International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

Performance of Keras on Indian Traffic Signs Classification and Recognition

Sanket R. Godbole[1], Hrishikesh N. Janjal[2], Devendra Pawar[3], Sourav A. Kanade[4], Anjana Ghule[5]

[1]*Student & Aurangabad*
[2]*Student & Kalyan*
[3]*Student & Nashik*
[4]*Student & Aurangabad*
[5]*Professor, Dept. of Information Technology, Government College of Engineering, Aurangabad, Maharashtra, India*

Abstract - *classification and recognition of traffic signs is a very interesting topic in the field of computer science and has various applications like developing self-driving cars and robot navigation. This paper explains detailed, how we evaluated our real-time traffic sign recognition system and thus may serve as a building block towards establishing a commonly accepted evaluation methodology with the help of Keras*.

Our model uses different modules consisted of Keras like Conv2D and Maxpooling. The images used in the experiment are pre-processed with various image processing methods like canny edge detection, histogram equalization, fit ellipse. In the experiments we used traffic signs dataset consist of various traffic signs according to the Indian standards. Indian traffic signs consist of English letters and numbers. They are very similar to European signs. The method is validated on the dataset of Indian traffic signs. In the past few works have been done on the restricted data set that we considered. The dataset for other countries (like Germany) were also mediated.

***Key Words*: classification and recognition, keras, Maxpooling, image processing.**

1. INTRODUCTION

In the driving environments traffic sign plays a very vital role like governing the traffic, warning the drivers and performing various related actions. Grasping the information from the traffic signs is very crucial in a self-driving car environment as the classification of these signs will help the car to make certain decisions, thus it increases driving safety and comfort.it can also be used in adaptive cruise control (ACC) driving mode for easy driving. This can provide an understanding of the entire driving and traffic context.

Road safety is always a major concern everywhere especially in developed countries. Automated research is a big area of research in these countries. Driver assistance systems are developed to alert drivers and provide Safety. Various Image processing and computer vision-based methods are capable of detecting the lane lines of road, detecting obstacles while driving like tress, pedestrians, other vehicles. These traffic sign detection and classifiers thus seek to catch the driver's attention and avoid the accidents.

Indian Traffic signs are according to a standard database of Maharashtra police and Aurangabad police can be divided into Compulsory signs, Warning Signs and Guide signs. These traffic signs can be identified according to their shapes like triangle means to warn, square means to inform and the circle is used for giving orders. For classifying and detecting we should have information about color and shape.

Fig1.Indian Traffic Signs Database and notations

1.1 Literature Review

Auranuch Lorsakul and Jackrit Suthakorn [1] studied the Traffic Sign Recognition for Intelligent Vehicle/Driver Assistance System Using Neural Network on OpenCV. they discussed Traffic Sign Recognition (TSR) using Neural Networks technique. The images were pre-processed in stages with image processing techniques, such as, threshold technique, Gaussian filter, Canny edge detection method, contour plots and Ellipse. Then, the Neural Networks were performed to recognize the traffic sign patterns.

Benjamin H¨oferlin and Klaus Zimmermann [2] represented Reliable way of traffic sign recognition. They used the 3 common stages of recent TSR systems which are detection, classification and tracking. They later added the refinement stage where they improved the localization and detected the traffic signs using a CCD Algorithm.

Sebastian Houben, Johannes Stallkamp and Jan Salmen [3] studied Detection of Traffic Signs in Real-World Images. Presented a large real-world data set for evaluating such algorithms together with a reasonable performance metric, baseline results, and a web-interface for comparing approaches. They used various traditional techniques and number of baseline algorithms. They were considered to cover the currently favoured techniques, but they fell short on the performance. But the results were promising Regarding the variety of driving and weather conditions.

Fatin Zaklouta and Bogdan Stanciulescu [4] study K-d trees and Random Forests and used them for classifying 43 different traffic signs. Different size HOG descriptors and Distance Transforms are used to evaluate the performance of these two tree classifiers on images. They randomly selected the variable. The Random Forests are less sensitive to variations in the background than the K-d trees because of the random selection of the variables

2. Indian Traffic Signs

Indian Traffic Signs are standardized and accepted nationwide, these are broadly classified into the following categories.

1. Mandatory Signs: These traffic signs are used to ensure free movement of traffic and make the road users cognizant of specific laws and regulations, restrictions and prohibitions. Violation of these road safety signs is an offense, as per law.

2. Cautionary Signs*:* These traffic signs make the road users conscious of hazardous conditions on the road beforehand. The drivers, accordingly, take necessary actions to handle the situation.

3. Informatory Signs*:* These traffic signs guide road users about destinations, distance, alternative routes, and prominent locations like food joints, public toilets, nearby hospitals, etc.

