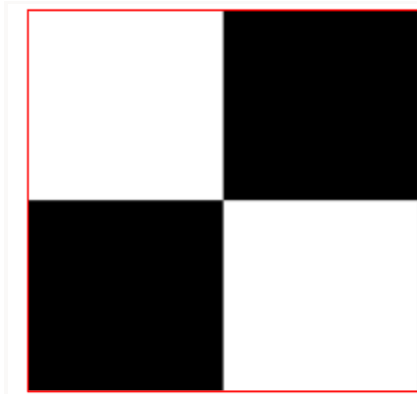# ML Report Lab 04

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Q.1 Samples collected for a bi-class classification problem is observed to be distributed as a checkerboard pattern (shown below). Is it possible to design a perceptron that can handle this class distribution complexity? Justify your answer with learnings from this exercise.

Ans. A perceptron is the same as a modified trained neuron. In perceptron, we separate the classes either into positive or 1 values and negative or 0 values.
But for the X-OR function, we cannot actually draw the line for separating them in binary classes as resulted in 1 and 0 values because the keyword here is that there are no solutions for non-linear separable data.
Perceptron can only linearly separate the labels with different real values, also referred as the single perceptron.

The data observed as the checker board pattern for bi-classification problem will give only 50 percent accuracy on applying the perceptron model for same reason as single perceptron can only separate the binary objects. On this checker pattern whenever we give perceptron model we cannot get more than 50 percent classification.

Q.2 Compare the performances (in terms of time taken) between the perceptron learning (A1 & A2) & matrix inversion method (A5) for the classifier model building for the purchase classification problem.

Ans. Perceptron Learning model gives the vector 'w' i.e weight. The perfect weights give us the exact classes for positive or negative values.
The model or algorithms only converges on the graph when all the objects/inputs are classified properly to their labels.

In the A1 and A2, I observed by applying the perceptron model the graph didn't converge properly. In the bipolar case, it was constant no convergence and no divergence.
In other experiments with different activation functions, it diverges in some cases and is constant. So the conclusion is it is not a good model to use for classifying smaller data or binary data with fewer inputs and layers also.
The matrix inversion method is somewhat good for the purchase problem. It classified the data with good accuracy.
So matrix inversion is better method in terms of single perceptron learning.
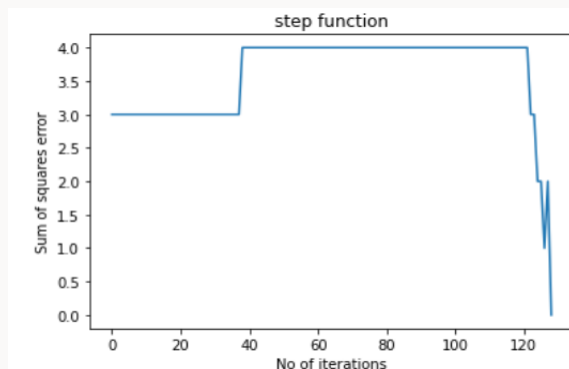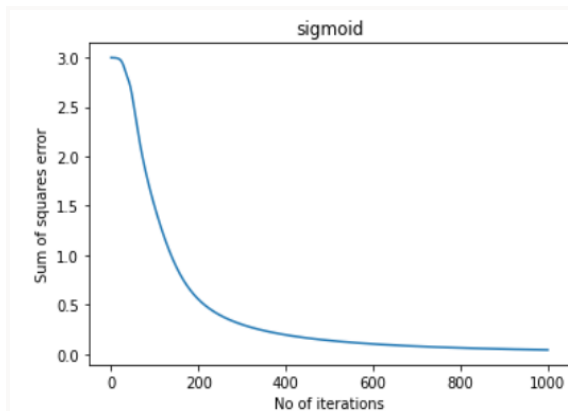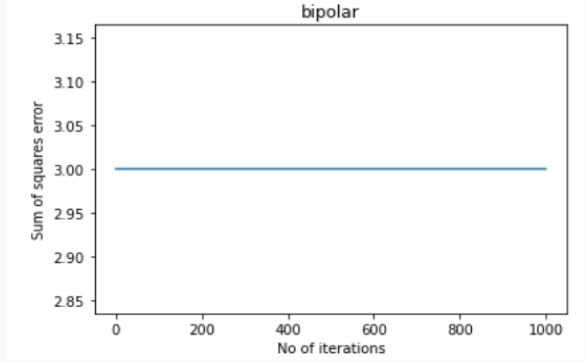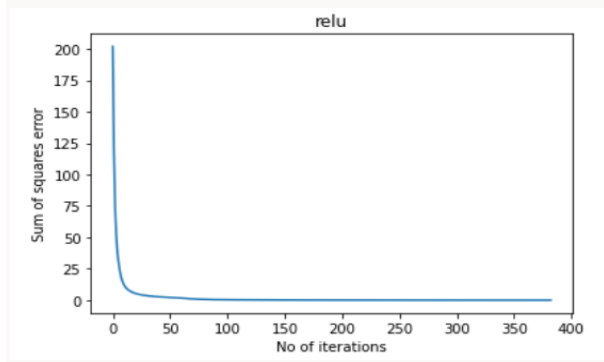
The above figures are the activation functions showing the convergence and divergence in perceptron learning model.