Zero Padding Tensor

Ajinkya.S.Raghuwanshi

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Introduction

Zero padding is a technique that allows us to preserve the original input size. This is something that we specify on a per-convolutional layer basis.

Examples

- Images
- Data extrapolation
- Tensor extension.

Why is it required?

In a normal neural network each layer has some number of filters that we define, and we also define the dimension of these filters as well.
These filters basically lead to the reduction of the output layer size due to the process of convolution. The example of it is shown below:

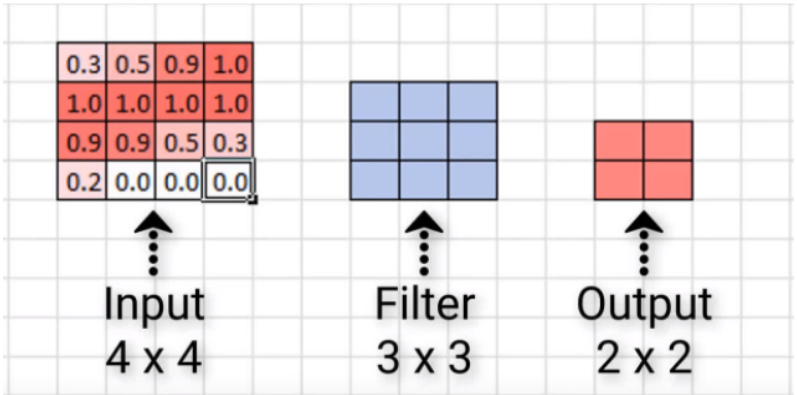

Figure 1: Convolution.

Issues with reduced dimensions.

The reduction in the dimensions of the output leads to loss of data if the most important pieces of data is situated at the edges of the input frame.
This is resolved by zero padding.

Zero padding

Zero padding is a technique that allows us to preserve the original input size. This is something that we specify on a per-convolutional layer basis.

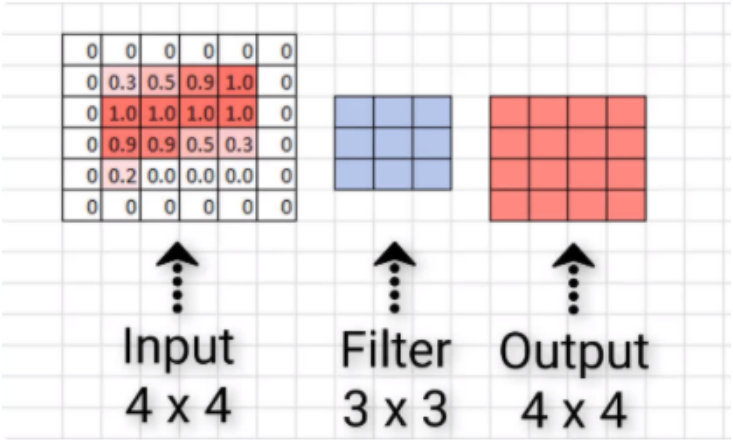

Figure 2: Zero padding output.

Approach to be used.

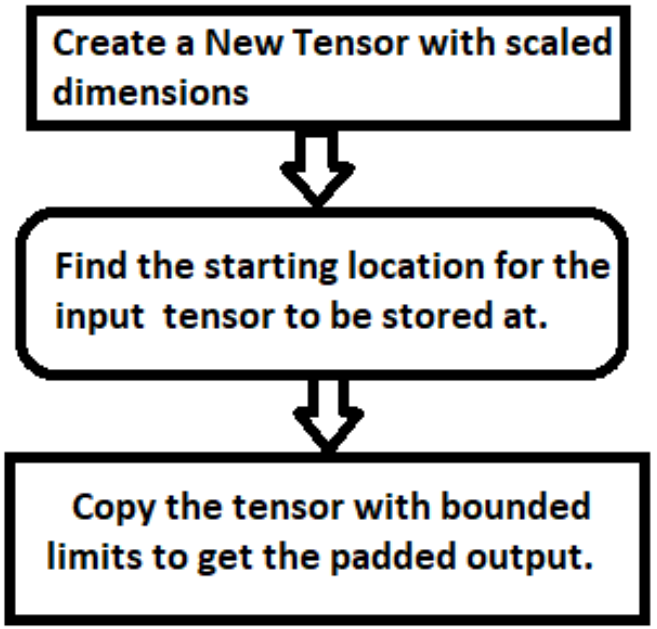

Figure 3: Zero padding procedure.

Code snipping

```
// Zero padding: Extend the size of an n-dimensional tensor to each side
// by a factor of s, and populate the newly created locations with zeros.


void zeropadtensor(Tensor* src, uint32_t scale_factor, Tensor* result) {

    // Creating a tensor tp store the source Tensor
    Tensor tp_src = &src;

    // Calculating the new data for the zero padded tensor.
    uint32_t ndim_scale = ndim * scale_factor;
    uint32_t dims_scale = dims * scale_factor;

    // Creating a new tensor according to the configurartions of the
    // zero padded Tensor.
    Contant_tensor = createTensor(ndim_scale, dims_scale, TensorDataType dt, uint16_t mempool);

    // Initialing the newly created tensor to all zero elements
    Resultant_tensor = getConstantTensor(0, &Constant_tensor)

    // copying the input tensor to the zero intialized tensor so as to create
    // the resultant tensor
    copy_tensor_for_expansion(Resultant_tensor, tp_src, &result);

}
```

References

- https://www.tensorflow.org/api_docs/python/tf/pad
- https://hyunyoung2.github.io/2018/07/23/Tensorflow's_Neural_Network_Convolution/
- https://deeplizard.com/learn/video/qSTv_m-KFk0