Table No.1

Indian Traffic Signs based on shapes and color		
Color	**Shape**	**Sign**
Green	Rectangle	Informatory
Red	Triangle	Warning
Red	Circle	Compulsory
Red	Octagon	Stop
Red	Inverted triangle	Give Way
Blue	Rectangle	Informatory
Blue	Circle	Regulatory

3. Traffic Sign Detection and Classification

Traffic Sign Detection is like other tasks in computer vision such as object detection, identifying the images with various boundaries. Traffic signs are usually associated with salient shapes, and uniform and distinctive colors. And traffic sign recognition is the processing of such detected images.

In this method we applied various methods of image processing so that the features of the images can be extracted easily and these details will be helpful for the further identification processes.

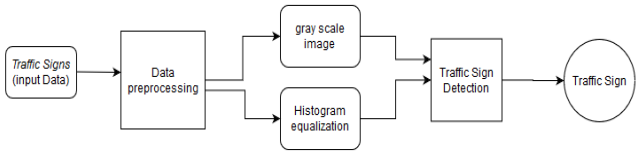

Fig 2. Structure of the proposed system for traffic sign recognition.

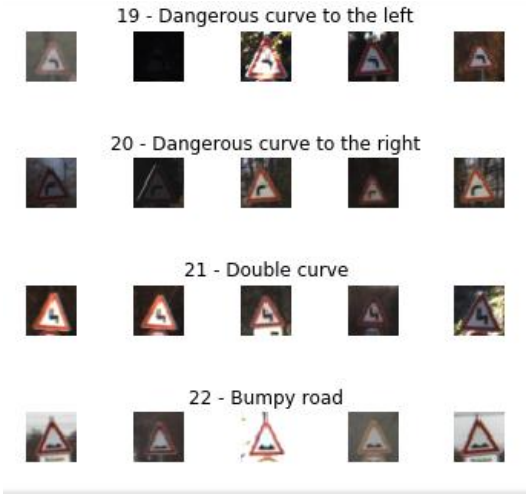

Fig3. Samples of training images

3.1 Converting Images into Grayscale Format

Grayscale is a range of monochromatic shades from black to white. Therefore, a grayscale image contains only shades of gray color and no color. While digital images can be saved as grayscale images, even color images contain some grayscale information. This is because each pixel has a certain brightness or intensity value despite its color. Intensity values which can be measured on a scale from black to white. Black means zero intensity and White means high intensity. Gray scale images are less complex and having an only single layer for processing and thus making it efficient for processing.

3.2 Histogram Equalization Method

Histogram equalization is a technique in image processing for adjusting image intensities to enhance contrast. Some of our images are blurry, dark and fragile we need to enhance those images by using OpenCV function. For equalizing the histogram, we need to compute the histogram of the image and then normalize it into a probability distribution. For normalization, we just need to divide the frequency of each pixel intensity value by the total number of pixels present in the image. This is equal to the resolution of the image. The equalization process makes sure that the resulting histogram should be flat.

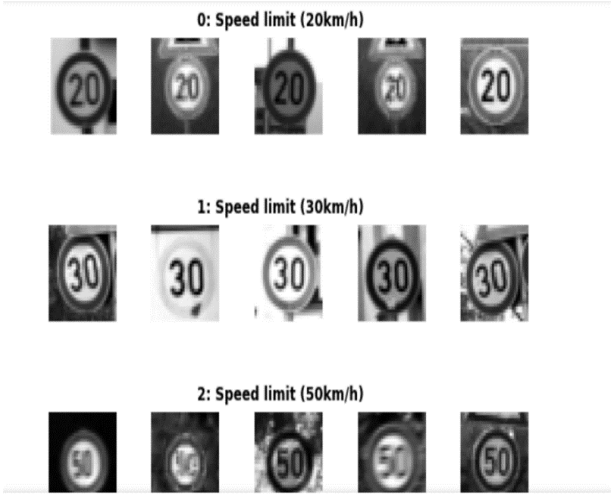

Fig4. Images after Processing

In our case we use OpenCV for the histogram equalization process. The image intensity will be stretched for making it clear.

3.3 Neural Network Classification

The architecture proposed is inspired by Yann Le Cun's paper on the classification of traffic signs.

Neural Network implementation database is categorized as the Preprocessing phase, Learning phase, validation and testing phase. This has been carried out using Keras and its functions which significantly reduces the time for neural network training, validation and testing. Keras is a high-level neural networks API, written in Python and capable of running on top of TensorFlow, CNTK, or Theano.

Our Convolutional neural network model consisted of layers of Conv2d and Maxpooling parameters. Keras Conv2D is a 2D Convolution Layer, this layer creates a convolution kernel that is a wind with layers input which helps produce a tensor of outputs. Max-pooling reduces the dimensionality of images by reducing the number of pixels in the output from the previous convolutional layer and it also reduces the problem of Overfitting.

