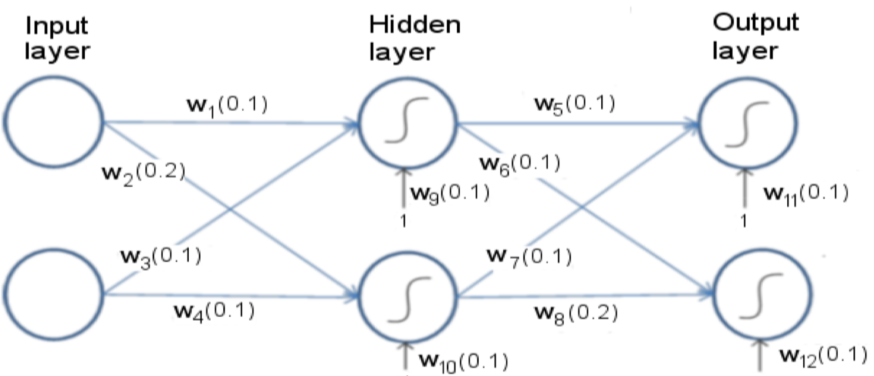
Reading Handwriting using Machine Learning

Griffith University – s5151332 – Written for Intelligent Systems, 2802ICT – Due on 17/05/2020

# Part 1: Calculating a neural network by hand

We were tasked to do a neural network’s calculations by hand by doing stochastic gradient descent with backpropagation. As a quick foreword, the example we were given does a single round of generating outputs, errors, and then updates all the weights with a single sample – taking 6 pages. If we do these four times over (two sets of samples twice) we’re going to make 24 pages! Have fun reading this.

z



## Forwards Pass 1

We can start with . Presumably this means i1 = 0.1 and i2 = 0.1 then we batch with it, and use the squared error function with all the generated errors together.



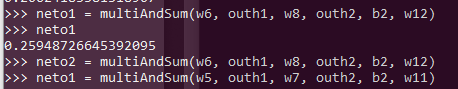
Now carrying out that same process for :





= 0.5513784696896066





= 0.5645102463659317

## Error

= 0.10063063872901962

= 0.15933590912606246

## Backwards Pass 1

Now we shift into finding the partial derivatives of these

Now we put this back into:

Note that this is the same for and as the variables end up being the exact same.

Now we must do this for

Now we put this back into:

Notice this is valid for both partial derivatives by and .

## Forwards Pass 2



Now carrying out that same process for :





Now we can calculate the outputs:



= 0.5515016245695407





= 0.5646938181510764

Calculating Total Error

= 0.10063063872901962

= 0.15933590912606246

= 0.15207702095142128

= 0.09474573597794406

= 0.5067893047844474

## Backwards Pass