



Questions & Answers

Technical advice from other data scientists



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What is Pooling in Deep Learning?

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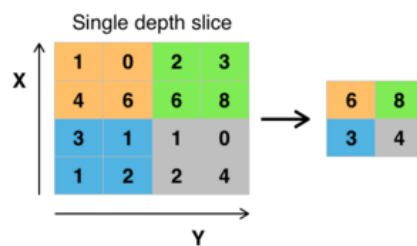
1

Pooling is nothing other than down sampling of an image. The most common pooling layer filter is of size 2x2, which discards three forth of the activations. Role of pooling layer is to reduce the resolution of the feature map but retaining features of the map required for classification through translational and rotational invariants. In addition to spatial invariance robustness, pooling will reduce the computation cost by a great deal.

- Backpropagation is used for training of pooling operation
- It again helps the processor to process things faster.

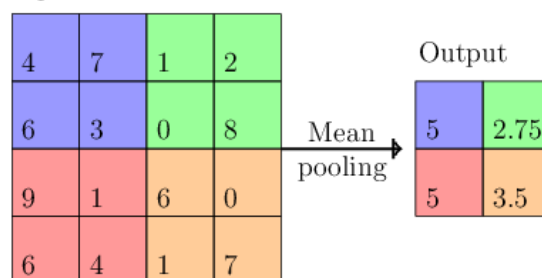
There are many pooling techniques. They are as follows

- **Max pooling** where we take largest of the pixel values of a segment.

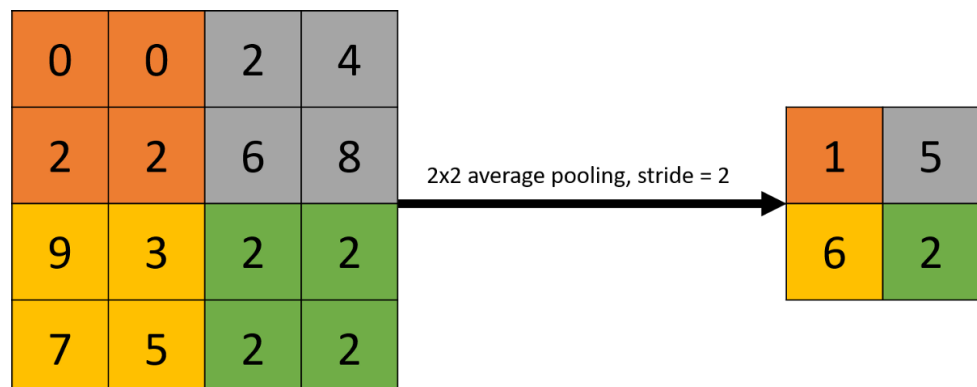


- **Mean pooling** where we take largest of the pixel values of a segment.

Input



- **Avg pooling** where we take largest of the pixel values of a segment.



- Reducing the number of the parameter by representing the model more effectively.
- Regularization

So dominant architecture in recent times for image classification is convolution neural network, where number of parameter is reduced effectively through convolution technique in initial layers and fully connected layers at the very end of the network .

Usually, regularization is performed through data augmentation, dropout or batch normalization. Most of these regularization techniques have difficulties to implement in convolutional layers. So, alternatively, such responsibility can be carried over by pooling layers in convolutional neural network.

There are three variants of pooling operation depending on roots of regularization technique:

- **Stochastic pooling:** Randomly picked activation within each pooling region is considered than deterministic pooling operations for regularization of the network. Stochastic pooling performs reduction of feature size but denies role for selecting features judiciously for the sake of regularization. Although clipping of negative output from ReLU activation helps to carry some of the selection responsibility.
- **Overlapping pooling:** Overlapping pooling operation shares responsibility of local connection beyond the size of previous convolutional filter, which breaks orthogonal responsibility between pooling layer and convolutional layer. So, no information is gained if pooling windows overlap
- **Fractional pooling:** Reduction ratio of filter size due to pooling can be controlled by a fractional pooling concept, which helps to increase the depth of the network. Unlike stochastic pooling, the randomness is related to the choice of pooling regions, not the way pooling is performed inside each of the pooling regions.

There are other variants of pooling as follows:

- Min pooling
- wavelet pooling
- tree pooling
- max-avg pooling
- spatial pyramid pooling

Pooling makes the network invariant to translations in shape, size and scale. Max pooling is generally predominantly used in objection recognition.

Hope you like this topic and if yes greatly appreciate an UPVOTE.

Options

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