Programming Assignment 4

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CAP-5415 Computer Vision

ABSTRACT:

The goal of this assignment is to create an Convolutional Neural Network from scratch with given specification for the CIFAR-10 dataset utilizing fully connected layers, convolutional layers and then increase the number of convolutional layer to see how it affects the training.

IMPLEMENTATION OF THE CNN:

1. Introduction:

Convolutional neural networks (CNN) are a form of deep neural networks in the field of deep learning that were mostly used for analysis and image recognition. Convolutional neural networks employ a highly unique technique called as convolution.

Convolution is a mathematical operation that is applied to two functions to provide an output in the form of a third function that illustrates how the shape of one function is impacted or modified by the other function.

2. DATASET:

For this assignment the CNN is trained using the CIFAR10 collection of pictures. It includes 60K photos with a 32x32 resolution and 10 distinct classes, including trucks, vehicles, horses, frogs, deer, birds, cats, and ships.

3. RESULTS

For 2 convolutional layer and 3 fully connected layer:

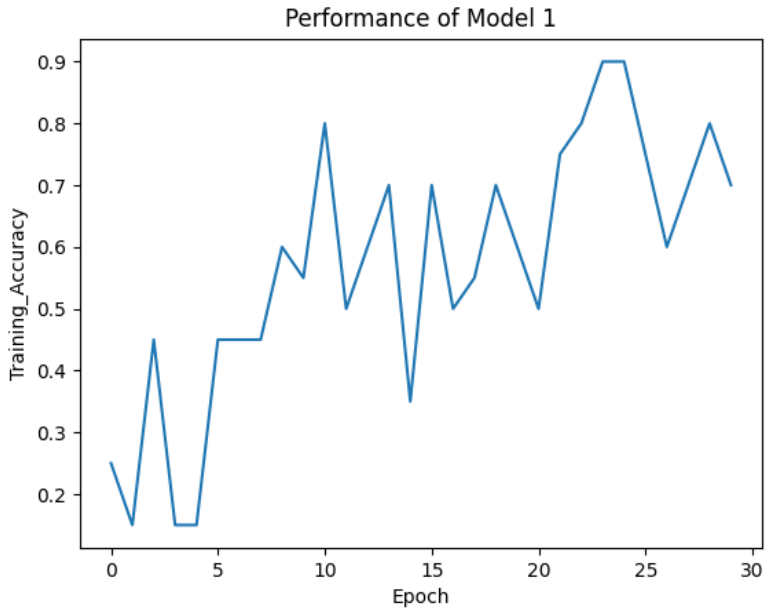

Fig 1: Training Accuracy

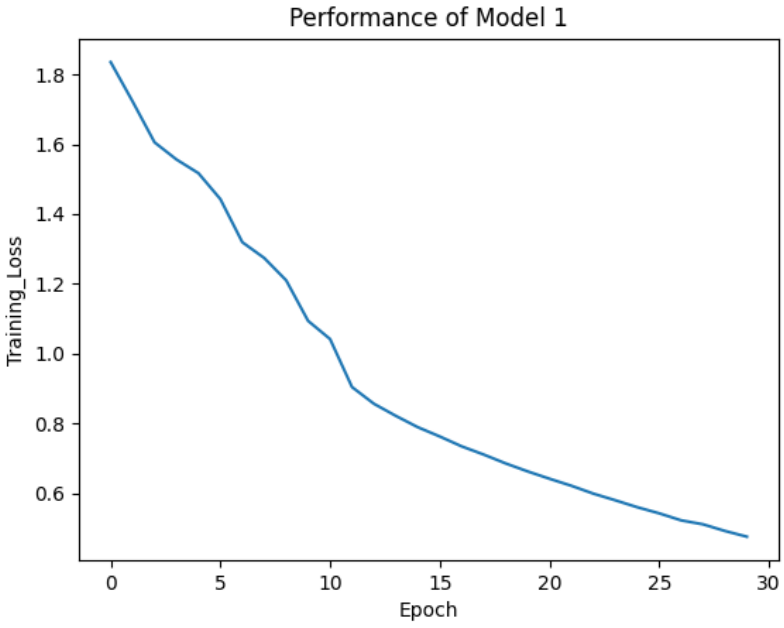

Fig 2: Training Loss

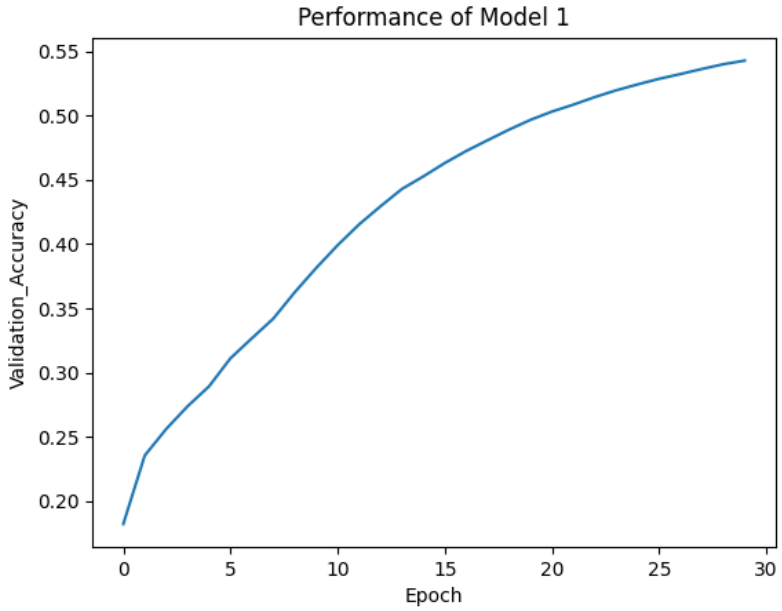

Fig 3: Validation Accuracy

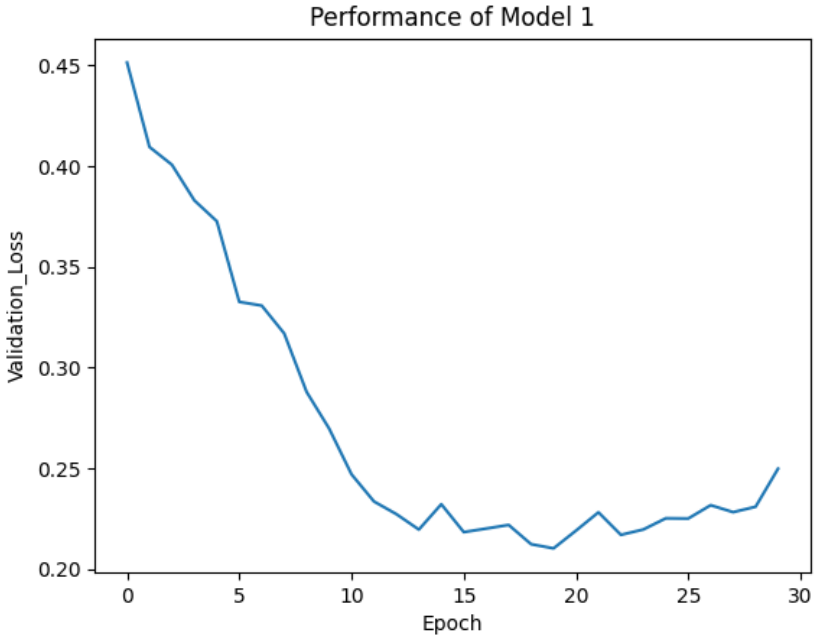

Fig 4: Validation Loss

CLASS	ACCURACY
Airplane	**68%**
Automobile	**74%**
Bird	**47%**
Cat	**57%**
Deer	**56%**
Dog	**42%**
Frog	**71%**
Horse	**63%**
Ship	**74%**
Truck	**68%**
Overall	**62%**

Table 1: Test Accuracy for all 10 Classes

For 3 convolutional layer and 3 fully connected layers:

