LOVELY PROFESSIONAL UNIVERSITY

INT248

Advanced Machine Learning

Assignment 1

Assigned By : Ankita Wadhawan

Project on :

Vehicle Logo Detection using CNN

GitHub link: https://github.com/YashYadavalli/INT248

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Introduction

A Convolutional Neural Network Implementation for VLD(Vehicle Logo detection)

Convolutional Neural Networks (CNN) are state-of-the-art Neural Network architectures that are primarily used for computer vision tasks. CNN can be applied to several different tasks, such as image recognition, object localization, and change detection. Recently, Aim here is to develop a Computer Vision model which could identify the car brand in a given image. Considering that different car brand can appear quite similar and any car can look very different depending on their surroundings and the angle at which they are photographed, such a task was, until quite recently, simply impossible.

However, starting around 2012, the 'Deep Learning Revolution' made it possible to handle such a problem. Instead of being explained the concept of a car, computers could instead repeatedly study pictures and learn such concepts themselves. In the past few years, additional Artificial Neural Network innovations have resulted in AI that can perform image classification tasks with human-level accuracy. Building on such developments we were able to train a Deep CNN to classify cars by their model. The Neural Network was trained on the dataset of logos of 20778 pictures of cars logos, comprising 40 different brands. Over time we could see the accuracy of predictions began to improve, as the neural network learned the concept of a logo, and how to distinguish between different models. After a few practice attempts, the CNN's accuracy reached around 71%.

Data Used: I have taken dataset from Kaggle after. This dataset is made from web-scrapping of logos from google image classifier.

Total no classes : 40

Total no of Images: 20778

Brand	No.of Logos	Brand Name	No.of Logos
Audi	744	Mercedes	698
BMW	602	Mitsubishi	585
Chevrolet	663	Nissan	538
Citroen	438	Datsun	520
Dacia	363	Opel	593
Daewoo	318	Peugeot	605
Dodge	316	Porsche	584
Ferrari	645	Renault	632
Fiat	493	Romeo	852
Ford	667	Rover	782
Honda	456	Saab	431
Hyundai	488	Seat	374
Jaguar	404	Skoda	551
Jeep	500	Subaru	501
Kia	490	Suzuki	467
Lada	354	Tata	303
Lancia	460	Tesla	559
Lexus	612	Toyota	615
Maserati	561	Volkswagen	644
Mazda	484	Volvo	406

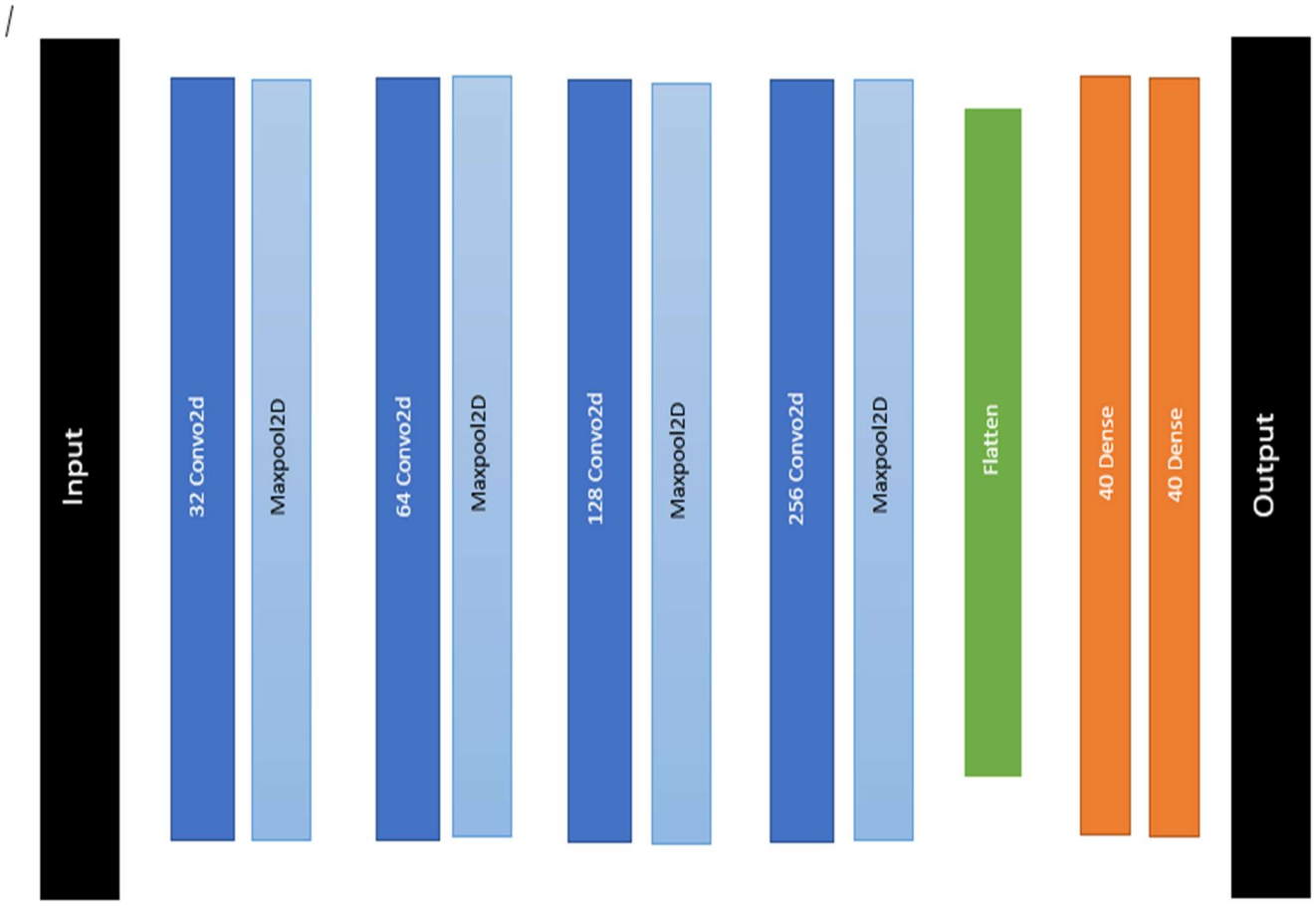
The dataset here is not classified it is just a folder of Images and each image is named in the form of Name of the brand + random number in jpg format.
For Example: “Alfa Romeo10882_small.jpg”
So I have removed unwanted characters in the name using Re[Regular Expressions] package.

