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Intro to Deep Learning

<div align="center">Homework 3</div>

Assignment:

Watch the lecture and describe the following and each one's function in a convolutional neural network with at least 3 full sentences each:

1. Filter
2. Feature
3. Feature Map
4. Pooling

Filter - A filter is an array of various weights that convolutes around an input image. The filters depth must be the same as that of the input image. As it convolutes around the image it is performing element wise multiplications between the values of the pixels within the original pictures and the values found within the filter, which is then added up to produce a single value that represents the value of the given area tested.

Feature - Features are numbers used to identify how prevalent a specific design or pattern is within the given input. To gather these distinct features one must input an image to receive a given output that consists of the features presented within the image. Each of these features have different characteristics that they are trying to detect within the image, such as a curve or a straight line. To detect the prevalence rate of these features one will set every feature to have a value of zero except for one and then pass this backwards through the network until it reaches the pixel layer.

Feature Map - A feature map is the product formed after a filter is fully convoluted around an entire input image. The amount of varied filters to be used on an image is determined by the image itself. As each differing filter is passed through the image, the other filters will be set to

zero so only the wanted characteristic will be detected. The total feature map or maps created from the first layer will then be used and refined for the continuation of this process with the proceeding layers. As one continues throughout the convolutional neural network, the feature maps produced will be more in depth and concise, and provides better identification or classification of the image.

Pooling - Pooling is the downsampling of the volume of an input. It independently reshapes and resizes each depth slice for a given input. This is used mainly to control overfitting as well as decrease the computations and parameters of the network.