**CAR TRAFFIC SIGN RECOGNIZER USING CONVOLUTIONAL NEURAL NETWORK CNN**

# **ABSTRACT**

TSR (Traffic Sign Recognition) represents an important feature of advanced driver assistance system, contributing to the safety of the drivers, autonomous vehicles as well and to increase driving comfort. In today’s world road conditions drastically improved as compared with past decades. Obviously, vehicle’s speed increased. So, on driver’s point of view there might be chances of neglecting mandatory road signs while driving. This paper explores the system to helps the driver about recognition of road signs to avoid road accidents. TSR is challenging task, while its accuracy depends on two aspects: feature extractor and classifier. Current popular algorithms mainly deploy CNN (Convolutional Neural Network) to execute both feature extraction and classification. In this paper, we implement the traffic sign recognition by using CNN, the CNN will be trained by using the dataset of 43 different classes of traffic signs along with TensorFlow library. The results will show the 95% accuracy.

# **INTRODUCTION**

Road and traffic signs must be properly installed in the necessary locations and an inventory of them is ideally needed to help ensure adequate updating and maintenance. Meetings with the highway authorities in both Scotland and Sweden revealed the absence of but a need for an inventory of traffic signs. An automatic means of detecting and recognizing traffic signs can make a significant contribution to this goal by providing a fast method of detecting, classifying and logging signs. This method helps to develop the inventory accurately and consistently. Once this is done, the detection of disfigured or obscured signs becomes easier for human operator. Road and traffic sign recognition is the field of study that can be used to aid the development of an inventory system (for which real-time recognition is not required) or aid the development of an in-car advisory system (when real-time recognition is necessary). Both road sign inventory and road sign recognition are concerned with traffic signs, face similar challenges and use automatic detection and recognition. A road and traffic sign recognition system could in principle be developed as part of an ITS (Intelligent Transport Systems) that continuously monitors the driver, the vehicle, and the road in order, for example, to inform the driver in time about upcoming decision points regarding navigation and potentially risky traffic situations (Fleyeh, 2008).

The aim of intelligent transport systems is to increase transportation efficiency, road safety and to reduce the environmental impact with the use of advanced communication technologies (Sermanet, & LeCun, 2011; De la Escalera, Armingol & Mata, 2003). Automatic TSR, as an important task of Advanced Driver Assistance Systems and ITS has been of great interest in recent years. The road signs are placed on either roadside or above the roads. These signs provide mandatory information regarding to guiding, warning and regulating the behaviors to drivers in order to make driving safer and easier.

There are several different TSR like speed limits, no entry, traffic signals, turn left or right, children crossing, no passing of heavy vehicles, etc. Traffic sign classification/recognition is the process of identifying the, which class traffic sign belongs to. TSR has a direct impact on the safety of drivers, and damages can be easily produced due to their ignorance. Automatic systems are developed to assist the drivers, based on detection and recognition of signs which corrects the most unsafe driving behaviors.

The main purpose of advanced driver assistance systems is to collect significant information for drivers in order to reduce their effort in safe driving. Because drivers must pay attention to various conditions, including vehicle speed and orientation, passing cars and to many more. So, if driver assistance systems collect such information, it will greatly reduce the burden of drivers. Thus, road signs are designed in such a way that attracts a driver’s attention with colors and simple geometric shapes.

The research work available on recognition of traffic signs for local roads is quite sparse and still at the preliminary stage. Mostly it is focused on recognition of traffic signs for local roads and they are also still at the preliminary stage and focused on recognition of traffic signs through static images. In this work, algorithms were developed in “Google Colab” environment to recognize traffic signs while vehicles in motion. Project is mainly focused on automatic recognition of warning signs placed in local roads captured by image clips. Traffic signs were recognized based on its geometrical characteristics and color information (Gunawardana 2010). In this project, we develop a deep NN (Neural Network) model that that can classify the traffic signs present in the image into different categories. With this model, we can read and understand traffic signs which are very important task for autonomous vehicles.

