deeplearning.ai

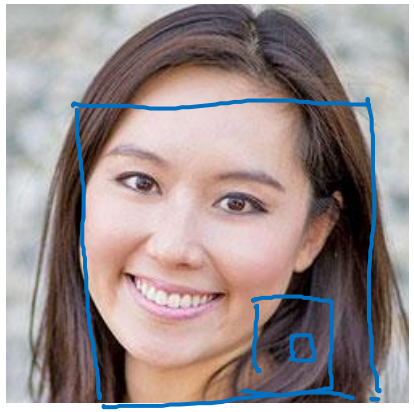
# Deep Neural Networks

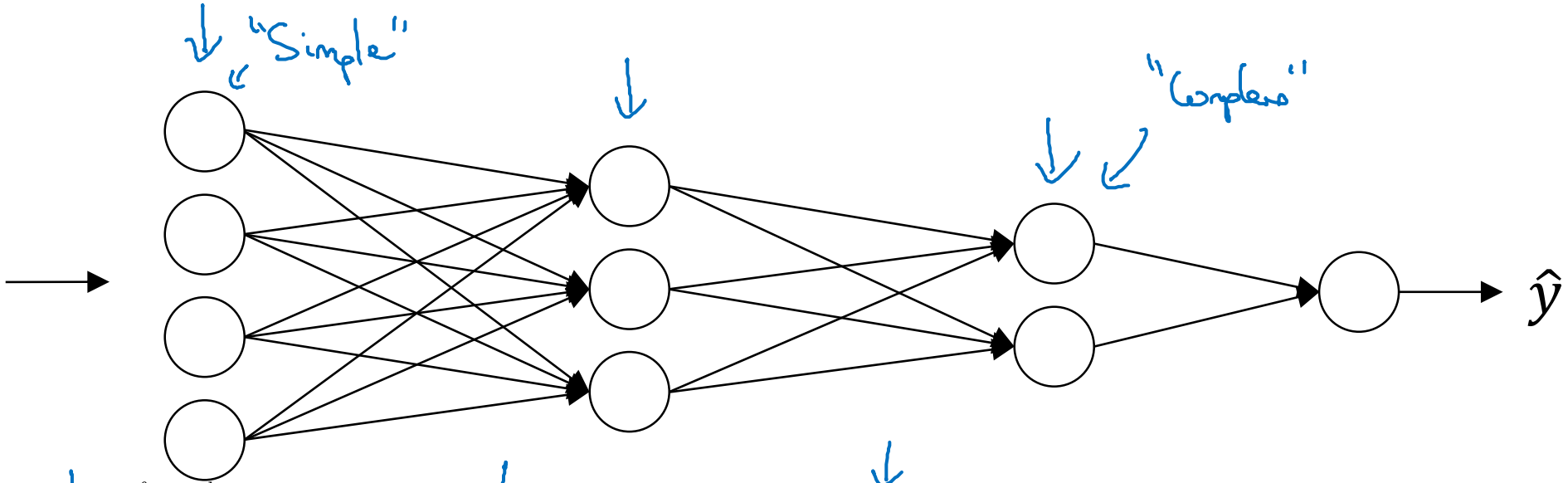
## Why deep representations?

Specifically they need to be deep or to have a lot of hidden layers

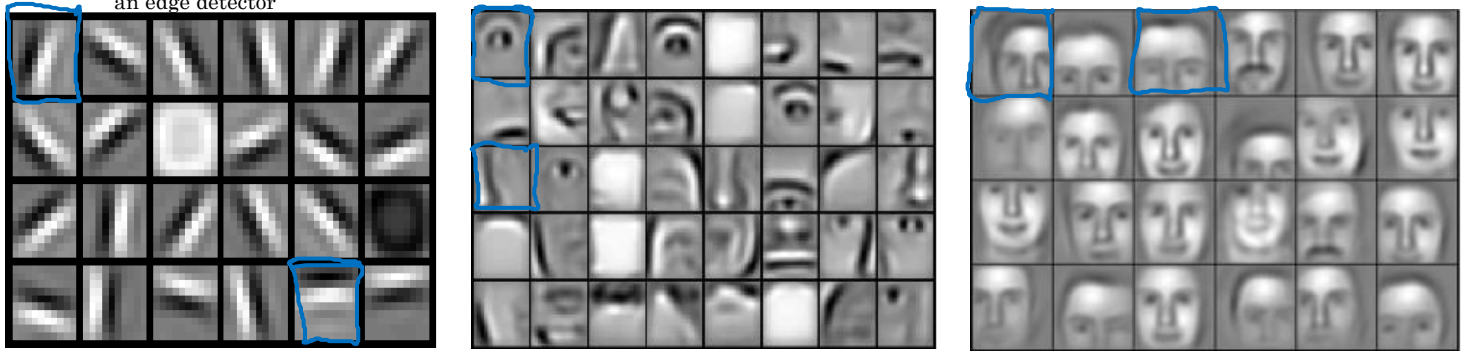
# Intuition about deep representation

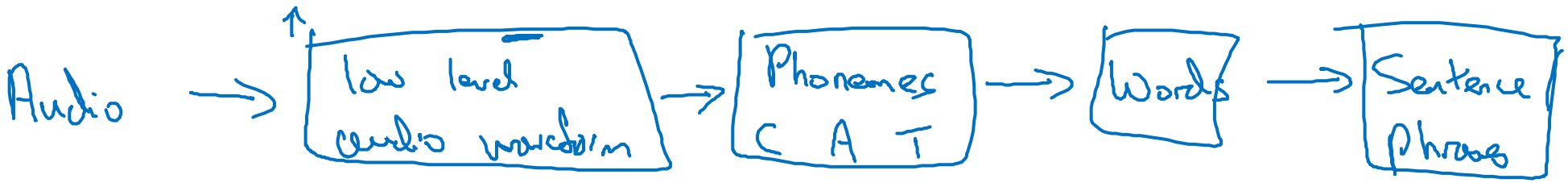
So intuitively you can think of the earlier layers of the neural network is detecting simpler functions like edges and composing together in the later layers of a neural network so they can learn more and more complex functions.






feature detector or
an edge detector






Andrew Ng

Main intuition when you take away from this is just finding simple things like edges and then building them up composing them together to detect more complex things like an eye or a nose and composing those together to find even more complex things.
And this type of simple to complex hierarchical representation or compositional representation applies in other types of data than images and face recognition as well.
For example if you're trying to build a speech recognition systems is how to visualize speech but if you input an audio clip then maybe the first level of a neural network might learn to detect you know low level audio waveform features such as is this tone going up or is going down or is it white noise or sibilant sound lights right and what is the pitch. But you can detect take low level waveform features like that and then by composing low level waveforms maybe you learn to detect basic units of sound. So in linguistic they called phonemes.

So deep neural network with multiple hidden layers might be able to have the earlier layers learn these low levels simpler features and then have the later deeper layers then put together the simpler things that's detected in order to detect more complex things like recognize specific words or even phrases or sentences that you're uttering in order to carry out speech recognition.

# Circuit theory and deep learning

There are mathematical functions that are much easier to compute with deep networks than with shallow networks.

When I'm starting out on a new problem, I'll often really start out with even logistic regressions and try something with one or two hidden layers and use that as a hyper parameter that you tune in order to try to find the right depth for your neural network.

Informally: There are functions you can compute with a "small" L-layer deep neural network that shallower networks require exponentially more hidden units to compute.