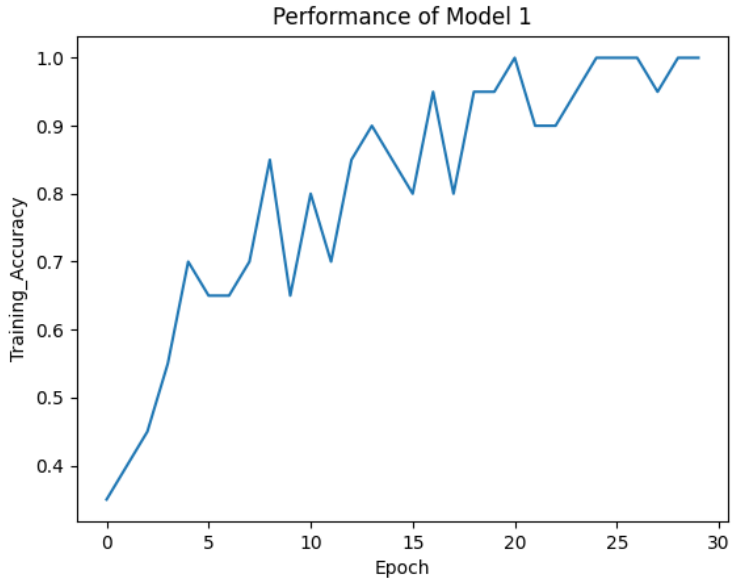

Fig 5: Training Accuracy

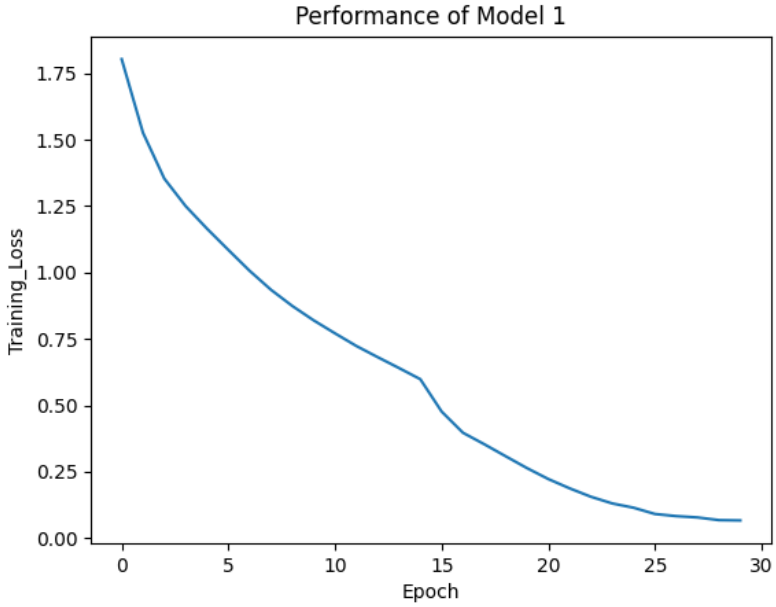

Fig 6: Training Loss

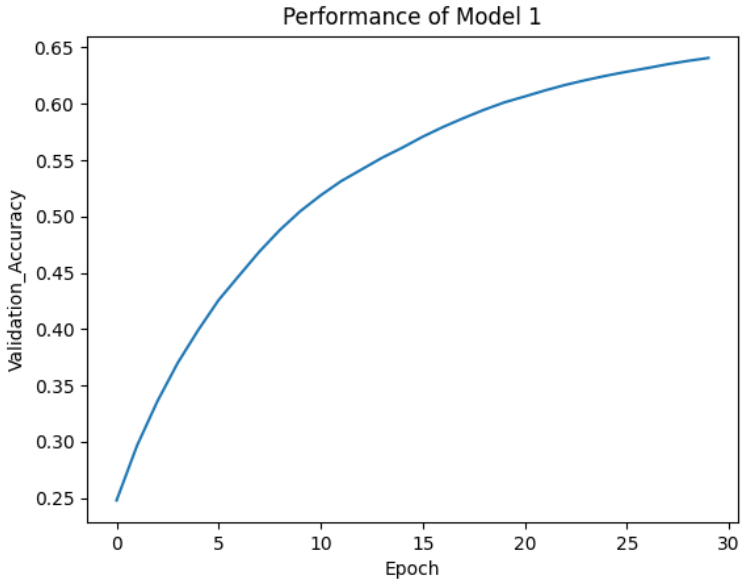

Fig 7: Validation Accuracy

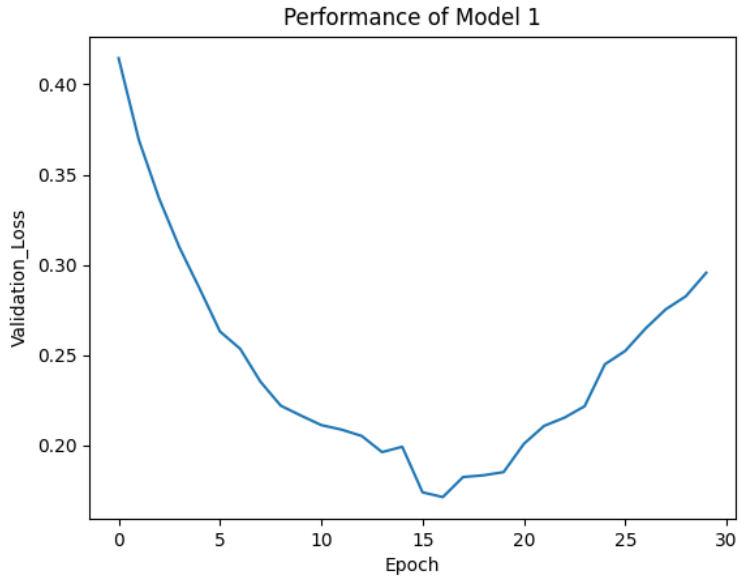

Fig 8: Validation Loss

CLASS	ACCURACY
Airplane	**76%**
Automobile	**87%**
Bird	**59%**
Cat	**42%**
Deer	**68%**
Dog	**69%**
Frog	**81%**
Horse	**79%**
Ship	**82%**
Truck	**75%**
Overall	**72%**

Table 1: Test Accuracy for all 10 Classes

4. CONCLUSION:

When we compare the Graphs and the Charts, we can clearly see a 10 percent jump in the overall test accuracy, as well as the training loss also dipped a lot. The difference is just by addition of one extra convolutional layer. According to me this can be further improved by using more convolutional layers and maybe a dropout layer just to avoid any over fitting.