Assignment5- Artificial Neural Network

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1.The structure of ANN

The representation of Artificial neural networks consists of inputs, outputs and one hidden layer which contains 50 neurons. Inputs represents pixels of picture (there is 784 pixels) , outputs represents 10 possible solution, between 0 and 9. There is also two types of weights, first type is places between input and hidden layer and, if we represent it like the matrix their dimension will be 784x50, second type is between hidden layer and output with dimension of matrix 50x10. Like activation function was used Sigmoid Function. Value for learning rate was chosen empirically, $\eta = 0.45$.

2.Updating weights

With η we decided how much new changes of weight will affect on them, in our case it will affect 45%. Calculating error is doing in backward propagation, error of last weights will depends of our output and output which we suppose to get, while error in first weights will depends of result in the before (because this is backpropagation).

$w_i = w_i + \eta * \Delta w_{ij} = w_i + \eta * \delta_j x_{ji}$
Output layer: $\delta_k = (t_k * o_k) * f(o_k)$
$Hiddenlayer : \delta_k = f(o_k) * \sum_{r \in downstream(k)} \delta_r * w_{rk}$
$Parameters$:
η- Learning rate
Δw_{ij} - How much weights have been changed
k- One of output neuron
t_k - Expected output
o_k - Output from NN
f - Activation function
r- neurons of the next layer

3.Percentage of correctness

In figure 1 is provided correctness of the total test data and percentage of correctness of each of the classes in the test data set. On the left side of each class is provided a number that corresponds to the output from data set.

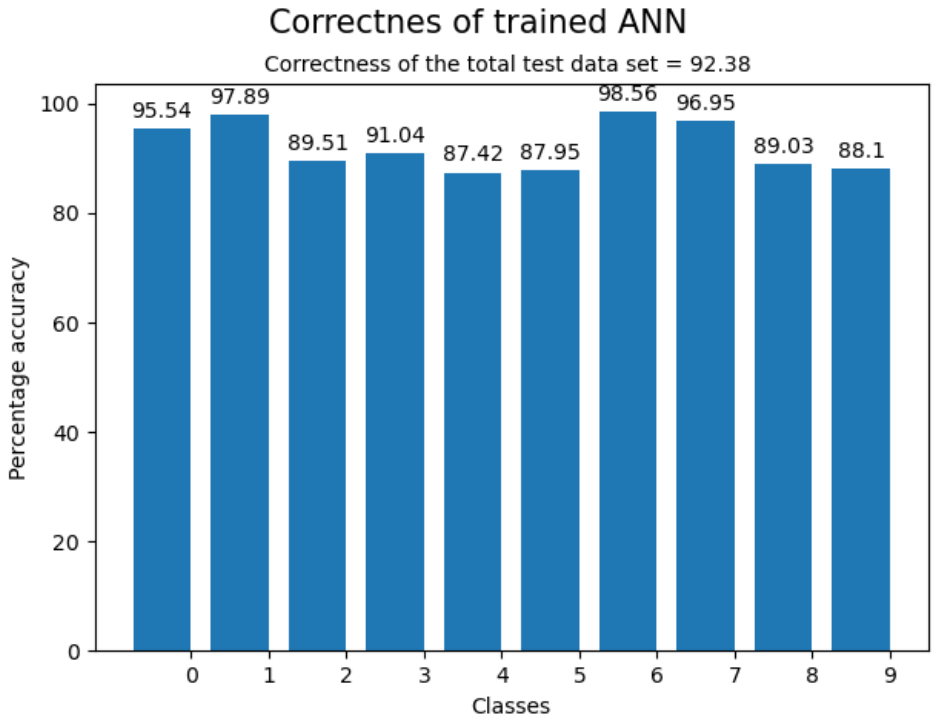

Figure 1: Success in percentage

4.Accuracy in the validation set

Figure 2 showing how the accuracy in the validation set is changing during the training process. Number of weights update represents also number of pictures on which was done training.

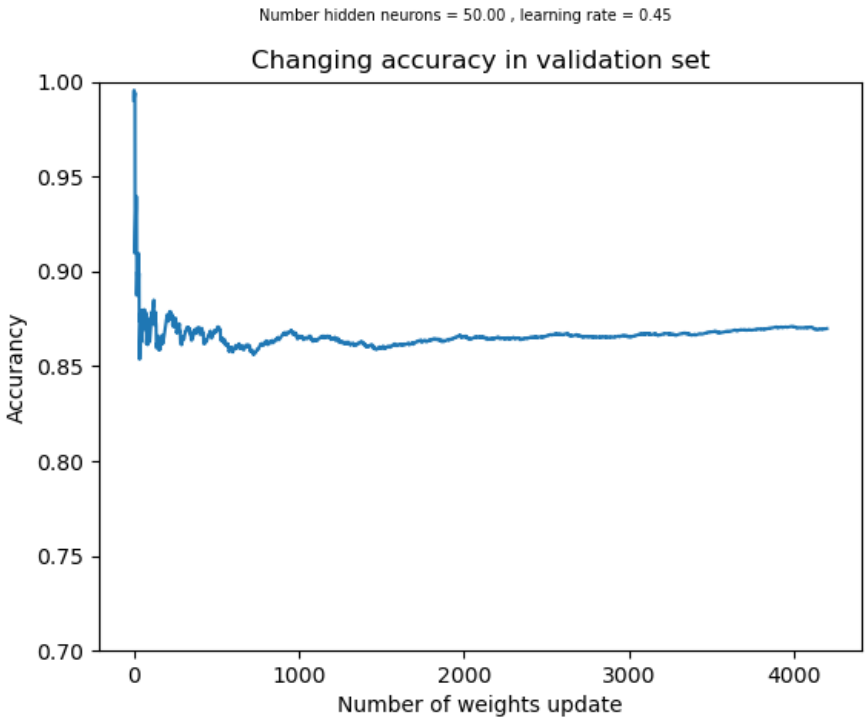

Figure 2: Accuracy of correctness in validation set