USE OF NEURAL NETWORK FOR HANDWRITTEN DIGITS RECOGNITIONS

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***Abstract*— Neural networks and AI (Artificial intelligence) are the most emerging technology for the computer to make things analyze and learn in a better way[1]. Back propogation is one of the most commonly used algorithm in the neural network for learning. We are proposing the back propogation algorithm for character (0-9) images for image recognition analyzing the way it works and also the impacts on the change of its paramaters . This paper includes the proposal of using neural networks for Handwritten digits**

***Index Terms*— Back propogation, cost function ,sigmoidal neuron**

I. INTRODUCTION

We will be using neural networks for image recognition. Image recognition plays an important role in pattern recognition. Neural network is a network based on the model of the brain.It consists of several neuron and layers. Which are interconnected with the help of weights. The neural networks are trained by adjusting of weights to get the desired output. The handwritten digits recognition of characters is already done using various ways having a high accuracy for devnagiri scripts but we will be using the method of backpropogation algorithm and neurons to train the network understaning the way the system do the learning. .We will use MNIST IMAGES(data set it is a data set of around 50000 images from handwritten experts.

II. PREVIOUS WORK

It has been proposed in the research paper by DR RAMA KISHORE that the 3 layer network consisting of input, hidden and output layer can be used to used to perform the image recognition task . It consists of neuron interconnected by weight.They have used the below model ,however the output layers can change as per the requirement.They have also achieved good accuracy,we will try to analyze it in more details.Below is the given figure of the model consisting of input neuron,output neurons and hidden neurons.

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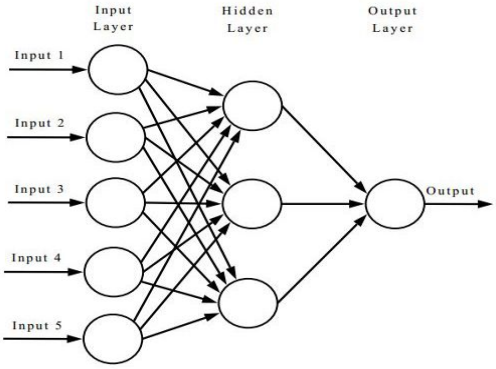


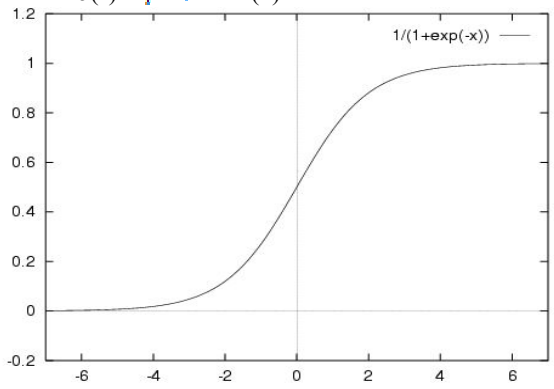
III. PROPOSED METHOLODOGY

We will be using neural network with 3 layers

1. Input layer
2. Hidden layer
3. O/p layer

We will be using sigmoid neuron which can takes input between 0 and 1 and generates the output on the basis of the sigmoidal function. Here is the graph for the the sigmoid function ,where sigmoid function is

$$\sigma(z) \equiv 1/1 + e^{-z} \quad (1)$$



We are using the sigmoidal neuron since the input can vary as per the weights.

Below are the steps of methodology which are applied to train the network. We will be using stochastic gradient descent and back propogation using fixed certain epochs and training the images in the form of batches of m training examples .

1) We will initializes the weight and biases and create the network using neurons
2) The Output of the neuron will be calculated using below sigmoid function

$$1+\exp(-\sum j\ wjxj-b)) \quad (2)$$

3) we will be using the below cost function and try to minimize it using stochastic gradient descent

$$C(w,b) \equiv 1/2n \sum x \ \|y(x)-a\|^2 \quad (3)$$

Where w,b are the weights and the biases and the y(x) are the desired output and a is the actual output from the current state of the network.

4) **For each training example *x*:** Set the corresponding input activation $a1$, and perform the following steps:

Feedforward: For each $l=2,3,\ldots,L$ compute $zx,l=wla,l-1+bl$ and $ax,l=\sigma(zx,l)$.

Output error $\delta x,L$: Compute the vector $\delta x,L=\nabla aCx\odot\sigma'(zx,L)$.

Backpropagate the error: For each $l=L-1,L-2,\ldots,2$ compute $\delta x,l=((wl+1)T\delta x,l+1)\odot\sigma'(zx,l)$.
Where ∇aC=(a,L−y)

Gradient descent: For each l=L,L−1,…,2 update the weights according to the rule wl→wl−η/m∑x δx,l(ax,l−1)T, and the biases according to the rule bl→bl−η/m∑xδx,l.

FUTURE WORK

Its hard to determine the parameters which we should take if we don't know about the learning like learning rate, number of neurons considering the complexity of the problem.

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