn different features of input data at different layers of the network. Convolution, activation and pooling are mostly layers used for CNN. In convolution filters are added to input data for highlighting features of the dataset. In the activation layer only the data that meets our conditions is forwarded to the next layer. And the pooling layer simplifies the output and gives the results. After learning about features of input data in all the layers, next it shifts to the classification layer. The final layer in CNN is classification where it classifies the input that came from pooling layers and provides the final output.

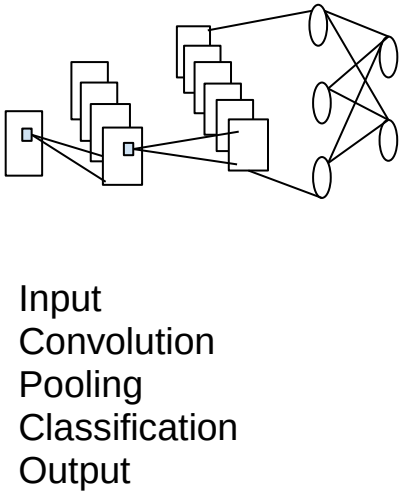

Fig: CNN model

3.3 Keras

Many deep learning models developed so far use a library called Kera. It is written in Python. Advantages of keras is it is open-source and highly extensible and user friendly. Major backend engines used for building deep learning models are TensorFlow, Theano, CNTK. TensorFlow is widely used for research and it can run on various CPUS and GPUS and mobile os. Theano is used for various mathematical calculations in multidimensional arrays. Many multinational companies like Netflix, Uber, Square, Yelp use Keras to develop many public domain products.

3.4 System architecture:

Our model mainly consists of 8 phases which are displayed in the figure below. The first phase is a collection of data sets which consists of various traffic signs in various shapes and sizes. In the second phase we train the model based on the above formed data set. After that in the third phase we will test our model using a data set called test. The most important phase in our model is the fourth phase where we take input from the user and predict the outcome based on the trained model and once a sign is recognized the output is displayed on the screen.

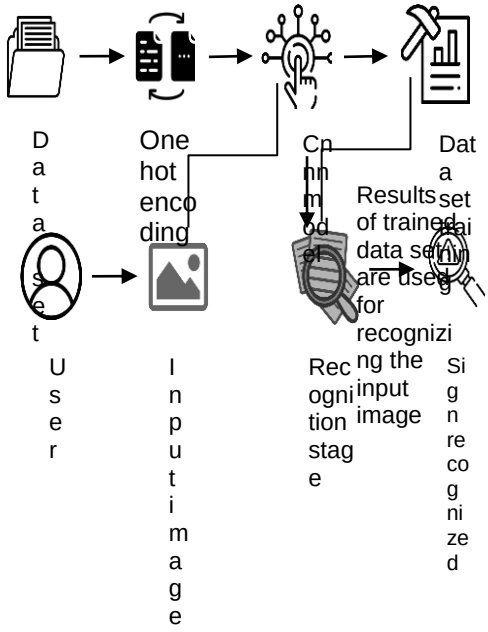

Fig: System Architecture

4 WORKFLOW OF PROPOSED METHOD

The below image shows a series of tasks that must be performed to complete the proposed model correctly.

