CIFAR 10 IMAGE CLASSIFICATION

INTRODUCTION

The CIFAR-10 dataset (Canadian Institute For Advanced Research) is a collection of images that are commonly used to train machine learning and computer vision algorithms. It is one of the most widely used datasets for machine learning research.The CIFAR-10 dataset contains 60,000 32x32 color images in 10 different classes.The 10 different classes represent airplanes, cars, birds, cats, deer, dogs, frogs, horses, ships, and trucks. There are 6,000 images of each class . The crux of the project is to train a model with CIFAR 10 dataset so that it can classify any given image into the correct category

IMPORTANCE

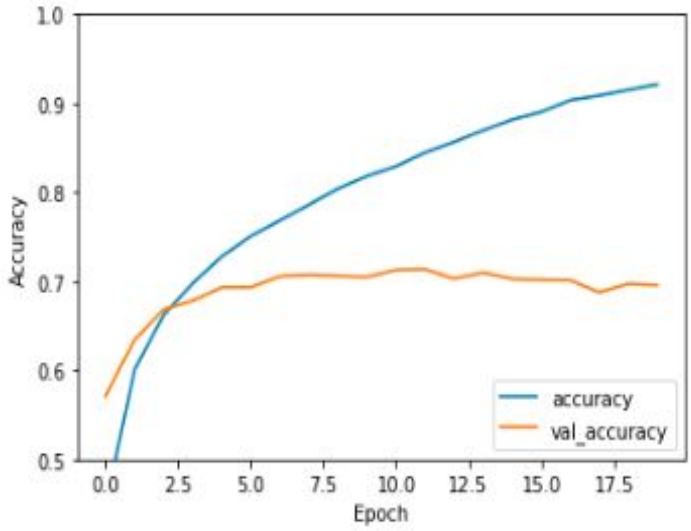
Image classification is a very widely used application in many industries such as E-commerce , Healthcare , space research etc . CIFAR 10 provides a broad range of image categories to train a model .

DATA SOURCE

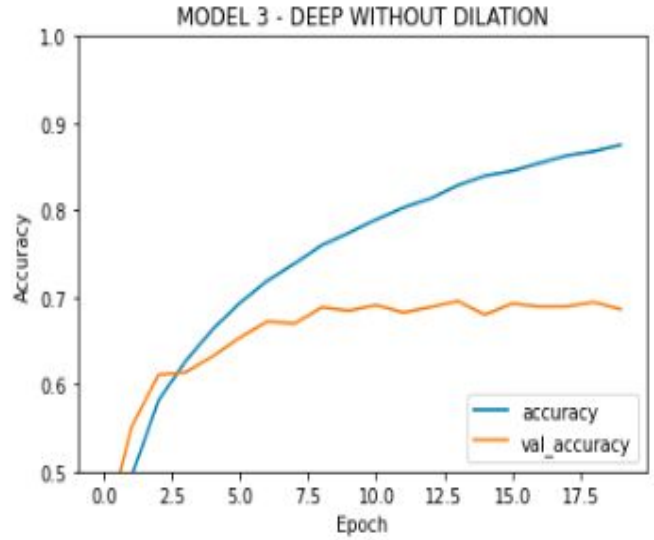
CIFAR 10 dataset is an established computer-vision dataset used for object recognition .It was collected by Alex Krizhevsky, Vinod Nair, and Geoffrey Hinton.

MODELS AND METRICS

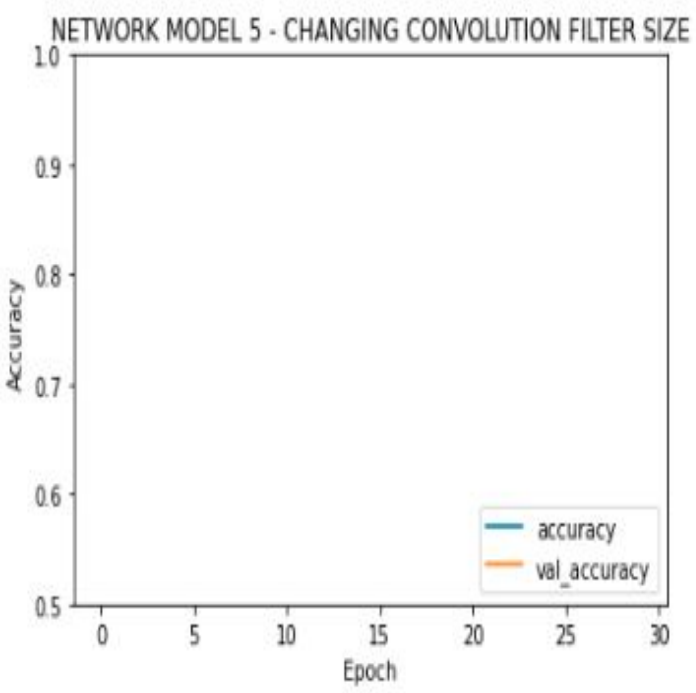
Several network architectures were tried out before reaching the best architecture . Accuracy score was chosen as the performance metric .



