HELMET VIOLATION PROCESSING SYSTEM FOR MOTORCYCLISTS SAFETY USING DEEP CONVOLUTION NEURAL NETWORKS

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ABSTRACT: Today, the two-wheeler is the most popular means of transport. The helmet is the main protection of the motorcyclist, because cyclists without a helmet have less protection and are more at risk. Therefore, it is very desirable for cyclists to use a helmet. We present the development of a system that uses image processing and deep convolutional neural networks (CNN) to find law-breaking bikers.

With the advent of the latest technologies, manual strategies can be replaced by automatic detection systems that use machine learning. Using video surveillance of the road, the proposed approach recognizes without manual help whether the motorcyclist is wearing a helmet or not. The proposed system uses image processing and deep convolutional neural networks to identify motorcyclists who are not wearing helmets. Trials with real videos succeeded in highlighting in the surveillance video riders wearing and not wearing helmets, with a low average rate of false alarms, thus demonstrating the effectiveness of the proposed approach. The system uses convolutional neural networks derived from image data of motorcyclists head region, using individual images.

1.INTRODUCTION

Helmets provide bikers with the most protection, and riding without one poses a significant risk.Bike riders are required to wear helmets.The vast majority of the nations expect motorcyclists to wear protective cap yet couple of individuals violate the standards.Therefore, creating a method for locating motorcyclists who are in violation of the law that makes use of image processing and deep convolutional neural networks (CNNs).The government mandated that both the pillion rider and the bike driver wear helmets.To catch those who don’t wear helmets, many Indian states have used manual tactics.

With the advancement of modern technologies, manual strategies are being replaced by self-regulating detection systems that use Machine Learning to identify and punish violators.Machine learning is an Artificial Intelligence (AI) application that allows systems to automatically learn and improve from experience without being explicitly programmed.Using video surveillance of the street, our approach detects whether or not the bike rider and pillion rider are wearing helmets. To identify motorcyclists who are not wearing helmets, the proposed system employs image processing and Deep Convolution
Neural Networks.

The system uses Convolution Neural Networks derived from head region image data of bike riders. The model has been trained to determine whether the motorcyclist and pillion rider are wearing helmets.

LITERATURE SURVEY:

According to the report in 2021, two-wheelers accounted for the highest number of fatal road accidents (69,240 deaths), accounting for 44.5

percent of total road accidental deaths.During 2021, two-wheelers were responsible for nearly 70,000 deaths in road accidents in the country.
The majority of two-wheeler deaths were reported in Uttar Pradesh (7,429 deaths) andTamil Nadu (8,259 deaths) accounting for 10.3% and 11.9% of total two- wheeler deaths, respectively.

There are more motorcycles on the road these days, which increases the likelihood of an accident occurring. As a result, both the main rider and the pillion rider should wear helmets to reduce the risk of an accident occurring. Many families have lost loved ones as a result of road accidents caused by not wearing a helmet. Even if an accident occurs, the helmet protects the person to some extent. It is necessary to wear a helmet while driving a motorcycle in order to reduce the risk of being attacked and suffering serious injuries.Our proposed work will at the very least warn violators to wear helmets, reducing the number of road accidents.

2.1 Automatic Detection of Bike-riders without Helmet using Surveillance Videos in Real-time
Authors: Kunal Dahiya, Dinesh Singh, C. Krishna Mohan

In this journal, we propose a method for automatically detecting bike riders without helmets using real-time surveillance tapes. By Using background subtraction and object segmentation, the proposed method first detects bike riders in surveillance video. Then, using visual features and a binary classifier, it determines whether or not the biker is wearing a helmet. In addition, we present a consolidation approach for violation reporting, which aids in improving the proposed approaches reliability. To assess our approach, we compared the performance of three widely used feature representations for classification: histogram of oriented gradients (HOG), scale-invariant feature transform (SIFT), and local binary patterns (LBP). On real-world surveillance data, the experimental results show a detection accuracy of 93.80%.It is also shown that the proposed approach has low computational cost. It works in real time with processing time 11.58 ms per frame.

