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Intro to Deep Learning

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Watch the lecture and describe each of the following function’s in a CNN.

With at least *3 full* sentences each:

1. **Filter**

A filter is a matrix of numbers, which are weights, that is designed to detect the presence of special characteristics. They are randomly defined or defined to specific numbers. In a CNN, each network’s layer acts as a detection filter. These filters can detect a feature or patterns anywhere in an image, including things such as its color, size, rotation, transformation, and etc. It is then applied many times, to all areas. Eventually, every filter is calculated by a final layer which determines its decision based on the dataset.

1. **Feature**

A filter corresponds to a pattern or feature that the filter is looking for. Features are intricated in the input layer of a CNN. They are the elements used to make the classification of the dataset. The filters learn to detect different features in the image. For example, a neural network whose intended purpose is to decide whether an animal is a cat or dog, would consider and analyze each of the animal’s features. Features can vary from simple to complex and can also rely on postprocessing of the input dataset. A feature is a visual representation of simple characteristics found in an image.

1. **Feature Map**

A **feature map** is the output of a filter on a given layer. Throughout each layer, the filter is moved to every position in the dataset, allowing the **feature map** to collect every position’s output. The number of filters is equal to the number of **feature maps,** so in a CNN, hidden layers are divided into **feature maps** that are the result of a single filter being applied to different positions of the input dataset. The more images that are input then the **feature map** will be more accurate. It gives us the strongest features that it can detect in the image and the idea of which part of the image stimulates that feature so strongly.

1. **Pooling**

The **pooling** layer reduces computational time and minimizes the complexity of parameters. **Pooling** is one of the most common functions, utilized in CNNs. Its basis is that a feature’s relative location to other feature’s locations is the most important, and handles the extraneous information involved with their specific locations. **Pooling** is repeated several times, until the spatial information is pooled out of the image. The input dataset is divided into rectangles by the pooling layer and then the final output layer displays the maximum value for a set of four of the rectangles. A probability of all the categories that are interested in recognizing- is given.