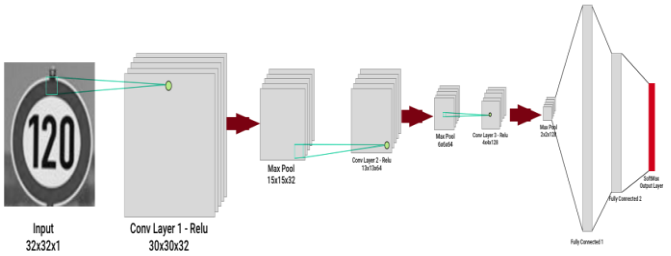

Fig5. CNN Model

4. Result and Evaluation

The proposed algorithm is experimentally tested on a image incorporated within a standard database of traffic police Maharashtra. The results thus generated are summarized in Table.

Table No.2

Sequential Model Performance		
Epochs	**Loss**	**Accuracy**
1	0.7817	0.7792
2	0.1336	0.9600
3	0.0869	0.9726
4	0.0627	0.9807
5	0.0493	0.9841
6	0.0445	0.9860
7	0.0415	0.9864
8	0.0337	0.9892
9	0.0311	0.9900
10	0.0299	0.9909

The system was trained with training data set, and validated with validating data set to find the best network architecture and find the optimal solution.

The traffic sign detection and recognition algorithm being proposed have been tested with a set of pictures taken from Indian Road traffic sign pictures. The model test Score has 99.6% accuracy.

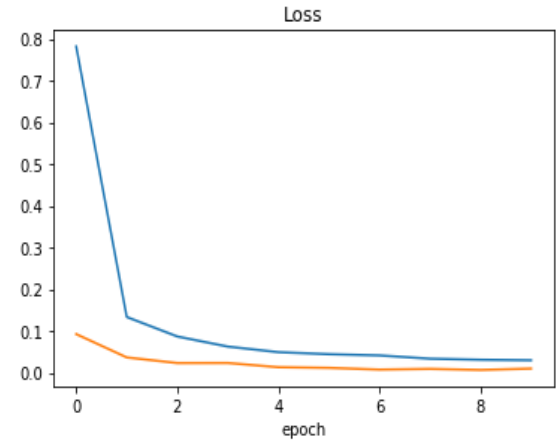

Chart 1. Epoch vs Loss

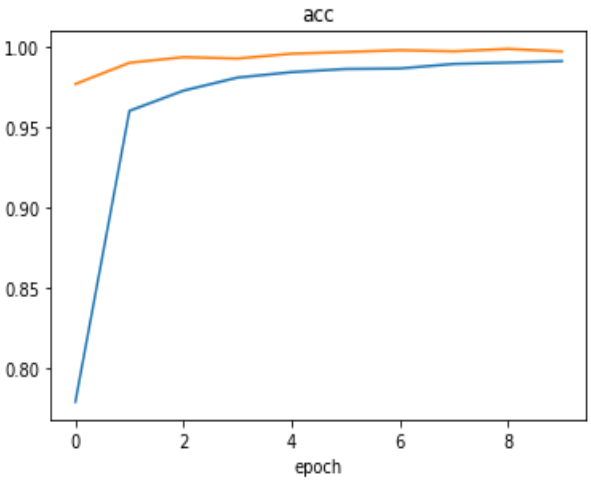

Chart 2. Epoch vs Accuraccy

5. CONCLUSIONS

This paper has described an approach to detect and classify the Indian Road traffic Signs with the Keras and describes its overall performance. The algorithm proposed has three main stages Preprocessing, neural network classification and testing. Our analysis shows that the performance of Keras on traffic signs detection and recognition with a precise accuracy rate of 99.6%. This could significantly reduce the rate of accidents with the help of traffic signs notifications. Future work also would investigate the use of a better complementing feature for real-time classification and recognition and showing the results live while driving the cars and in Self-driving cars. Finally, extensive tests, including other challenging scenarios like different weather situations should be taken into account.

6. REFERENCES

[1] Auranuch Lorsakul and Jackrit Suthakorn (2007) ," Traffic Sign Recognition for Intelligent Vehicle/Driver Assistance System Using Neural Network on OpenCV" , Faculty of Engineering, Mahidol University.

[2] Benjamin H¨oferlin and Klaus Zimmermann," Towards Reliable Traffic Sign Recognition", Universit¨at Stuttgart Stuttgart, Germany.

[3] Sebastian Houben, Johannes Stallkamp And Jan Salmen(2014)," Detection of Traffic Signs in Real-World Images: The German Traffic Sign Detection Benchmark",IJCNN.

[4] Fatin Zaklouta and Bogdan Stanciulescu," Traffic Sign Classification using K-d trees and Random Forests".

[5] Indian Traffic Standard division Maharashtra.

[6] Indian Traffic Standard division Aurangabad.

BIOGRAPHIES

	Name: Sanket R. Godbole Student of Information Technology From Government College of Engineering, Aurangabad
	Name: Hrishikesh N. Janjal Student of Information Technology From Government College of Engineering, Aurangabad
	Name: Devendra S. Pawar Student of Information Technology From Government College of Engineering, Aurangabad
	Name: Sourav A. Kanade Student of Information Technology From Government College of Engineering, Aurangabad