Deep Neural Networks

Why deep representations?

deeplearning.ai

Intuition about deep representation

Audio → low level audio tones/ pitch/speed etc. → Phonemes C A T ↳ may recognize the 'C' sound in CAT → may combine phonemes to define words → combine words to sentences

triggered on vertical edge

20 hidden units

triggered when it finds a horizontal edge

Groups pixels together to actually form the edges etc. which may lead to identification of ears, nose etc.

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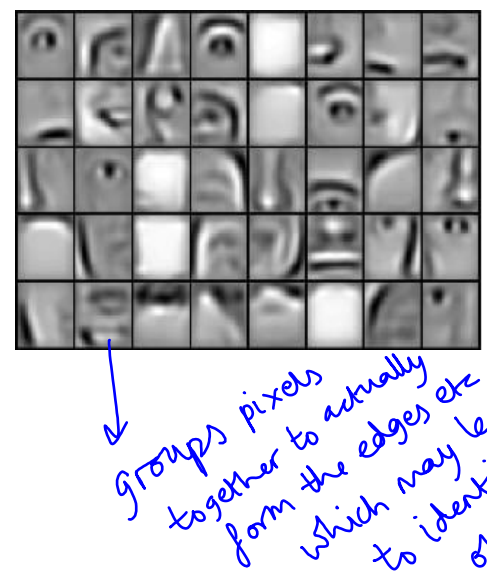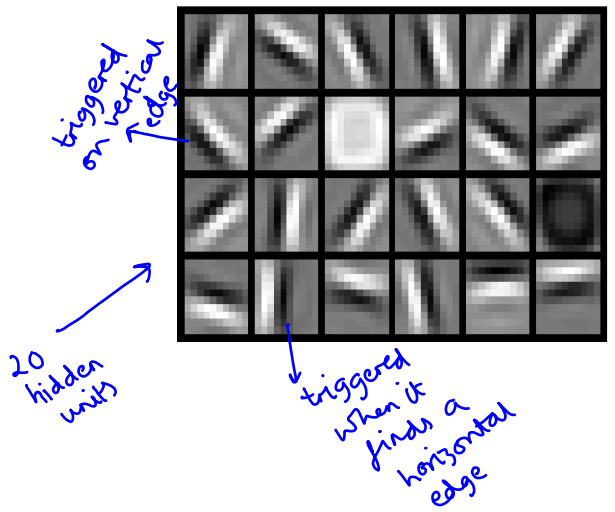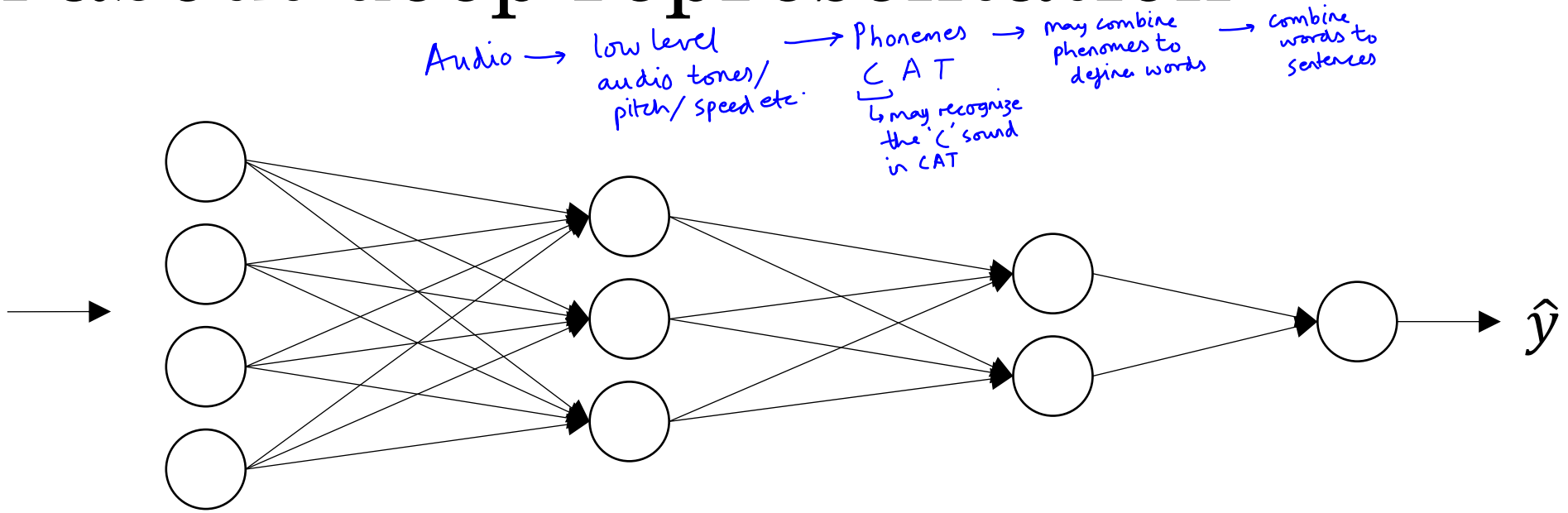
Circuit theory and deep learning

$\rightarrow$ AND, OR, NOT gates

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.

If layers ↓ each remaining layer will
need to have many more hidden units
to get the same result

eg Imagine if you need to find $y = X_1$ XOR X_2 XOR $X_3 \ldots X_N$

Many hidden
layers

complexity
is $O(\log N)$

1 Hidden layer $\rightarrow$ will store result for $X_1 = 1$, the rest being 0

$\rightarrow$ will store result for $X_2 = 1$, the rest being 0

etc $\Rightarrow$ you need 2^N XOR gates
to store results with
X_i being 1 or 0

$\Rightarrow$ compute
required
is $O(2^N)$

which is worse than
$O(\log N)$

$\Rightarrow$ Deep N/W is
better

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