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Transfer Learning Based Traffic Sign Recognition System for Surveillance Application

Manisha Chahande, Vinaya Gohokar

Abstract: ***Road Traffic Recognition is very important in many applications, such as automated deployment, traffic mapping, and vehicle tracking. Proposed traffic sign recognition system tails the transfer learning method that is frequently used in neural network uses. The benefit of expending this technique is that the initially network has been trained with a rich set of features appropriate to a wide range of images. Once the network is trained , learning can be transferred to the new activity adjustment to the network. Firsthand Indian traffic sign dataset is used.New results exhibit that the suggested method can accomplish modest outcomes when matched with other related techniques.***

Index Terms: Convolution neural network, Object detection, traffic sign detect, , transfer learning, driver assistance system

I. INTRODUCTION

In recent times, many popular automobile businesses like Benz, BMW etc. are sky-high developing Advanced Driver assistance System. Mobil eye, technology company that advances vision-based advanced driver assistance system (ADAS), commercialize ADAS system equipped not solely LKAS (Lane Keeping Assist System), however conjointly Traffic Sign Recognition system (TSR) for regulation signs of Indian traffic .

Convolutional neural networks have great representative learning abilities. Some current works show the Convolution neural network models and carry out recognition activities by activating CNN [7], [6], [17], [8]. Motivated by these works, we suggest a new way of recognizing road signs with CNN based on MPP. The key inspiration of this work is to present a new model for the detection of road signs. The key features of suggested system contain

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* Correspondence Author
Manisha Chahande*, Amity University ,Noida, India manisha _157@rediffmail.com ,
Vinaya Gohokar, Maharashtra Institute of Technology ,Pune,India vvgohokar@mit.edu.in

First CIFAR-10 data set is pre-trained with CNN It has more than fifty thousand training images.

This already trained Convolutional Neural Network is transferred first hand traffic sign detection dataset using just 400 training images for stop sign, divergence and pedestrian sign.

New results prove that the our method can succeed modest results when matched with few other approaches. In this paper section 2 describes some study on India traffic signal recognition . Study on transfer learning described in section 3. Detailedd description of the suggested system presented in section 4. Section 5 provide the Information on the execution and experimental results , conclusion the paper described in section 6

II.RELATED WORK

TSR is very dynamic research field in the computing society for many years. With many mature learning techniques in the car. Traffic Sign Recognition can generally be treated as a model classification problem. Between the abundant approach , Support Vector Machine (SVM) demonstrate their exceptional act , applied in [9],[10].Reinforcement is another powerful method for classifying road signs. A similar sampling resemblance to the measurement with SimBoost and the regression method of the diffused trees was proposed in [11]. A CNN is a different type of multilayer neural network that extracts functions that combine convolution, clustering and activation levels.. The best effective CNN architecture [17] is trained with back propagation and the main act was obtained in many reference data sets. A multi-stage convolution network is introduced to increase road signal recognition in [14]. we highlighting on determining the transfer approach that is usually used in deeper learning applications recommended in this model which inspired by earlier research work in convolution neural network.

CNN is an intensive and often difficult to use computing process on the CPU. Using the GPU has greatly facilitated large-scale training and testing data sets for CNN.

III.TRANSFER LEARNING IN NEURAL NETWORK

In the environment of artificial neural networks,[17] transfer learning can transfers the features learned from a initially trained network to a new problem. When there is not sufficient quantity of training data, the creation of a convoluted neural network is not usually effective [1], [3] Generally in deep learning concept ,neural network is trained for large data.

When trained artificial neural network has to used for new task initial layers of the trained network can be fixed, where as last layers need to be developed to learn the specific features of the new data set .

Transferable learning [17] usually can includes faster training times than the construction of a fresh convolutional neural network since it is not necessary to estimate all the parameters of the new network. Transferable learning is useful when you want to form a Convolution Neural Network in your data , but for various reasons, the data set may not be suitable for forming a complete neural network (that is, too small). While data growth is a viable option in many cases, transfer learning has also showed dynamic.

Transferable learning actually refers to the procedure of presumptuous a pre compressed CNN, which replaces the completely linked layers (and potentially the last convolutional layer) and the formation of such layers in the data set. After fixing convolutional layers weights, deep CNN [17] can still abstract general image features like color, edges, while fully-connected layers can take this data and use it to categorize data relevant to the problem. In general , transferable learning is done at the final level when there is a moderate quantity of data, and the classification layer is fully connected with a 1/100 learning rate of the value used to obtain the model merger during training in ImageNet

IV. PROPOSED SYSTEM

We develop a Divergence, stop and pedestrian traffic sign recognition system based on deep learning. An outline of our work is demonstrated in Fig. 1.

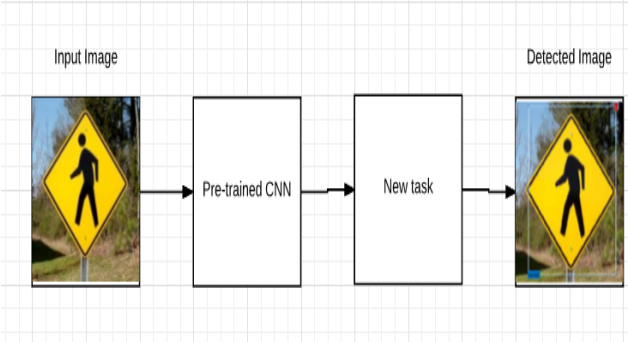

Fig-1 Flow of transfer learning for traffic sign recognition system

In the focal stage of system, an input image is applied to pre-trained CNN. The image process is from

In the central phase of proposed system, an input image is applied to pre-trained CNN. The image process is from the RCNN detector. When transfer learning is used ,the RCNN detector only considered areas that may contain an object. This greatly reduces the computational costs incurred while performing a Convolution neural network .

