PAPER DETAILS

Paper Title : A Model Based on Convolutional Neural Network (CNN) for Vehicle
Classification.

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WHY THEY HAVE CONDUCTED THIS RESEARCH?

The research was conducted to develop a CNN model for classifying the vehicle. This research was conducted to develop an accurate and efficient vehicle classification system that could potentially contribute to the reduction of traffic-related accidents in the researcher's country. They were concerned about traffic-related road accidents and aimed to find a way to prevent them.

PROPOSED SYSTEM

In this research, they proposed a system using Convolutional Neural Networks (CNNs) for Vehicle Classification. The process involves data collection, data preprocessing, training a CNN using different architectures such as VGG19, DenseNet, and MobileNetV2, and performance measures.

Firstly, in the data collection stage, they gather a dataset with total 4800 images. The images can be obtained from various sources.

Next, in the data preprocessing stage, they clean and preprocess the data to be used for training the model. This may involve tasks such as normalizing image, resizing images, convert image to grey scale, and normalizing the data. They resized images 128 x128 shape.

After preprocessing the data, they train a CNN model using different architectures such as as VGG19, DenseNet, and MobileNetV2. These architectures are designed to handle different types of images and tasks.

Finally, the performance of the vehicle classification system is evaluated using various metrics such as precision, recall, F1- score, and accuracy. The evaluation can be done on a separate validation dataset or through cross-validation on the original dataset.

ARCHITECTURE

In this research they used three CNN architectures one is MobileNetV2 architecture and second is DenseNet architecture and third is VGG19 architecture.

MobileNetV2 is a popular CNN architecture for image classification tasks. The architecture is based on depth wise separable convolutions, which allows for high accuracy with lower computational cost.

DenseNet is a convolutional neural network architecture designed for transfer learning. It is a pre-trained model. In this proposed model they used DenseNet-121 architecture. Convolutional layers of this architecture five and also pooling layers is five. Also there are three transition layers which reduce the spatial dimensionality of the feature maps. There is one classification layer that outputs the final predictions for the input image.

VGG19 architecture consists of 19 layers. Convolutional layers of this mode is 16 and 3 fully-connected layers. In this layer also have five Max pooling layer and one softmax layer. Fully connected layers are used for classification purposes. The fully connected layers in VGG19 consist of 4096 channels each, followed by another fully connected layer with 1000 channels, which is used to predict the output labels.

EXPERIMENTED RESULT

For vehicle classification they used a dataset of 4800 images. Using MobileNetV2 architecture the model gained training accuracy 97.01% and validation accuracy 98.10% that is the highest accuracy. Also proposed model achieved training accuracy 94.32% and validation accuracy 95.37% using DenseNet architecture also VGG19 achieved training accuracy 91.94% and validation accuracy 92.68%.

Accuracy on the training set of this proposed model. In the first epoch DenseNet 121 achieves an accuracy of 93.33%, which increases to 94.32% in the 10th epoch. Similarly, VGG19 achieves an accuracy of 89.84%, which increases to 91.94% in the 10th epoch. Also MobileNetV2 achieves an accuracy of 95.51%, which increases to 97.01% in the 10th epoch.

Accuracy on the validation set of this proposed model. In the first epoch DenseNet 121 achieves an accuracy of 94.12%, which increases to 95.37% in the 10th epoch. Similarly, VGG19 achieves an accuracy of 90.94%, which increases to 92.68% in the 10th epoch. Also MobileNetV2 achieves an accuracy of 96.03%, which increases to 98.10% in the 10th epoch.

In this proposed model, for training dataset best precision 97.01% and for validation dataset best precision 98.10%