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Intro to Deep Learning

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Homework 3

Filter: A filter is a scanner with a limited pixel view from its origin pixel. These filters slide along the rows and columns of an image, each one looking for specific features in an image. Once done scanning, a filter is able to map out where, and to what intensity its features were found throughout the image.

Feature: A feature is a specific arrangement of pixels in an image which certain filters detect and respond to. Features in an image are classified into low level features such as lines and curves, medium level features which are combinations of low level features and then high level features which combine aspects of medium level features. Low level features are usually found towards the beginning of the network while medium and high level features, most commonly, are found towards the end of network.

Feature Map: A feature map is the output of a single filter after it has scanned all rows and columns of an image. To produce a feature map, an empty matrix is first created, able to hold only a fraction of the pixel values in the original image. After every filter scan of a specific area of an image, matrix multiplication is done between the filters weights (the feature it is detecting) and the images pixel values for that area. The numerical output from this multiplication is then stored in the corresponding feature map matrix’s position. This process is repeated until all rows and columns of the image have been scanned thus creating a feature map for a specific filter.

Pooling: Pooling is method used to downsample data, thus removing extra, unneeded complexity. The most common, and effective type of pooling used today is known as max pooling. Max pooling takes small segments of an image, usually 2x2 splices, and finds the max pixel value in the group. It then creates a new matrix able to hold a faction of the pixel values of the original image, and places the max pixel value for the group into its corresponding spot in the new matrix.