The architecture of proposed TSR system CNN is composed of many layers, where each layer describes a definite computation

Suggested Algorithm can be described in following steps:

1st Step : Database Collection of Indian traffic signs

2nd Step : First train network with CIFAR-10 .

3rd Step :Once the network is trained, it should be confirmed that training was successful. First, a rapid visualization of the Initial convolutional layer's filter weights can help determine any immediate issues with training.

4th Step : Indian Traffic signs Training Data is input for network . Now that the network is functioning well for the CIFAR-10 classification, the transferable learning method can be used to fine-tune the network for Indian traffic sign detection.

5th : ground truth data is to load

Training data is contained in a table that comprises the image file name and the Region of interest tags. Each Region of interest tag is a boundary box around the objects of concern within an image. For training of the Divergence Signal Detector, only the divergence sign ROI tags are required.

Step 6: Train Recurrent -CNN Traffic Sign Detector

Lastly, train the Recurrent CNN object detector using the Recurrent convolution neural network object detector. The training purpose is to repeatedly modifies the original CIFAR-10 network, categorized in a network that can categories images in two way : traffic signs and a background.

Step 7: Envision the feature map superimposed on the test image.

V.EXPERIMENTS AND RESULTS

Convolution neural network initially trained with the CIFAR-10 data set and this pre-trained CNN is tuned for our divergence of first-hand, pedestrian and signaling diversification signals using only 400 image training. Too bad, CNN pre-training, the formation of our marker would need many more images.

The program runs on Matlab 2017a and MatConvNet [16] with a 64-bit Windows system installed use 400 images of diversion sign for testing. Fig-4 &5 shows the sample images of proposed TSR system database . Table -I displays the final result of proposed method as a sign of diversion. We tested the database at a different time. The minimum batch precision reached by 10 times is 93.22%. However, the accuracy of our approach is improved when using only 50 epochs to 99.19%. It's almost the same for 100 times. However, time spent requires much more for 100 epochs. Figure 2 and Figure 3 show the results of no. of epochs with loss and accuracy. Table II shows the Fine Tuned results on Diversion dataset. Suggested method shows the best result.

Table- I The Result of Accuracy of diversion sign

Epoch	Time Elapsed Loss	Mini-batch loss	Mini-batch Accuracy
1	28.46	2.9965	73.98%
10	287.36	0.2386	93.22%
20	617.07	0.0778	98.40%
50	1687.57	0.0228	99.19%
100	3271.85	0.211	99.09%

Table-II Fine Tuned results on Diversion dataset

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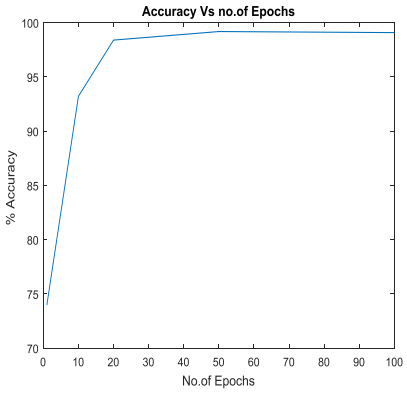

Fig-2 Accuracy Vs No. of Epochs

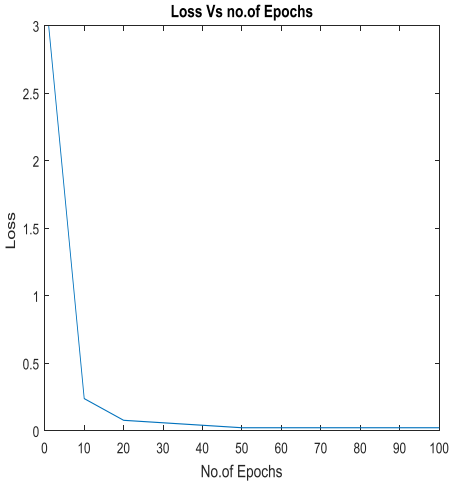

Fig-3 Loss Vs No. of Epochs

Fig-4 Sample database of diversion sign

Fig-5 Sample database of stop sign

Fig-6 Detected Images

VI.CONCLUSION

Transfer learning based traffic sign recognition system for an indoor and outdoor scene proposed . A new CNN architecture is offered to boost the recognition accuracy of f Indian traffic sign and it lessens the computational cost incurred when running a CNN. Proposed approach use of transfered learning for TSR , achieved best accurateness rate . Extensive experimentations have been performed, with promising results.

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AUTHORS PROFILE

Manisha Chahande is working as Assistant Professor in Amity University, Noida. She has teaching experience of more 12 years .Her area of interest includes Image and video processing, Microwave Engineering. She has many Publications in Journals and National /International Conferences.

Vinaya Gohokar working as Associate Professor in Department of E&TC, Maharashtra Institute of Technology, Pune. She has teaching experience of more than 25 years .Her area of Interest includes Image and video processing, Microwaves and Internet of Things .She is PhD Guide in Amaravati and Nagpur University. She has many Publications in Journals and National /International Conferences.