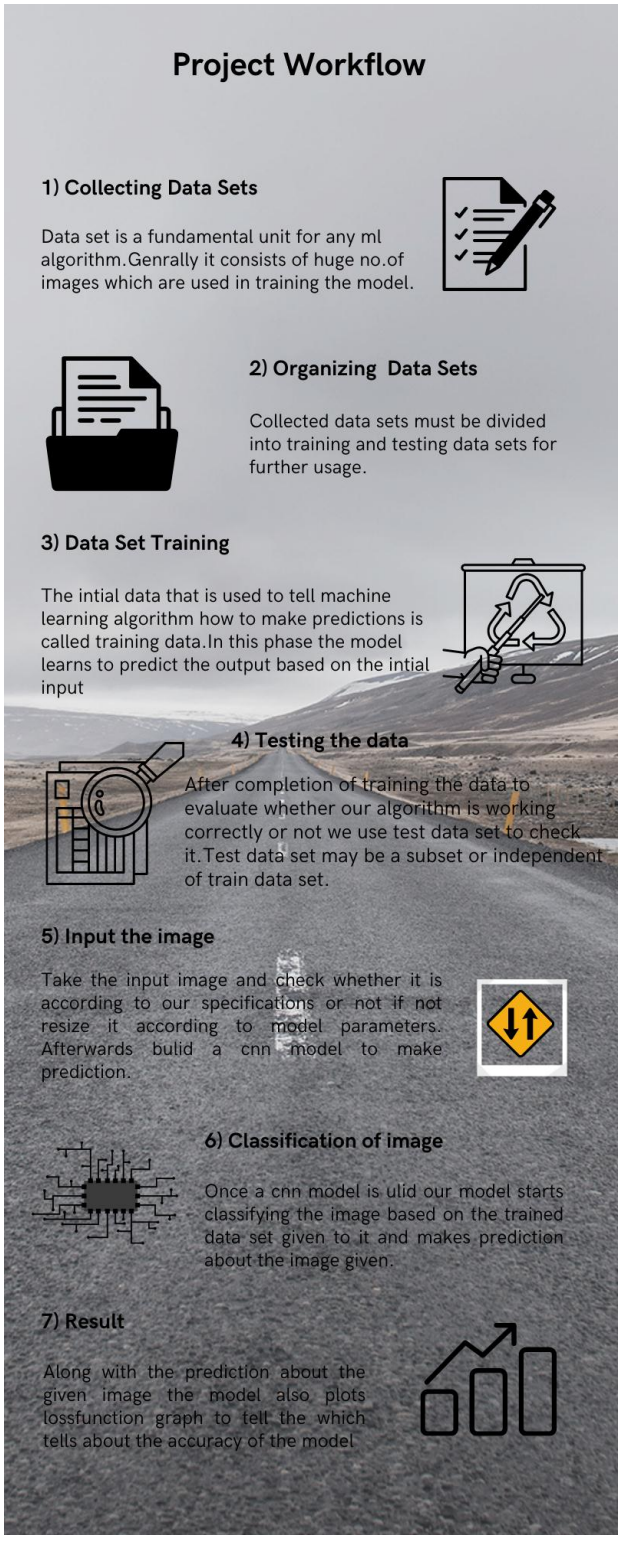

Fig : Project Workflow

5. RESULTS

After taking input from the image will be classified and the extracted fractures will be compared with the images used for training the model. And image to which maximum features matches will be given as input and along with that graph plotting accuracy and loss function are also displayed.

```
from keras.models import load_model
model = load_model('my_model.h5')
test_image = Image.open('/content/drive/MyDrive/Meta/2.png')
test_image = test_image.convert('RGB')
test_image = test_image.resize((30,30))
test_image = np.array(test_image)
test_image = np.resize(test_image, (1,30,30,3))
pred = model.predict(test_image)
l=max(pred)
k=np.where(l==max(l))
num=k[0][0]
print(classes[num])

1/1 [==============================] - 0s 90ms/step
Children crossing
```

Fig: Giving Input to the model

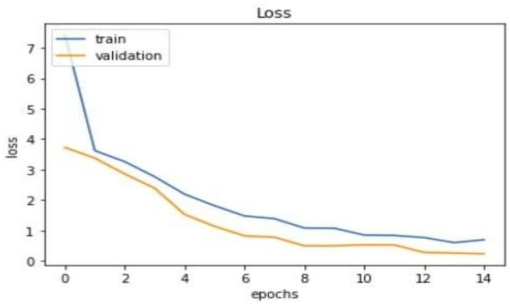

Fig: Plotting loss function.

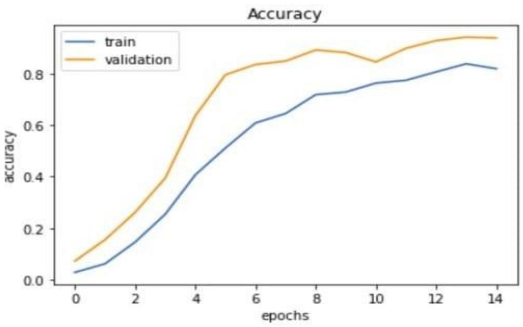

Fig: Plotting Accuracy

6. CONCLUSION

For maintaining road safety, it is important to follow traffic signs. For self-driving cars identifying road signs is the most difficult task. So, the proposed system Detection of road signs using CNN helps them to detect the unclear, tampered and wrongly oriented traffic signs by detecting the outliers and extracting the features of the given input image. Using this model, we achieve 95% accuracy. We perceived the changes in accuracy and loss function for

larger data sets. We can build this model using other techniques-based color detection and feature extraction techniques like SVM and SIFT. To make the model more user friendly we can develop a Graphical User Interface to input the image. Using GUI users can easily understand the working of the model and how different signs are classified.

7. REFERENCES

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