2.2 Detection of Motorcyclists without Helmet in Videos using Convolutional Neural Network
Authors: C. Vishnu, Dinesh Singh, C. Krishna Mohan and Sobhan Babu

Wearing helmets is very important to the safety of substation personnel. In this paper, we propose a safety helmet detection framework based on machine learning theory and image processing techniques. The TensorFlow model analyzes the human head-to-body ratio to detect head position while enabling pedestrian detection. Next, we use color space conversion and head position color feature identification to detect whether the employee is wearing a helmet. Experimental results of a large number of substation surveillance video sequences show that the detection rate of the helmet-wearing detection system reaches 89.0%, proving the effectiveness of the proposed framework.

2.3 Helmet Detection on Motorcyclists Using Image Descriptors and Classifiers
Authors: Romuere R. V. e Silva,· Kelson R. T. Aires, · Rodrigo de M. S. Veras

The number of motorcycle accidents has increased rapidly.Despite the fact that helmets are the most important piece of motorcycle safety gear, many drivers do not wear them.A system for identifying motorcycle riders without helmets and a detection method for motorcycles

were proposed in this paper.We used the random
forest classifier and the wavelet transform (WT) as the descriptors for vehicle classification.The image attributes were extracted using the Circular Hough Transform (CHT) and the Histogram Of Oriented Gradients (HOG) descriptor for helmet detection, and the objects were categorized using the multilayer perceptron (MLP) classifier.The accuracy of the vehicle classification results was 97.78 percent.The helmet detection algorithm step achieved an accuracy rate of 91.37 percent.The authors database was used to get the results.

2.4 Visual Big Data Analytics for Traffic Monitoring in Smart City

Authors:Singh, D and Vishnu, C and C, Krishna Mohan

In order to find those who are breaking traffic laws, an application like video surveillance for traffic control in smart cities needs to analyze a large amount of video footage over many hours or days.An enormous amount of real-time visual data cannot be analyzed using conventional computer vision methods.As a result, there is a demand for visual big data analytics, which entails processing and analyzing large amounts of visual data, such as videos or images, in order to discover interpretable semantic patterns.In this paper, we propose a structure for visual huge information examination for programmed recognition of bicycle riders without head protector in city traffic.In addition, we investigate opportunities for future research and talk about the difficulties associated with visual big data analytics for traffic control in city-scale surveillance data.

2.5 A comprehensive study of motorcycle fatalities in South Delhi

Authors: C. Behera, R. Ravi, L. Sanjeev, and D. T

All India Institute of Medical Sciences in Delhi examined 94 motorcycle-related fatalities from South Delhi from April 2007 to March 2008, .The victims age and sex, injury pattern, helmet use, alcohol consumption, cause of death, mode of transportation to the hospital, and offending vehicles were all examined in the data analysis.During the study period, the cases accounted for 5.38 percent of all autopsy cases.Male victims outnumbered female victims by 6.4% in 93.6 percent of cases.The age range from 21 to 30 was the most common (44.67%). The most common cause of death was a head injury, including injuries to the cervical spine (74.47 percent).In the majority of cases, the offenders vehicle was a large vehicle (34.04 percent).The majority of motorcycle crash victims (78.72 percent) were drivers, and only 54.05 percent of them were wearing helmets at the time of the incident.At the time of the incident, no pillion riders were found to be wearing helmets.Just six cases (6.38%) were tracked down sure for liquor.

2.6 Motorcycle detection and tracking system with occlusion segmentation

Authors: C.-C. Chiu, M.-Y. Ku, and H.-T. Chen

A vision-based motorcycle monitoring system is proposed in this paper to identify
and track motorcycles.A method for segmentation and detection of occlusions is
offered by the system.The method determines the classes of motorcycle occlusions and separates the motorcycle from each occlusive class by utilizing the visual length, visual width, and Pixel Ratio.The helmet detection or search method is used to ensure that the helmet and motorcycle do not escape because motorcycle riders are required to do so.The robustness, accuracy, and time responses of the experiments conducted with complex road scenes are reported, demonstrating the methods validity.