Example: “Alfa Romeo10882_small.jpg” converted to “Romeo”

Proposed Architecture:

Neural Network used : Convolutional Neural Network

Architecture: Sequential



Total Parameters : 704,999

Trainable Parameters : 704,999

Nontrainable Parameter’s : 0

Accuracy test score: 70.04%

Precision : 89.62%

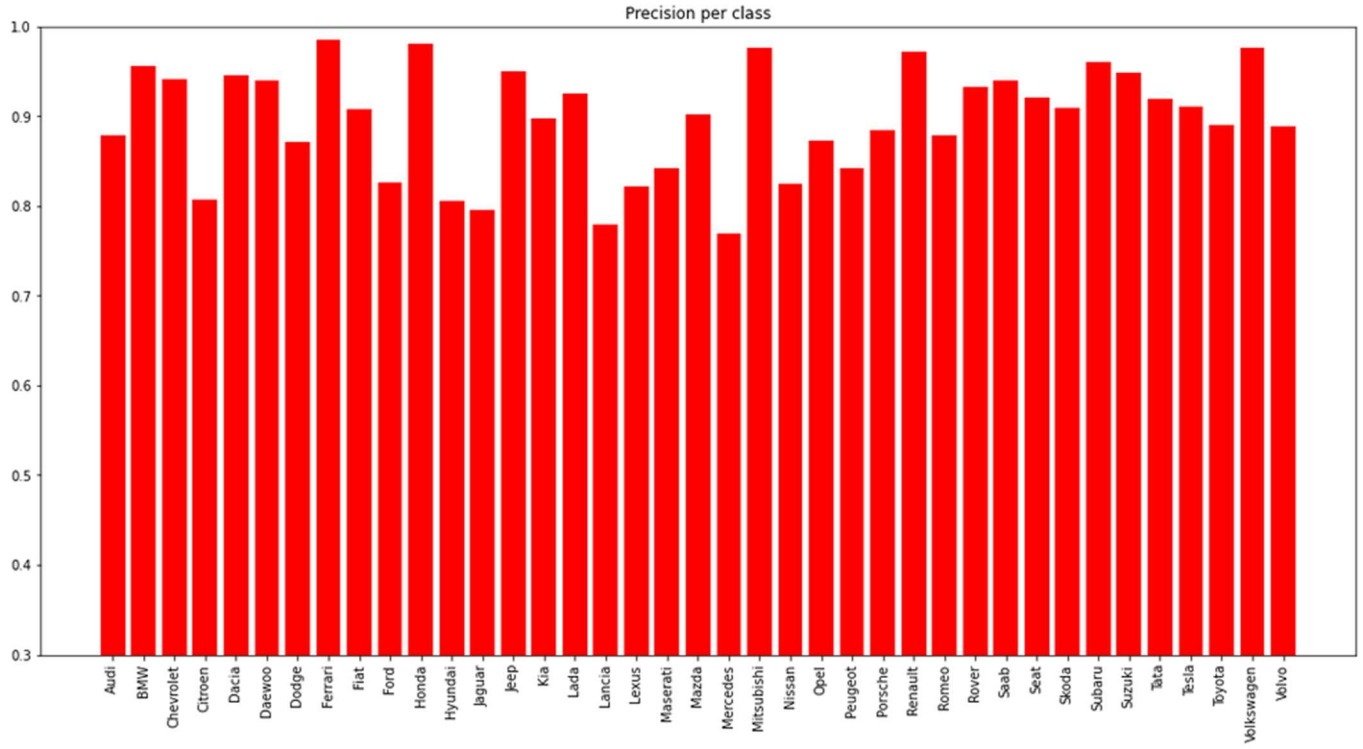
Recall : 61.62%

F1_Score : 72.22%

Accuracy : 70.04%

Result Analysis

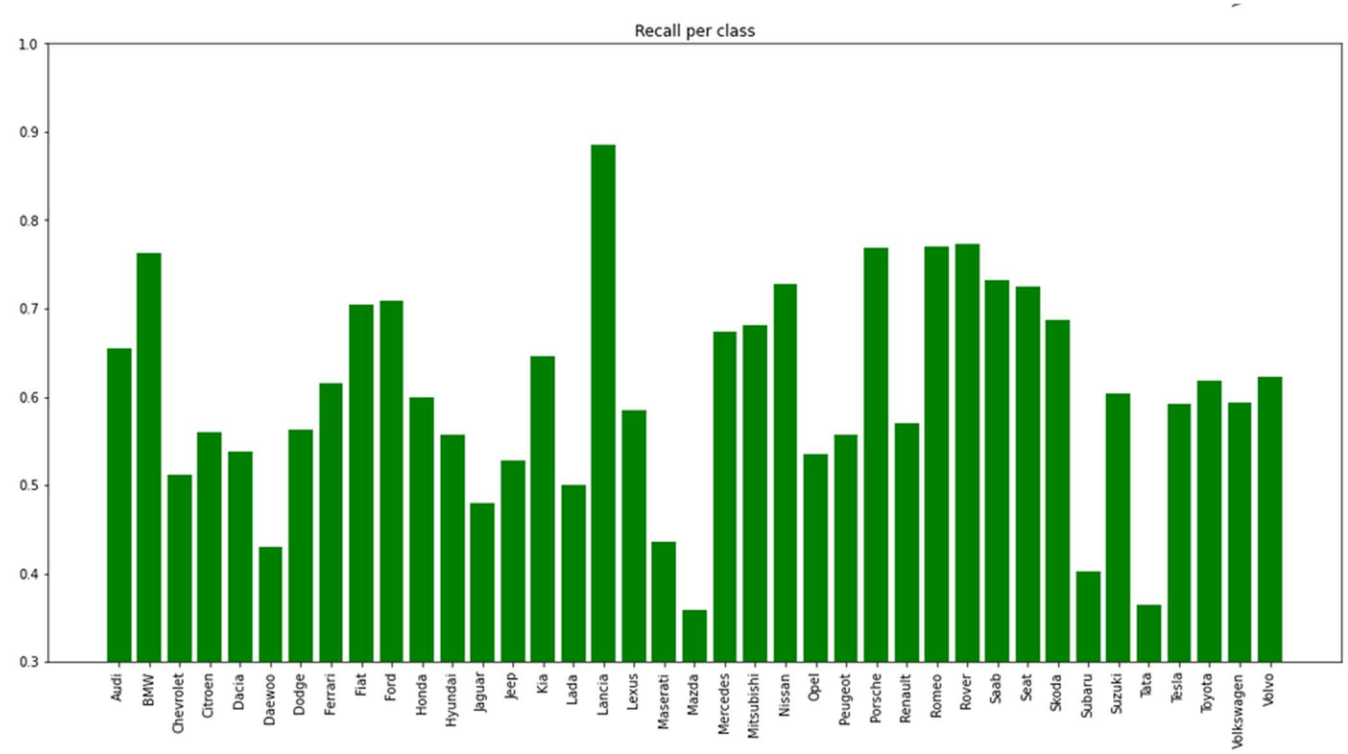
Precession



While observing Precession per class ,the following 5 classes got the highest precession as their logos are having only one letter or symbol.

