Understanding CNN

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- (•) CSE 425
- ( ) EEE 474

What authors explains about stride in the paper?

According to authors, stride is an option that can manipulate the overlap between the regions that the filter looks at in the convolution layer. It can also reduce the output size and the number of parameters. The authors use equation (1) "O = 1 + (N-F)/S" to formalize the effect of stride on the output size. They also show an example of stride 1 and stride 2 in Fig. 6 and Fig. 7.
They remark that CNNs' stride option offers chances to lower the parameters and lessen some of the negative effects. They also go on to describe how, by adjusting the stride, we may change how much the nodes of the subsequent layer overlap with those of their

neighbors. Additionally, they give an illustration in Fig. 6 of how altering the stride can lower the output's size.

How zero padding is effective in CNN where the authors proposed to use it?

The authors mention that zero padding is a method to resolve the issue of losing information on the border of the image. It also helps to manage the output size and prevent it from shrinking with depth. They use equation (2) "O = 1 + (N+2F-F)/S" to include zero padding in the output size formula. They also illustrate zero padding with an example in Fig. 8.
To avoid losing any information that might be present on the image's border during the convolution process, the authors suggest using zero padding in CNNs. The zero padding approach is a fairly straightforward yet effective way to address this problem, as it is described in. The network output size can be controlled and prevented from decreasing with depth by introducing zero padding. Consequently, any number of deep convolutional networks is feasible. Zero padding also aids in controlling output size, as demonstrated in the example in Figure 6.

What is convolution layer? What it does ?

The convolution layer is the main layer in CNN that performs the convolution operation between the input and a filter matrix. It extracts features from the input by sliding the filter over the input and computing the element-wise product and sum. The authors explain the convolution layer in section II.A and use equation (3) and Fig. 10 to show how it works.

One of the fundamental parts of a convolutional neural network (CNN) is a convolution layer. Convolution is a mathematical procedure that is applied to the input image or data in this layer. Convolution is a technique for multiplying the related elements by slidding a filter or kernel over the input. The outcome is a feature map that displays how well the filter fits the input at each place. Multiple filters can be applied to the convolution layer to extract various aspects from the input, such as edges, forms, colors, etc.

A convolution layer can reduce the number of parameters in a neural network, make it invariant to translations, and obtain abstract features when input propagates toward the deeper layers. The web page context also explains how to calculate the output size of a convolution layer, how to use stride and padding to control the overlap and down-sampling, and how to visualize the learned features from a convolution layer.

What authors represented by max pool layer? how they have performed max pool?

The max pool layer is a type of pooling layer that performs down-sampling to reduce the complexity and the size of the output. It partitions the input into sub-region rectangles and returns the maximum value inside each sub-region. The authors describe the max pool layer in section IV and demonstrate it with an example in Fig. 12. They use a 2x2 filter and stride 2 to perform max pooling.

A max pool layer is another element of a convolutional neural network (CNN). It is a layer that performs down-sampling on the input or feature map by dividing it into sub-regions and returning the maximum value of each sub-region. The max pool layer can reduce the complexity and size of the input for further layers, and also introduce some translation invariance.

According to the authors, the max pool layer was represented using a 2x2 filter and a stride of 2, meaning that each 2x2 input block is translated into one output pixel. Additionally, the authors noted that the max pool layer can be used with non-equal filters and strides to increase efficiency and that it should only be utilized when the presence of information, rather than its spatial location, is crucial.

What advantages CNN have over traditional Neural networks

Some advantages of CNN over traditional neural networks in the introduction and conclusion sections. They are:

- CNN reduces the number of parameters in ANN by using local connections, weight sharing and pooling.
- CNN can handle a huge amount of data and solve complex tasks that are not possible with classic ANNs.
- CNN can learn features automatically from the data without manual feature engineering.
- CNN can detect and recognize features regardless of their positions in the input by using convolution and translation invariance.
- CNN can be extended to different dimensions such as 1D, 2D or 3D depending on the type of data.

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