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Machine Learning Based Framework for Vehicle Make and Model Recognition

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Abstract: ***Nowadays, the speedy increase with in the rage of the automobiles on the main road and urban roads have created several challenges regarding the proper management and management of traffic. This is a very significant framework for intelligent traffic monitoring and management. Vehicle analysis is an important component for many smart applications, that includes automated toll collection, self-guided car driver assistance systems, smart car parking systems. In a recent years, due to increased security awareness in parking lots, restricted areas and building for access control systems, the need to identify and classify the vehicles has become important.***

Keywords: Machine Learning, Make ,Model, Vehicle Recognition

I. INTRODUCTION

The convolution neural network used to analyzing the image. This are called Area invariant artificial neural network and shift invariant, supported their translation un-changeability characteristics and shared- weights design. To map image information to an output variable the CNNS were designed. as a an input the image information is involving for any type of prediction problem so they have proven that go-to technique is so effective.A VMMR system should have good worth in terms of vehicle tracking and vehicle identification supported vehicle rather than the vehicle license plate related. The LPR system and VMMR system are used to complement one other. For many intelligent transportation system applications the VMMR system in real time is an important component such as traffic management, traffic behavior analysis etc. for this applications the VMMR system will reduce the price. The current system recognize vehicle identification. The VMMR depend on human observation or automatic license plate recognition (APLR) Firstly, it is very hard for humans to understand and accurately differentiate between the variety of make and model of vehicle. Secondly, it becomes a very long task and laborious for a human observer to screens and record the outgoing or incoming makes/modes and to observe the multitude of screens and monitor. Such as long amount of disadvantage during this ancient VMMR.

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II. RELATED WORK

VMMR BY USING CNN METHODS:

2.1 Logo Recognition Using Whitening Transformation Technique

Foo Chong Soon et.al., [1] proposed a technique using a (CNN) and redundancy of adjacent are removed and also enhance the images data by using whitening transformation technique. for vehicle logo recognization . the main objective whitening transformation is generate identity covariance matrix and also decorrelate the features. To implement and update every weight parameter in the each iteration they used (SGD) stochastic gradient descent method. SGD is very large dataset with sufficient ability to converge in deep learning. To train the weight filters of network has been deployed while using back propagation algorithm program with (SGD)optimization technique.

2.2 Vehicle Type Classification With CNN:

Xinchen wang et.al., [2] implemented a technique using neural network with deep convolution. Implemented a vehicle detection technique. The identification of the automobile within the natural scene was a solution. To solve the problem the program uses faster R-CNN. Aimed towards cars and trucks. They used two methods RPN + ZF, shared and RPN + ZF, unshared. The region proposal algorithm program has been reduced the computation time. (RPN) Region proposal network is equipped by using (SGD). The ZF network may be a deep convolution neural network is a backbone sharing with five convolution layers. The caffe based network is built on VAVDIA jetson TKI. It is then run regularly. The instrumentation of vehicle type classififcation hardware assisted on NVDIA jetson TKI used in this.

2.3 Vehicle Logo Detection Based On MIL Frame Work:

Faezeh Tafazzoli et.al., [3] proposed a logo identification of vehicles and the goal is to identify regions and to maximize the fusion of specific indications. They used a vmmr base MIL system without any object/part annotation. They are using two MIL algorithams, the MI-SVM and citation –KNN (CKNN) classifiers at the instance level. They present a Vmmr system of two stage that identifies fine grains using multiple instance learning. they use a regular SVM classifier for single globle vectore extracted from the whole image, and can see that as SI-VM. A two stage system proposed by them which is used to verify the manufacturer logo and each picture or video is assigned a lable in the starting MIL

framework. The picture have been resized to 450*600 pixels and these pixels are representes usig color space from CIE lab.

2.4 Vehical Recognition Using Deep Neural Network:

Khil soin et.al., [4] implemented that they should observe the driverless car assistance system for moving vehicle on road. Using the Deep Neural networks (DNNS) method they solve vehicle identification and recognition problems. Previously the CNN was using the data collection CIFAR-10.

While collecting information they used CIFAR-10 to train the CNN using stochastic gradient with momentum the system preparing calculation with rate of 0.001 and data is loading for next training. next load ground truth data and store the preparing information in table that includes the name of the image record and the labels of the ROI. Each ROI tag could be a limit box with in image around the objects of enthusiasm. Only the significant ROI picture lables for the vehicle are required to prepare vehicle detector. Utilizing the R-CNN protest the identifier prepare the question indicator of R-CNN, at long last they train R-CNN substantial vehicle detector. preparation work changes the primary arrangement of CIFAR-10 naturally , organized in structure that can group images into 2 classes. The Significant vehicle and non-specific foundation group. The test images was superimposed on the map.

