# Paper Review 03

## A Model Based on Convolutional Neural Network (CNN) for Vehicle Classification

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## Purpose of This Research

This research is done to classify various type of common vehicles, with the goal of eliminating traffic-related road accidents. The study used three different methods, including MobileNetV2, DenseNet, and VGG 19. Authors used 4800 photographs of vehicles.

## Proposed System

The paper proposes using three different CNN architectures, including DenseNet, VGG 19, and MobileNetV2, to detect different types of vehicles. The dataset used for training and validation has undergone preprocessing by converting the images to grayscale, resizing them to 128x128 pixels, setting labels, normalizing the images, and converting them to numpy arrays. The performance of the models is measured based on several metrics, including accuracy of the training and validation datasets, recall, precision, and F1 score. The results provide how accurately model are classifying vehicles in real-world scenarios. This study can be used to develop better vehicle detection algorithms and improve traffic control systems.

## Architecture

In this research, CNN architecture is used for image processing and classification. It includes DenseNet, VGG 19, and MobileNetV2, to detect different types of vehicles. DenseNet give high accuracy using less parameters, very powerful feature. It include batch normalized Relu activation convolutional hidden layer and transition layer in architecture.

VGG19 is a variant of the VGGNet architecture. It include 19 layers.

Another architecture is MobileNetV2. It has 28 deep convolutional neural network layers and an inverted residual structure with residual connections between bottleneck layers

Three of those architecture used to detect different types of common vehicles.

## Experimental Procedure

Researcher used numpy arrays for all images and trained the models on 80% of the data and 20% for validation. Authors labels the data when more than two output found. For preprocessing authors maintain all the requirements. In order to include their trainable layer included average pooling and Relu activation in the first convolution layer with 128 neurons they froze the base layer. Authors needed four output where they use Softmax activation. After 10 epochs the results showed that MobileNetV2 achieved the highest accuracy of 98.10%, followed by DenseNet at

95.37% and VGG19 at 92.68%. MobileNetV2 get the best result of precision (96.39%), accuracy (96.46%), F1-score (95.23), and recall (96.63%). The MobileNetV2 model successfully identified categorical vehicles accurately in tested pictures too.

## Future Plan

The authors get the best result in MobileNetV2 compared to others. They plan to work with wider dataset in order to compare with MobileNetV2. They also planned to integrate the model with IoT cloud for future work plan.

## References


1. A Model Based on Convolutional Neural Network (CNN) for Vehicle Classification by FM Javed Mehedi Shamrat, Sovon Chakraborty, Saima Afrin, Md Shakil, Mahdia Amina Moharram, Tonmoy Roy