CNN and Image Classification

Introduction

**Important Concepts**

CNN Feature Building

Adding Layers

Receptive Field

Pooling

Flattening and fully connected layers

A screenshot of a computer

Description automatically generated

A CNN is an NN with special layers.

Process

The model classifies an image by taking a part of the image, each input passes this chunk of image through a series of convolution layers:

* Convolution
* Filtering
* Pooling
* Fully Connected

Convolution and Pooling layers are the first layers used to extract features from an input. These can be seen as the learning layers. the fully connected layers are analogous to the normal hidden layers in an NN. Both are learned simultaneously by minimizing cross-entropy loss.

**How CNNs Build Features**

H.O.G. uses Sobel kernels to detect vertical and horizontal edges.

A screenshot of a video

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H.O.G can be represented with a diagram similar to an NN.

A screenshot of a computer

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The linear function is replaced with a convolution, and squaring and squareroot operations are analgous to activation functions.

A screenshot of a computer

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In a CNN there are still neurons but the kernels are learnable parameters. Activation functions are applied to each pixel. Instead of an activation, the output is an activation map or ‘feature map’ similar to a 1 channel img.

Like the HOGs Sobel kernel, each kernel of a CNN will detect a different property of the img, ie. the mouth, nose, outline, eyes.

There are M Kernels for M Features and M Feature Maps.

For each map, convolution and ReLu is applied.