# LITERATURE SURVEY

There are many researches in the literature dealing with Road TSR problem. According to Kale and Mahajan (2015), the road sign recognition system is to be divided into two parts, the first part is detection stage which is used to detect the signs from a whole image, and the second part is classification stage that classifies the detected sign in the first part into one of the reference signs which are presents in the dataset. They used PCA (Principle Component Analysis) and ANN (Artificial Neural Network) techniques for detection and recognition with the dataset of different road signs from Maharashtra RTO (Regional Transport Office). Tool used by them was MATLAB. For TSR, mostly the preferable model for image classification is CNN. The recognition system is implanted into autonomous vehicle ‘Eurecar’. The system was followed by HSV (Herpes Simplex Viruses) and Hough transform algorithms for extracting ROI (Return on Investment) of traffic signs. Gaussian blurring was also applied as canny edge detectors. Then extracted area is given to CNN

model. They used dataset of 6 types of (Korean-Version) traffic signs to train the CNN model. The obtained results demonstrated low accuracy; it shows overlapping results when several proposal regions point to a same traffic sign. Development of clustering algorithm is considered as a future work for robust recognition system (Jung et. al. 2016). Most of the research used color segmentation technique with C-CNN with GERMAN traffic signs dataset for detection. The C-CNN method consists of selecting a set of ROIs by applying a color thresholding on the input image, thus reducing the search space. Then, a trained CNN is used to classify the ROI (whether it contains a traffic sign or not), followed by another CNN with the same architecture, that is used to recognize the detected traffic signs. Therefore, 2 datasets are selected, one for detection and another one, to recognize the traffic sign. Therefore, CNN was trained to recognize two classes: traffic sign/no traffic sign. It was concluded that C-CNN is slow and sensitive to weather conditions (Boujemaa *et al.*, 2017).

Researchers presented a three-stage real-time TSR system, consisting of a segmentation, a detection and a classification phase. They combine the color enhancement with an adaptive threshold to extract red regions in the image. The detection is performed using an efficient linear SVM (Support Vector Machine) with HOG (Histogram of Oriented Gradients) features. The tree classifiers, K-d tree and Random Forest, identify the content of the traffic signs found. A spatial weighting approach is proposed to improve the performance of the K-d tree. The Random Forest and Fisher’s Criterion are used to reduce the feature space and accelerate the classification. They presented that only a subset of about one third of the features is enough to attain a high classification accuracy on the GTSRB (German Traffic Sign Recognition Benchmark (Zaklouta & Stanciulescu 2014). The paper proposed a method for Traffic Sign Detection and Recognition using image processing for the detection of a sign and an ensemble of CNN for the recognition of the sign. TensorFlow is used for the implementation of the CNN. They have achieved higher than 99% recognition accuracies for circular signs on the Belgium and German data sets (Vennelakanti *et al.*, 2019). Research based on TSR methods proposed mechanism for real time TSR using CNN. The training database was established by field sample collection, with which the neural network model was trained. SGD (Stochastic Gradient Descent) optimizer is utilized during training to improve the learning efficiency. The test results show that the proposed

method achieves good performance in speed, accuracy and robustness for real time TSR (Xu *et al.*, 2018).

R-CNN was the first to use this strategy, but it is very slow for two reasons (Girshick *et al.*, 2014). Firstly, generating category-independent object proposals is costly; it takes about 3s to generate 1000 proposals for the Pascal VOC 2007 images (Simonyan & Zisserman 2014). Secondly, it applies a whole deep CNN to every candidate proposal calculated, which is obviously very inefficient and time consuming. To improve efficiency, the SPP-Net (Spatial Pyramid-Pooling Network). Girshick *et al.* (2015) calculated a convolutional feature map for the entire image and extracts feature vectors from the shared feature map for each proposal. This speed up the R-CNN approach about 100 times. They have proposed the Fast R-CNN model, which is a faster version of the R-CNN approach. He *et al.* (2015) proposed RPNs (Region Proposal Networks), which generate object proposals using convolutional feature maps. This allows the generator of the object proposal to share the convolutional features of the whole image with the detection network. With this technique detection system can achieve a frame rate of 5 fps on a powerful GPU (Graphics Processing Unit). Szegedy *et al.* (2016) improved the network architecture, to achieve a frame rate of 50 fps in testing, with competitive detection performance.

In current traffic management systems, there is high probability that driver may miss some of the traffic signs on the road because of overcrowding due to neighboring vehicles. So, we have introduced the TSR system with an aim of detecting and recognizing all the emerging traffic signs.

# CONCLUSION

In this research work, we demonstrated and developed an efficient alert traffic sign detection and recognition system. Both color information and the geometric property of the road signs are used to classify the detected traffic signs. The experiment shows that the system can achieve a high detection rate of 95%.System is giving accurate results under different illumination conditions, weather conditions, day light conditions and different speed levels of the vehicle. We have successfully classified the traffic signs classifier with 95% accuracy and visualized how our accuracy and loss changes with time, which is pretty good from asimple CNN model. The techniques implemented in this research can be used as a basis for developing general purpose, advanced intelligent traffic surveillance systems.