**Neural network**

The first component of our system is a filter that receives as input a 20x20 pixel region of the image, and generates an output ranging from 1 to -1, signifying the presence or absence of a face,

respectively. To detect faces anywhere in the input, the filter is applied at every location in the image. To detect faces larger than the window size, the input image is repeatedly reduced in size (by subsampling), and the filter is applied at each size. The window is then passed through a neural network, which decides whether the window contains a face.

To fit a function which varies linearly across the window to the intensity values in an oval region inside the window. Pixels outside the oval may represent the background, so those intensity values are ignored in computing the lighting variation across the face. Then histogram equalization is performed, which non-linearly maps the intensity values to expand the range of intensities in the window. The histogram is computed for pixels inside an oval region in the window.

The preprocessed window is then passed through a neural network. The network has retinal connections to its input layer; There are three types of hidden units: 4 which look at 10x10 pixel subregions, 16 which look at 5x5 pixel subregions, and 6 which look at overlapping 20x5 pixel horizontal stripes of pixels. Each of these types was chosen to allow the hidden units to detect local features that might be important for face detection.

In particular, the horizontal stripes allow the hidden units to detect such features as mouths or pairs of eyes, while the hidden units with square receptive fields might detect features such as individual eyes, the nose, or corners of the mouth. The network has a single, real-valued output, which indicates whether or not the window contains a face.

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