ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 8, Special Issue 1, August 2021

IMAGE COMPRESSION USING CNN

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ABSTRACT

Artifical intelligence is an area of computer science that emphasize the creation of Intelligence machines that work and react like human . ie, machine can learn and think .The team machine learning , deep learning, AI and Convultional neural network are interconnected with each other. Deep Learning is a subset of machine learning and machine learning is a subset of AI, which is an umbrella term for any computer program that does something smart. Machine learning is set of algorithms that parse data, learn have learning to make intelligent decision. Convolutional Neural Network is a type of artificial neural network used for image recognition and processing specifically designed by processing pixel values.

Keywords :CNN,ANN,NLP

CONVULATIONAL NEURAL NETWORK

CNNs are powerful image processing, artificial neural network (ANN) that is used for Image recognition and processing by processing pixel values. Instead of the other traditional method, CNN uses the multilayer *perceptron* model. The layers of CNN are arranged in such a way as to cover the entire visual field. So we can overcome the piecemeal image processing problem of traditional neural networks.

A CNN uses a system much like a multilayer perceptron that has been designed for reduced processing requirements. The layers of a CNN consist of an input layer, an output layer and a set of hidden layer that includes convolutional layers, re-lu layers, pooling layers, fully connected layers and

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normalization layers. The removal of limitations and increase efficiency for image processing results in a system that is far more effective and can be used along with natural language processing(NLP).

$$z(t) =$$

Fig.1

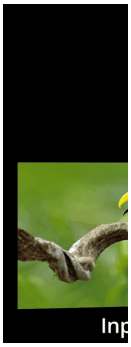
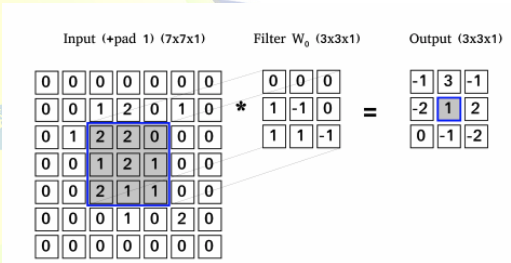


Fig.2

How it works..?

We have to discuss about how a digital image is compressed using CNN and the role of each layer. Nowadays we have several CNN models there like ALEXNET, ZF NET, GOOGLENET, VGG 16,RESNET etc.

Fig.3



If we take an example of a 28 * 28 image . Basically we know that a digital image is a matrix of pixels ranging from 0-255. So in the input layer, we have 784 individual cells to store each pixel values. Then it is passed to the next CNN layers.

CONVOLUTIONAL LAYER

Here we used some filter matrix(kernel) to the classify each and every object in the input image. We stride the kernel over the image and got a resultant output matrix. There is an *activation function* which takes the cross product of both input image and the filter matrix.

The output will be a grey scale image with negative values which helps to identify each object and their boundaries.

RE-LU LAYER

The output of convolutional layer is the input of the re-lu (rectified linear unit) layer. Here we remove the negative values in the matrix. So that we can focus on each single object in that image. We use re-lu function and sigmoid function to perform this.

Re-lu function

$$R(x) = max(0,x)$$

Sigmoid function

$$f(x) = \frac{1}{1 + e^{-x}}$$

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Then we got an output like:

15	20	
18	-110	
20	-15	
101	75	

Fig.4

POOLING LAYER

The image compression takes place in this pooling layer. We take the maximum value in each window and stride over the matrix. In this layer , we need to add some empty rows or columns to make it square matrix called padding.

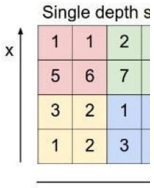

Fig.5

In this figure, we take the maximum value in each striding window. So that we can compress the image without any data loss. Then the next layer is fully connected layer.

FULLYCONNECTED LAYER

Here all the layers are combined together. So that we can get a specific output. If we take an image as input, then the compressed size is determined by

[W – K + 2P / S] + 1

Where W: Input matrix pixel size

K: Kernal matrix size

P: Padding size

S: Striding size

Here we can see the difference between the compressed image using CNN and the current method. It is clear that the output of CNN method is more clear and specific than the other.

CONCLUSION

So we can conclude the topic that by using Convolutional Neural Network, we can overcome all the current drawbacks in image processing. Gives more accurate output. It will be more faster and efficient. The multifocus concept can be possible. We can compress image without any dataloss. So it will be a beginning in image processing, when we use CNN.

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ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

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Vol. 8, Special Issue 1, August 2021

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