.2.5 Vehicle Color And Shape Using Convolutional Neural Network:

Mohamed Nafzi et.al., [5] proposed A vehicle re-identification module focused on make/model and a color classification. The automated vehicle surveillance may use this. During this work, to find out the VMM and the color descriptors using a CNN. And frame work they used Tensorflow. The normal large set of labeled imge data is needed for (CNN) convolutional neural networks training. To get vehicle images for testing an d training they used a web crawler. They achieves good classification accuracy and good separation between classes while applying cost function so they use cost function. And they used Adam Optimizer to reduce the Cross-Entropie. Based on ResNet architecture for color classification they optimized a CNN. Initial color classification accuracy tests were done with good and bad quality with two controlled data sets. Every data set contain 5934 images, including all existing make and model. Both data sets include images with different views. In their training they did not used any Stanford data set.

2.6 Vehicle Make and Model Recognition Using CNN:

Yongguo Ren et.al., [6] proposes a method using convolutional neural networks to track moving vehicles and MMRS. For training and research, the front view of starting images of vehicle were extracted into CNN. They prefer to use frame difference to identify the moving vehicle as a result of our camera being fixed in street. In this paper they suggested using a vehicle frontal full view to identify its pattern. Convolutionary layer is that the network main layer where a kernel is specified for filtering input data. Here given data results in a different features and filtered into a different kernels. The input data is filtered into different kernels and results in different features. They prefer to use maxpooling layer in the architecture to make sure that result in always obtained even though there translations are existed. Here The Relu layer is used to achive network nonlinearity. The non linearity property is used by this layer, which does not effect the convolutionalyers receptive fileds. The soft-max layer is used for estimatingof k mutually exclusive group. For dealing with the various problems related to tracking deep neural networks it defines a batch normalization technique. Our system is capable of accurately observing the front view of any vehicle image. Int there system the detection algoritham software is proven to be successful and very fast.

2.7 Vehicle Make And Model Viewing Independent Using CNN:

Afshin Dehghan et.al., [7] propose a system that recognige the color, make and model of the vehicle with high accuracy. The training consist of stage process pipeline cycle including data collecting , deep training and pre-processing of data . the training images 8,144and 8,041testing images were split into 50-50 train/test nearly. here all categories contain the same make and model and the deference is in the year of car made. This is due to mainly sophistication in the architecture of our proprietary deep neural network as well as the large amount of data to train this network. In this paper they implemented vehicle model, make and color recognition. implementing deep neural network and a large training dataset enables us to mark vehicle with high degree of precision in real time. They performed multiple experiments on public standards for each classification and verification process, and showed substantial improvements over previous ways.

2.8 Type Classification Of Vehicle Using A Semi-supervised CNN:

Zhen Dong et.al., [8] proposed a type classification of vehicle using semi supervised CNN from vehicle front view pictures. vehicle type classification using a semi-supervised convolutional neural network from vehicle frontal view images. SLFL is an unsupervised process is implemented to learn a filter bank of the CNN. They provide a supervised learning method for the softmax layer parameters. The learning technique is based on recognizing a great many common appearance characteristics are shared by many types of vehicles. they use the methodology of multi-learning to learn the information exchanged between various type of vehicle. They challenging data set of vehicle is called BIT-daset1 and they develop a complex.

that include 9,850 pictures of vehicle to test the proposed process. The dataset used for evaluating vehicle detection. All vehicles are classified into six groups within the dataset: Bus, Minivan, suv and trunk. They check their system and report the results on BIT-Vehicle data collection. The network filter are learned from the proposed SLFL technique for capturing vehicle rich and discriminative information. The vehicle image is consider as an input by the network and returns the propability of every type to which that vehicle belong as a result. Here features learned by the network are sufficiently discriminative to act well in the complex scene. The proposed method by experimental tests on their BIT vehicle public data collection and the dataset.

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2.9 Multi-View Surveillance On CNN And Classification Of Vehicle Type Using Bagging :

Pyong-Kun et.all., [9] Kim proposed a classification system of vehicle type for traffic management system. For best result from the large dataset for vehicle type classification with foure basic concept they propose a new sysytem, they are Bagging, Deep Learning, Data Augmentation, Post-processing and for deep learning. They used microsoft's CNTK for the deep learning library. In CNTK examples they tested ResNet20 ,

ResNet50 and AlexNet by adapting some parameters if necessary. They wanted to use randomness in bagging to get a generalization capability. Those dataset were used to train each model of deep learning . the best results was a large CNN model, selecting a middle size CNN because the bagging system required multiple models. the developing the system was critical. Despite getting the best result for a large size CNN,To build the system the training time was critical and bagging system want several models so as a basic model they chose CNN as middle size model. Bagging method helps to be a robust system. Data augumentation in the bagging system will increases the efficiency of the basic model. the post-processing can compensate for the unbalanced distribution of the data.

