Thomas Cox
Homework 3
Intro to Deep Learning

FILTER

A filter is usually a 3x3 matrix of weights arranged in such an order that when scanned over an image within the correct parameters, is able to detect features within the image. An example of a filter could be a 3x3 matrix, containing a column of 0's, 1's, and 0's in that order, could be used in order to detect a vertical line within an image. As the the CNN goes into deeper layers, it is able to use these filters to develop even more complex features.

FEATURES

A feature is what results from multiplying a filter across the entirety of an image. Doing this several times across multiple images within the dataset allows the network to better visualize the feature. In the more shallow layers, the network will only be able to develop simple lines and curves that will be used in the deeper layers to create more complex features. In deeper layers the network should be able to detect complex features such as eyes or mouths, as well as complex shapes that can lead it to classifying an image.

FEATURE MAP

A feature map is derived from location and intensity of the feature selected, it is able to show where certain features were most prevalent in an image. For example, if the CNN was trained on a dataset of headshots, the feature map for eyes would have a very high intensity in same spot since all of the headshots would be about the form factor for the persons in them. The network will also have multiple feature maps, so the network trained on headshots will also have very good feature maps for the mouth ears and other complex curves within the image.

POOLING

Pooling is used to reduce the definition of a certain feature in order for a deeper convolution to use it to develop more complex features, without the exact dimensions of the feature being so rigid that it is unable to recognize it within other images. By pooling, not only is the network better able to recognize more complex features, but it also cuts down on the cost computing those features, with less operations needed to complete the next layer.