Manarat International University

Department of Computer Science and Engineering
Neural Networks and Fuzzy Systems (CSE-433) &
Computer Vision & Robotics (CSE-437)

Name of the Contest :-

CIFAR-10 - Object Recognition in Images.

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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.

Computer algorithms for recognizing objects in photos often learn by example. CIFAR-10 is a set of images that can be used to teach a computer how to recognize objects. Since the images in CIFAR-10 are low-resolution (32x32), this dataset can allow researchers to quickly try different algorithms to see what works. Various kinds of convolutional neural networks tend to be the best at recognizing the images in CIFAR-10.

Data Preprocessing:-

- we were working on 3 steps ,1. Data preprocessing,

-->Onehotencoding (Binarized)

1)images load

i) Reduce dense

ii)binary representation

iii)normalization

2. model implementation

->Using CNN model from keras API

3.test set Predictions.

- **normalization techniques** : -

Actually we want zero-mean unit-variance activations from 0- 255 . so we try that is giving below :- consider a batch of activations at some layer. To make each dimension zero-mean unit-variance, apply a vanilla differentiable function :-

$$\widehat{x}^{(k)} = \frac{x^{(k)} - \mathrm{E}[x^{(k)}]}{\sqrt{\mathrm{Var}[x^{(k)}]}}$$

So our normalization steps

Batch Normalization:- divide(255),subract(.5).multiply(2) that’s make every image normalized so easy way.

Input: Values of x over a mini-batch: $\mathcal{B} = \{x_{1...m}\}$;
Parameters to be learned: γ, β

Output: $\{y_i = \mathrm{BN}_{\gamma,\beta}(x_i)\}$

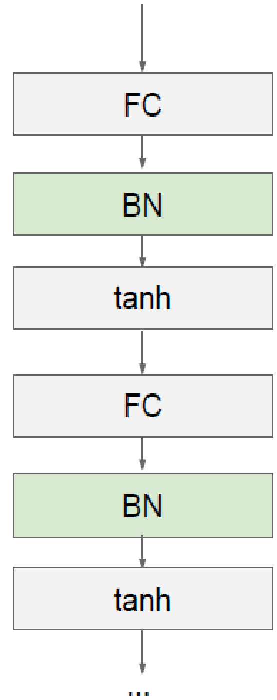
$$\mu_{\mathcal{B}} \leftarrow \frac{1}{m}\sum_{i=1}^{m} x_i \qquad \text{// mini-batch mean}$$

$$\sigma_{\mathcal{B}}^2 \leftarrow \frac{1}{m}\sum_{i=1}^{m} (x_i - \mu_{\mathcal{B}})^2 \qquad \text{// mini-batch variance}$$

$$\widehat{x}_i \leftarrow \frac{x_i - \mu_{\mathcal{B}}}{\sqrt{\sigma_{\mathcal{B}}^2 + \epsilon}} \qquad \text{// normalize}$$

$$y_i \leftarrow \gamma \widehat{x}_i + \beta \equiv \mathrm{BN}_{\gamma,\beta}(x_i) \qquad \text{// scale and shift}$$

Algorithm 1: Batch Normalizing Transform, applied to activation x over a mini-batch.



Batch Normalization for ConvNets

Batch Normalization for **fully-connected** networks

x: $N \times D$

Normalize

μ, σ: $1 \times D$

γ, β: $1 \times D$

$y = \gamma(x-\mu)/\sigma+\beta$

Batch Normalization for **convolutional** networks
(Spatial Batchnorm, BatchNorm2D)

x: $N \times C \times H \times W$

Normalize

μ, σ: $1 \times C \times 1 \times 1$

γ, β: $1 \times C \times 1 \times 1$

$y = \gamma(x-\mu)/\sigma+\beta$

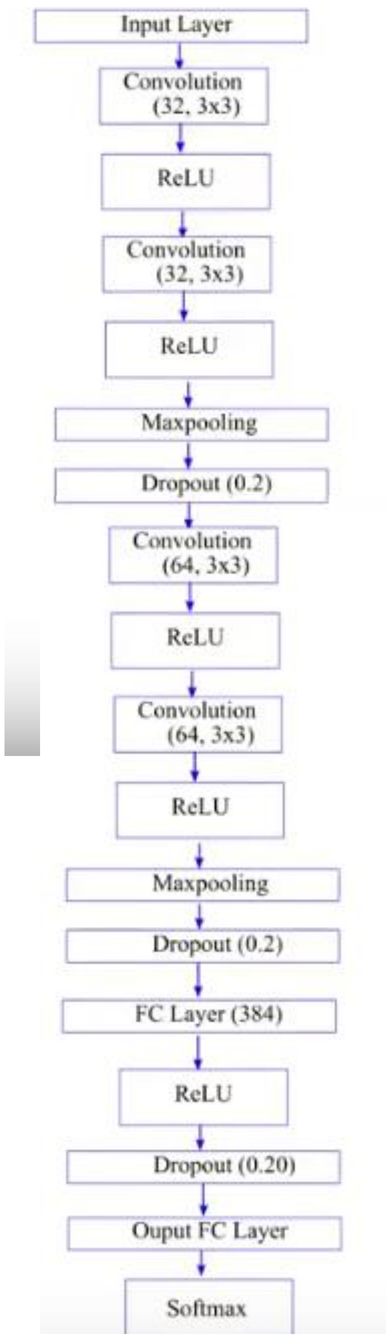
- **Augmentation:-**

->slowly improve learning rate,

->Some time Batch size ,and more epoch are improve ,

->we try to reduce our parameters size .

- **Our Network Architecture CNN Model:-**



Training Procedure: when we train our train file where import model and data that r processing to take best baseline.h5 that was coming from after our best epoch running. then we take it and train this an predict our image.

Result: our first submission came from only 46 epoch running train. Then we try increasing our epoch. after 60 ups then our score increase. also need a powerful computer to get better score.

Conclusion: Actually, every work is very important to improve our life, knowledge, and power that give use better lesion to learn. that's why we should try when any things come to my near. We may be taken it first time and try to understand that's doesn't mean we learn every things but we gain some knowledge about deep learning. inshallah next time we will try cifer-100 where has 100 class images . ;p