2.10 CNN Architecture For Vehicle Make And Model Recognition System Based on PCAnet:

Pyong-KunKim et.al., [10] implemented The PCNN and it recognize with one local feature of the vehicle, here the vehicle headlamp to recognize the model. This vehicle headlight detection system is utilizes coarse segmentation technique. The PCNN is an end-to-end device whose input is strongly segmented headlight picture of the vehicle with pixels in size. PCANet is a network for image classification, focused mainly on PCA for learning of multistage filter banks, and block-wise histogram. The proposed method worked well for left side view of front that uses the vechicle headlights as ROI. Here completely 13 recognized pictures incorrectly belonging to certain classes like Toyota avanza, Honda jazz, Toyota vios NCP150, Toyota vios NCP42, proton saga FLX, proton Exora, perodua myvi is intial generation and perodua myvi is second generation. The MatConNet's CNN method has also been applied to our dataset. Discriminative features which are automatically extracted from the PCNN network are robust are the against from various rotations, shifiting

2.11 Autonomous Vehicle Detection Using CNN:

Izzah Amain Tarmiz et.al., [11] implementing a technique for improving the bad Weathers and vehicle during night scene using CNN method. The input characteristics of input size 32*32, from mat lab dataset the volume in training phase is 177 images, volume in test phase is 188 images, four images from iROADS dataset and two from KITTI, RGB is depth. The CNN method implemented in mat lab 2017 aversion this algorithm used in deep learning. The CNN is suitable for pattern recognigation. This paper proposed a vehicle detection technique for AV using the CNN to detect the problems in a bad weather and during night scene also. with strong detection accuracy.

III. METHODOLOGY

The current system recognize vehicle identification. The VMMR depend on human observation or automatic license plate recognition (APLR) Firstly, it is very hard for humans to understand and accurately differentiate between the variety of make and model of vehicle. Secondly, it becomes a very long task and laborious for a human observer to screens and record the outgoing or incoming makes/modes and to observe the multitude of screens and monitor. Such as long amount of disadvantage during this ancient VMMR.

Here the recognition of vehicle model plays an crucial role in intelligent transport system. The PCNN is used recognize only single local feature of vehicle. This vehicle headlight detection system is utilizes coarse segmentation technique The PCNN is an end-to-end device whose input is strongly segmented headlight picture of the vehicle with pixels in size. PCANet is a network for image classification, focused mainly on PCA for learning of multistage filter banks, and block-wise histogram.

IV. RESULTS AND DISCSSION

Here we present a table how much accuracy got for a particular method and one by one With explanation. pyong-kun kim implementing a new classification system for vehicles on images from multi-view camera surveillance. the dataset classification problem has a lot of images but the distribution between class is not good. Small size class can be overwhelmed by big class. They wanted to use randomness in bagging to get a generalization capability. From training data set They sampled a half number and generated a new training data set. The sampling procedure was replicated and several sample datasets were produced with different photos of same number. In each deep learning model these datasets were used for training, so with the same function we got many different models.

Table-1:Different methods with accuracy

AUTHOR	METHODOLOGY	ACCURACY
Joon Huang Chuah at all	CNN with PCANet based CNN (PCNN)	89.83%
Pyong-Kun Kim at all	Deep Learning with bagging system	97.84%
XinchenWang1at all	Faster R—CNN with NVDIA bord	90%
Foo Chong Soon at all	CNN (Whitening transformation technique) with Backpropagation algorithm ,stochastic gradient descent optimization technique	93%
Hui Li , Peng Wang at all	CNN,RNN With SGD, bidirectional Recurrent neural network	98.3%

XinchenWang present a method for classifying vehicle type using deep learning. To solve the problem the system uses Faster R-CNN. This detection method will allow the network detection. The improved ZF network is implemented on PASCAL as the backbone network for mutual convolutionary layers of RPN and detection network. They also upgraded the ZF network and introduced two additional convolution layers and next max polling layer to the orginal network. It has finally seven shareable convolutionary layers. It can improve the network to express itself through increasing the depth of network.

Foo Chong Soon proposed a technique using CNN and redundancy of adjacent are removed. [1]by using whitening transformation technique. for vehicle logo recognization . the main objective whitening transformation is generate identity covariance matrix and also decorrelate the features. To implement and update evey weight parameter in the each iteration they used (SGD) stochastic gradient descent method. SGD is very large dataset with sufficient ability to converge in deep learning. For obtain and train network of weight filters has been deployed while using back propagation algoritham program with (SGD)optimization technique.

Hui Li Peng Wang has discussed the problem of detecting and recognizing car license plate with natural images. In Single Forward Pass which can recognize letters simultaneously and localize license plates. The license plate for vehicle is unique feature by each individual vehicle is identified [12]. The model have a variety of convolutionary layers for extracting discriminative features for license plate, a regional proposal network tailored specifically to car license plate, ROI pooling layer, multilayer perceptrons, for the plate recognition of RNN with CTS

V. CONCLUSION

This paper has explored the different methods which are used in CNN and R-CNN like whitening transformation technique, Stochastic gradient descent (SGD), PCAnet-based CNN and other methods. It has explained the Back propagation, and MIL algorithms. They used two methods RPN + ZF, shared and RPN + ZF, unshared. In this NVDIA Jetson kit . this NVDIA Jestson kit to detect the Vehicle type. While using SGD, bidirectional Recurrent neural network they got 9.7 accuracy. hardware instrumentation for classification of vehicle type supported on NVDIA jetson TK1. The purpose of real-time application, CNN structure is ideal for parallel computation objective integration into GPU and for the future work. We have to improve faster R-CNN output and improve feature extraction classification using CNN (e.g. cars, vans and cyc

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