**Week 3 – Notes**

**Neural Networks Overview**

Superscript inside square brackets represents the notation for the number of the layer

**Neural Network Representation**

Each layer, including the input and the output can be seen as activation layers

Therefore, each layer is denoted by a and a superscript inside square brackets where we put the index of the layer

A neural network that has the input, hidden and output layers is referred to as a 2 layer neural network, because the input layer is not counted

**Computing a Neural Network's Output**

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Description automatically generated

This is the representation of one unit, that can be perceived as 2 parts

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Description automatically generatedA picture containing text, font, white, typography

Description automatically generated

All the calculations for on layer can be computed just by multiplying the matrices

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Description automatically generated

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Description automatically generated with medium confidence

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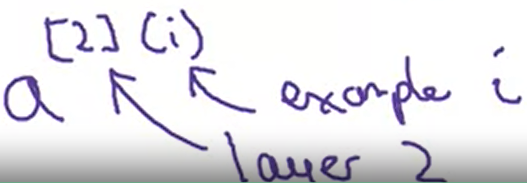
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**Vectorizing Across Multiple Examples**

If we want to compute the forward propagation for all examples, we will have to do the following computation for each training examples:

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Description automatically generated (if we are using a neural network with 2 layers + the input)

As a notation we use 

To create a forward pass on each example of the data set we would need a for loop, but to avoid it we can vectorize the entire data set:

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Description automatically generated(create a matrix X in which we have an x on each column)

A picture containing text, handwriting, font, line

Description automatically generated(same Z and A, where the columns stand for the examples, and the rows for hidden units)

We end up using the following computations for a vectorized forward pass across the entire data set

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Description automatically generated

When we vectorize across all examples, we have to keep in mind that during the forward pass the weights are the same for all training examples