2.7 Helmet presence classification with motorcycle detection and tracking
Authors: John P Chiverton

Helmets are necessary for motorcycle riders safety; however, enforcing helmet use is a labor-intensive and time-consuming process. As a result, a method for automatically identifying and following motorcycle riders wearing and without helmets is presented and evaluated.Support vector machines are used in the system, which was trained on histograms derived from static photographs and individual video frame image data of motorcycle riders head regions.A tracking system uses background subtraction to automatically segment video data into motorcycle riders using the trained classifier.The trained classifier is used to classify the riders isolated heads.Tracks are a series of regions that each motorcycle rider creates in time frames that are adjacent to one another.A mean of the individual classifier results is used to classify these tracks as a whole.On static photographs, tests demonstrate that the classifier can accurately classify whether riders are wearing helmets or not.The classification strategies veracity and usefulness are also demonstrated by tracking system tests.

3. METHODOLOGY:

To determine whether a person is wearing a helmet and the violators are identified.
Throughout the training and testing phases, we require a dataset for each classification. The dataset, which includes various images of people wearing helmets, is downloaded from various online platforms.

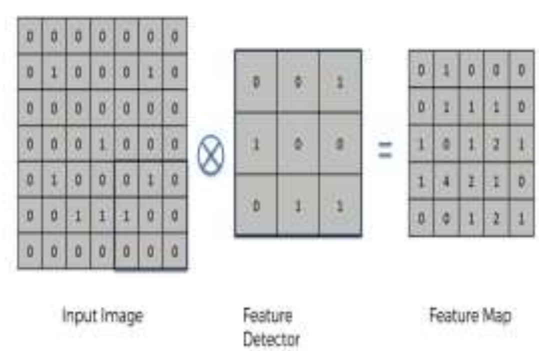
Once the dataset is prepared the next stage is object recognition which is finished utilizing convolution neural network. The nature of the problem at hand influences the design of the CNN.Each of the three convolutional layers in the proposed model is followed by a max pooling layer.MLP is used to connect the final layer.ReLu actuation capability is applied to the result of each convolutional layer and completely associated layer.The first convolutional layer uses 32 3x3 kernels to filter the input image.The output is used as an input for the second convolutional layer, which uses 64 4x4 kernels after max pooling has been applied. A fully connected layer of 512 neurons is followed by 128 kernels of size 1x1 in the final convolutional layer.The softmax function uses this layer output to generate a probability distribution for each of the four output classes.With a batch size of 100 and 1000 epochs, adaptive moment estimation (Adam) is used to train the model.

4.ALGORITHMS

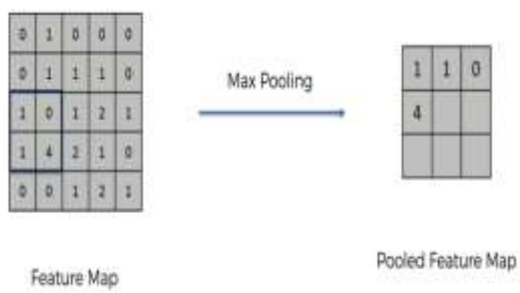
CNN:

There are four steps in the CNN algorithm:
Convolution: Two functions mathematical combination to produce a third function is referred to as convolution.It combines two sets of data.With the help of a kernel or filter, a CNN performs the convolution on the input data to generate a feature map.
The three components that go into the convolution process are as follows:

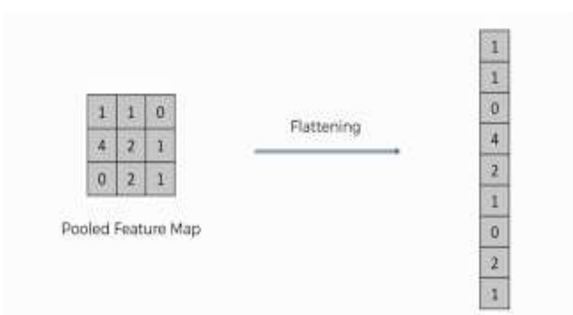
- Feature map
- Feature detector
- Input image



Max Pooling: Max pooling is a discretization technique based on samples. Down-sampling an input representation (such as an image or hidden-layer output matrix) is the goal , allowing assumptions to be made about the features in the binned subregions and reducing its dimensionality.