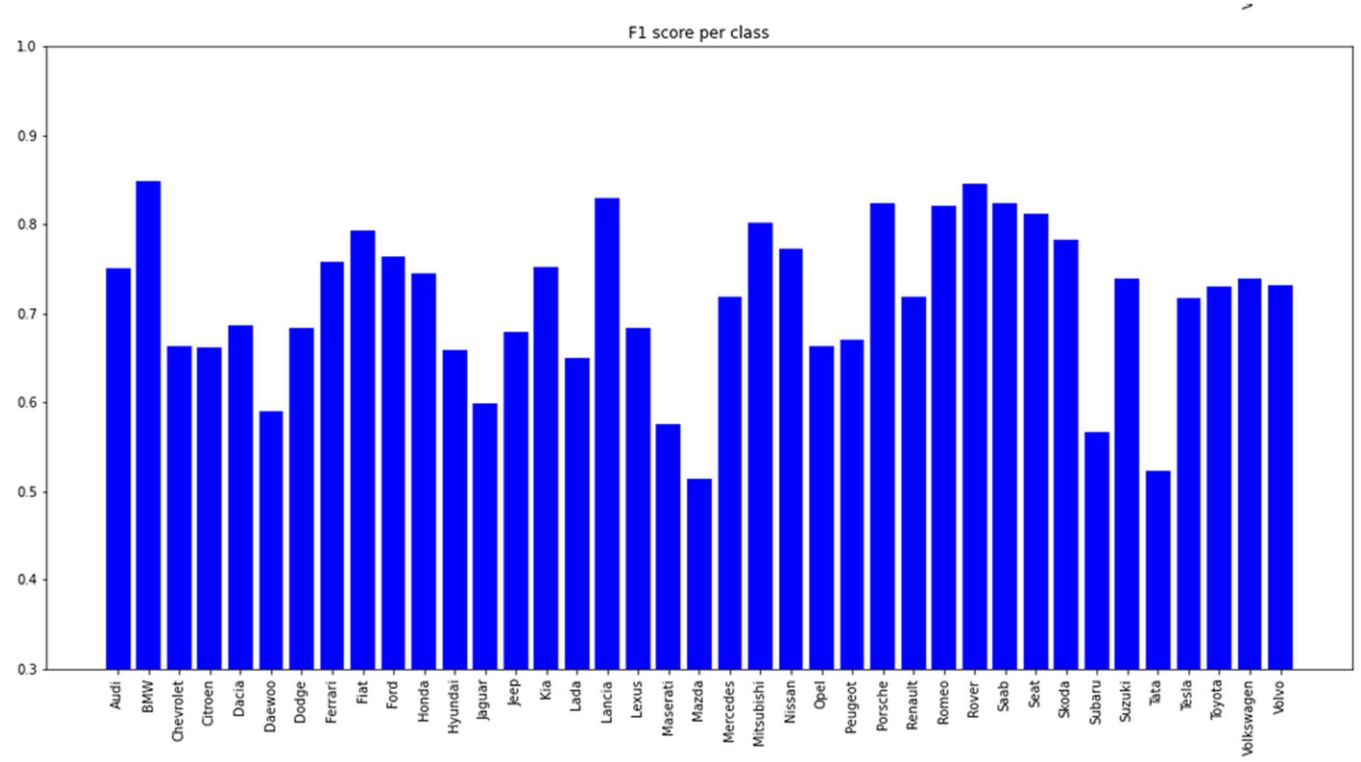
1. Honda
2. Ferrari
3. Mitsubishi
4. Renault
5. Volkswagen

Recall



While observing Recall per class ,the Lancia got the highest Recall per classes and Mazda and Tata got the lowest Recall per class.

F1 _Score



BMW, Lancia and Rover have the highest F1 Scores and Mercedes and Tata are having the least F1_Scores.

Conclusion:

By Observing three graphs Lexus, Jaguar and Hyundai have both precession and recall per classes because of the no.of Images that we provided for training are less compared to others. While performing the testing I have observed that the neural network was mistaking Hyundai for Daewoo and interestingly this is not the way around, Daewoo was not mistaken for Hyundai.

The model has well accuracy score, if we tweak the values in augmentation, I have observed the change in accuracy. So, if we make good number of tweaks in neural network and Image augmentation, we can get higher accuracy than 70.01% and by adding more images would get great results.

Feature Scope:

VLD(Vehicle Logo Detection) may be used in many ways but the topmost usage we can predict is by applying this recognition system in traffic monitoring. Also, for manufacturers, this may help to know and gather data of where the maximum and minimum no.of their vehicles present, so that they can focus on the specific locality/Area more to sell their products and figure out the problems facing while expanding their product coverage.

References:

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