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‘‘Traffic Sign Detection Using CNN’’

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ABSTRACT: We propose an approach for traffic sign detection based on Convolution Neural Networks (CNN).

We first transform the original image into the gray scale image by using Convolution neural networks with fixed and learnable layers for detection and recognition.

The fixed layer can reduce the amount of interest areas to detect, and crop the boundaries very close to the borders of traffic signs.

The learnable layers can increase the accuracy of detection significantly.

TSD research is of great significance for improving road traffic safety. In recent years, CNN (Convolution Neural Networks) have achieved great success in object detecting tasks.

KEYWORDS: Convolution Neural Network, Tensorflow,keras,

I. INTRODUCTION:-

The traffic sign detection has become one of the most important modules since it provides alerts for the drivers to relieve the pressure of driving. Detection of traffic signs has been a popular problem in intelligent vehicles since the middle of 1990s, and various methods have been proposed by researchers. these systems help to significantly improve the safety and implement an important step on the way to autonomous driving. traffic sign recognition using Convolution Neural Network (CNN), we proposed a method based on CNN, using fixed and learnable filters to detect traffic signs on scene images.

Traffic signs are an essential part of our day to day lives. They contain critical information that ensures the safety of all the people around us. Without traffic signs, all the drivers would be clueless about what might be ahead to them and roads can become a mess. The annual global roach crash statistics say that over 3,280 people die every day in a road accident. These numbers would be much higher in case if there were no traffic signs. On the other hand, researchers and big companies are working extensively on proposing solutions to self-driving cars. Just to name a few these include Tesla, Uber, Google, Audi, BMW, Ford, Toyota, Mercedez, Volvo, Nissan, etc. These autonomous vehicles need to follow the traffic rules and for that, they have to understand the message conveyed through traffic signs. very country has some standards set for the design of different traffic signs like U-turn, Left-turn, Right- turn, No-entry, etc. Traffic sign recognition is the process of automatically identifying which of the following class the sign belongs to. The earlier Computer Vision techniques required lots of hard work in data processing and it took a lot of time to manually extract the features of the image. Now, deep learning techniques have come to the rescue and today we will see how to build a traffic recognition system for autonomous vehicles. robust automatic traffic sign detection and recognition can support and disburden the driver, and thus, significantly increase driving safety and comfort. Generally, traffic signs provide the driver with a variety of information for safe and efficient navigation

II. METHODOLOGY:-

Traffic signals, signs and pavement markings are used for traffic control to provide a smooth, orderly flow of traffic. Traffic signals apply to drivers, motorcycle riders, bicyclists, moped-riders and pedestrians. They convey important information about the road conditions, potential hazards and other obstacles

Dataset:

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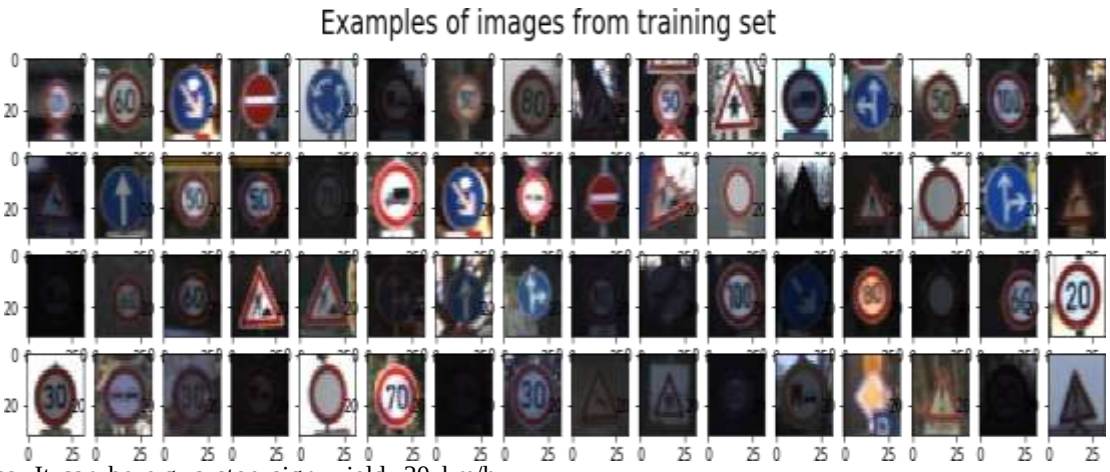
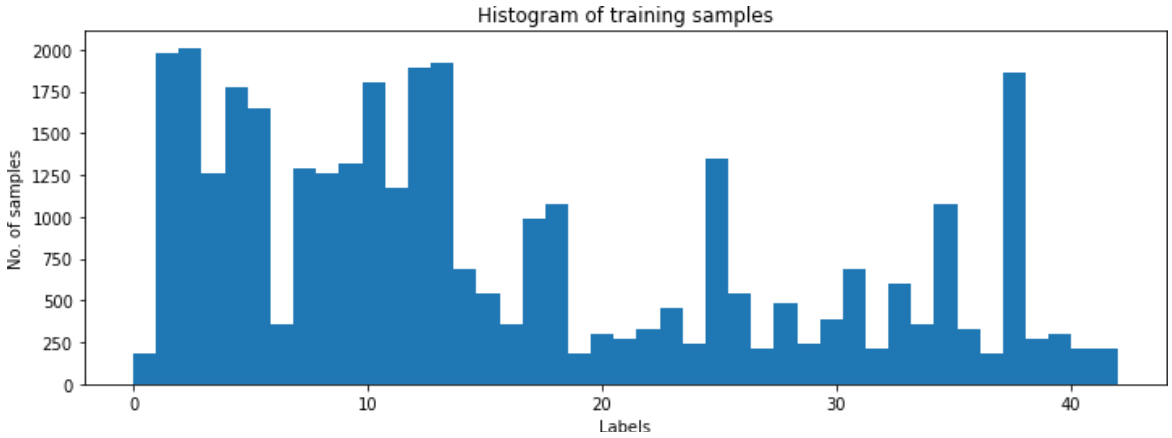
The dataset is divided into training set (34.799 samples), validation set (4.410 samples) and test set (12.630 samples). Each sample represents a traffic sign labeled as one of 43 classes. It can be e.g. a stop sign, yield, 30 km/h speed limit etc. The shape of a traffic sign image is scaled to 32x32 pixels in 3 channel RGB representation (32x32x3). Below, there are a few random samples from the dataset:



From the dataset:

We should firstly explore the dataset, understand it against the problem to solve. Let's see how many samples we have here for each traffic sign class. We wouldn't like the model to be biased towards any of the class. Below, there is a histogram of sample occurrences in the training set for each label.



Right now, we can see that some labels are greatly underrepresented while others have quite many representatives in.The Dataset. Should we dismiss the latter ones to equalize the histogram? Let's draw firstly the subset of images which are belonging to the same class.

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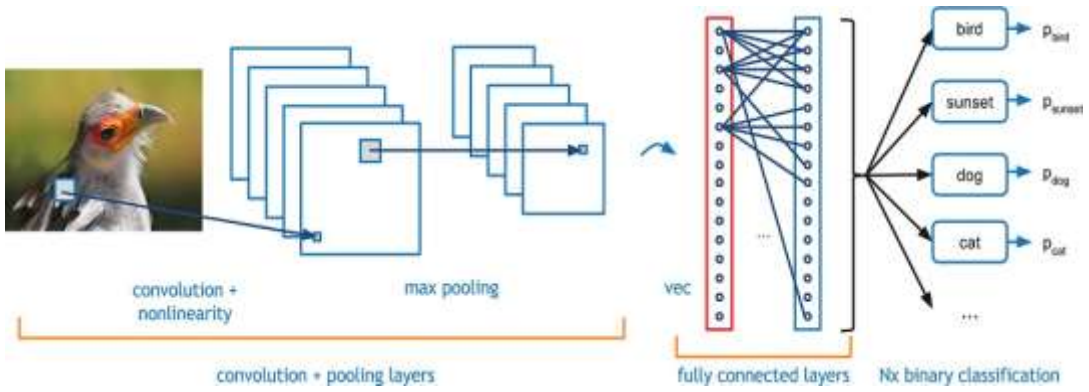
We can observe that images from the same class can be represented quite differently in the dataset. Generally,

there can be
Different lighting conditions, image can
Be **blurred**, **rotated** or **scaled**. Indeed these are samples which are extracted from real world IMG.

How to Work CNN:-

CONVOLUTION NEURAL NETWORK:-

Let's discuss briefly the concept of Convolution neural networks. They are very successful in image recognition. The key part to understand, which distinguishes CNN from traditional neural networks, is the **convolution** operation. Having an image at the input, CNN scans it many times to look for certain **features**. This scanning (convolution) can be set with 2 main parameters: stride and padding type. As we see on below picture, process of the first convolution gives us a set of new frames, shown here in the second column (layer). Each frame contains an information about one feature and its presence in scanned image. Resulting frame will have larger values in places where a feature is strongly visible and lower values where there are no or little such features. Afterwards, the process is repeated for each of obtained frames for a chosen number of times. In this project I chose a classic LeNet model which contains only two convolution layers.



The latter layer we are convolving, the more high-level features are being searched. It works similarly to human perception. To give an example, below is a very descriptive picture with features which are searched on different CNN layers. As you can see, The application

III. RESULT:-

The program is able to detect and recognise traffic signs and display them.

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IV. CONCLUSION:-

I successfully implemented a Convolution Neural Network to the Traffic Sign Recognition task. It was done using an open-source Tensorflow library for Python. I see the biggest room for improvement here. Many modern Deep Learning systems use more recent and more complicated architectures like GoogLeNet or ResNet. This comes in more computational cost, on the other hand. Here you can find a brief, illustrative comparison of the most popular architectures. The most difficult part of the project was to fine tune a CNN model parameters. It was sometimes cumbersome as I was not sure in which direction I should go. But this is the art of Machine Learning. I researched similar projects and tried to bring some ideas into my model. The interesting part was also data augmentation with image rotation and changing brightness which was also advised by many people doing this project.

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