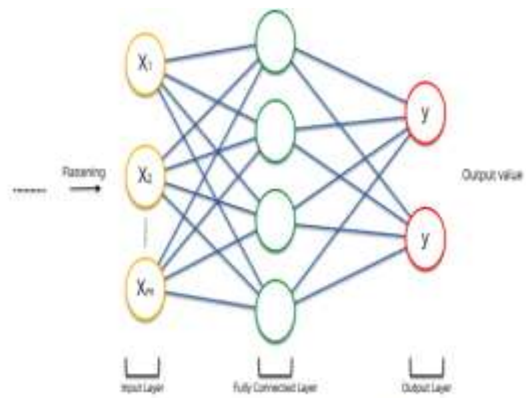
Flattening: The process of transforming all of the resulting two-dimensional arrays into a single continuous vector which is linear is known as flattening.



Full Connection: The so-called Fully Connected Layer receives input from the final Pooling Layer at the end of a CNN.There can be at least one of these layers ("fully connected" implies that each hub in the primary layer is associated with each hub in the subsequent layer).

In the full connection step, there are three layers, as shown in the image below:

- Input layer
- Fully-connected layer
- Output layer



5.EXPERIMENTAL RESULTS

Person wearing helmet

Person without helmet

6.CONCLUSION

The proposed system can provide the accurate results by training the dataset and further be enhanced by checking if more than two people are on bike. The violators can be punished by generating a challan. By wearing helmets it prevents from road accident and there is no loss of death. It will reduce brain injuries,severe cuts and so on. This project will help the government to get the violators without any manual help. It reduces the work of traffic police and everything will be in control with less chances of accident occurrence.

7. REFERENCES

1. C. Vishnu, Dinesh Singh, C. Krishna Mohan and Sobhan Babu,"Detection of Motorcyclists without Helmet in Videos using Convolutional Neural Network" Visual Intelligence and Learning Group (VIGIL), Department of Computer Science and Engineering Indian Institute of Technology Hyderabad, Kandi, Sangareddy-502285, India.

2. K. Dahiya, D. Singh, and C. K. Mohan, "Automatic detection of bike-riders without helmet using surveillance videos in real-time," in Proc. Int. Joint Conf. Neural Networks (IJCNN), Vancouver, Canada, 24–29 July 2016, pp. 3046–3051.

3. D. Singh, C. Vishnu, and C. K. Mohan, "Visual big data analytics for traffic monitoring in smart city," in Proc. IEEE Conf. Machine Learning and Application (ICMLA), Anaheim, California, 18–20 December 2016.

4. C. Behera, R. Ravi, L. Sanjeev, and D. T, "A comprehensive study of motorcycle fatalities in south delhi," Journal of Indian Academy of Forensic Medicine, vol. 31, no. 1, pp. 6–10, 2009.

5. W. Hu, T. Tan, L. Wang, and S. Maybank, "A survey on visual surveillance of object motion and behaviors," IEEE Trans. Systems, Man, and Cybernetics, Part C: Applications and Reviews, vol. 34, no. 3, pp. 334–352, 2004.

6. C.-C. Chiu, M.-Y. Ku, and H.-T. Chen, "Motorcycle detection and tracking system with occlusion segmentation," in Proc. Int. Workshop on Image Analysis for Multimedia Interactive Services, Santorini, Greece, 6–8 June 2007, pp. 32–32.

7. J.Chiverton, "Helmet presence classification with motorcycle detection and tracking," Intelligent Transport Systems (IET), vol. 6, no. 3, pp. 259–269, September 2012.

8. Z. Chen, T. Ellis, and S. Velastin, "Vehicle detection, tracking and classification in urban traffic," in Procs. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITS), Anchorage, AK, Sept 2012, pp. 951–956.

9. R. Silva, K. Aires, T. Santos, K. Abdala, R. Veras, and A. Soares, "Automatic

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Vol-12 Issue-12 No.02, December 2022

detection of motorcyclists without helmet," in Proc. Latin American Computing Conf. (CLEI), Puerto Azul, Venezuela, 4–6 October 2013, pp. 1–7.

10. W. Rattapoom, B. Nannaphat, T. Vasan, T. Chainarong, and P. Pat-tanawadee, "Machine vision techniques for motorcycle safety helmet detection," in Proc. Int. Conf. Image and Vision Computing New Zealand (IVCNZ), Wellington, New Zealand, 27–29 November 2013, pp. 35–40.