Model 1 - A small network with 3 convolution layers and 2 max pooling layers resulted in an accuracy of around 70%

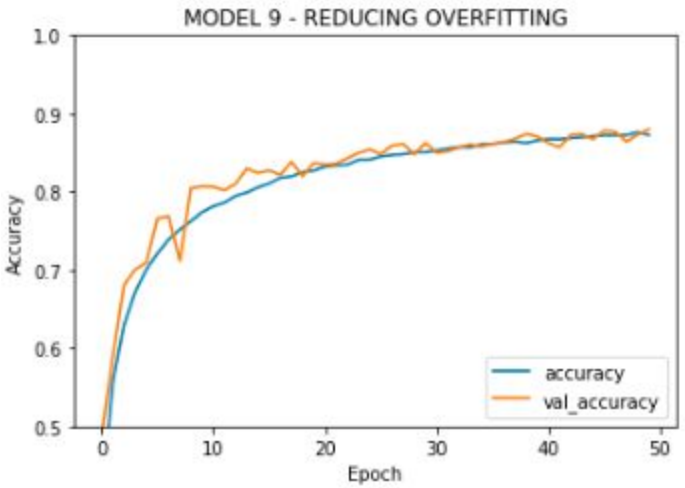


The network was made deeper with 9 Convolutions and 4 max poolings in between and tried out with(MODEL 2) and without (MODEL 3)Dilations . With dilation resulted in 67 % accuracy and without dilation resulted in 68 % accuracy



Many more layers were added with different filter sizes for convolution . This resulted in absolute underfitting and greater loss (MODEL 4 ,5)

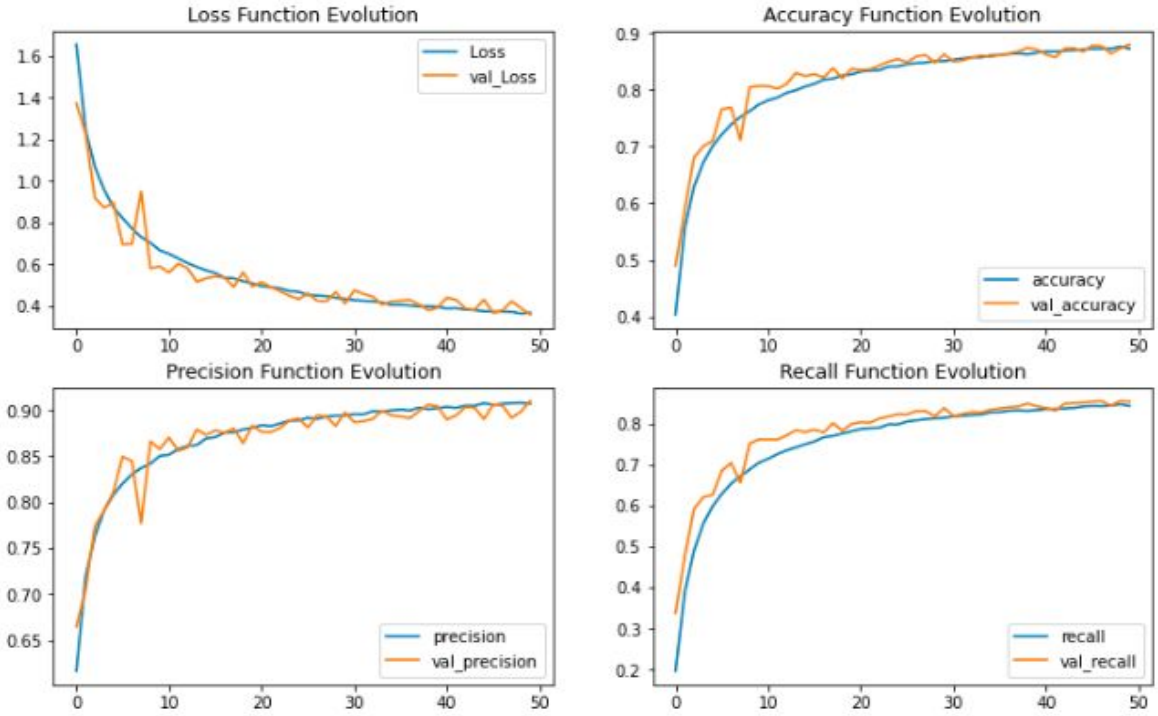
Kerner Intializers ,Dropouts were also added and the optimiser was changed to SGD with learning rate of 0.001 . But still the model did not exhibit any improvement . (MODEL 7)



MODEL 9
BatchNormalisation , Image Augmentation techniques were implemented for OneHot encoded Test labels and the accuracy boosted to 87%

METRICS :

Precision and Recall score were calculated and visualised for the Model 9 with 87% accuracy score



FUTURE SCOPE :

Furthermore the model can be trained on CIFAR 100 and the accuracy of the CNN can be calculated and compared . The dataset can be subjected to pre-trained weights from models such as VGG16 , Resnet50 etc and the performance can be compared .

SUMMARY :

The CIFAR 10 is a well established dataset and a Convolution Neural Networks have been constructed from scratch and tuned to provide an accuracy as best as ~87%