

1 PERCEPTRON

1.1 Generate a synthetic 4-dimensional dataset

- I will initialize weights and bias randomly between -1 and 1
- The 4D data-points will be integers from -9 to 9
- The classification would result in '0'(+ve) if the activation function results in <0 and '1'(-ve) if it results in ≥ 0
- Here we are going to create the activation function using the given weights and bias $f(x) = w_0 + w_1.x_1 + w_2.x_2 + w_3.x_3 + w_4.x_4$
- Lastly for the size of the data I will take it as say 5000
- Then I have to return a data.txt, I will create a txt file in collab and save it in the drive

1.2 training code for the perceptron learning algorithm

- It will have two attributes weights and bias
- The method activation function for classification
- The method fit to keep changing weights based on misclassification
- Another observation that I made here was that the hyperparameter lr(Learning Rate) doesn't change the convergence time by much here I am not using epoch or loss function because I am sure it will converge

1. $lr = 0.01 \rightarrow 32.558263540267944$ seconds —
2. $lr = 0.05 \rightarrow 32.847246170043945$ seconds —
3. $lr = 0.1 \rightarrow 33.67516469955444$ seconds —
4. $lr = 0.01 \rightarrow 32.027671813964844$ seconds —

1.3 testing and accuracy

1. 20% of data : accuracy = 99.825
2. 50% of data : accuracy = 99.96000000000001
3. 70% of data : accuracy = 100.0