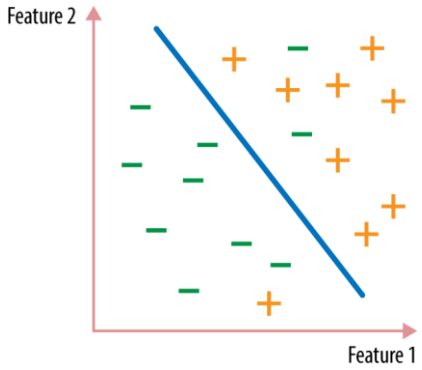
Neural Networks

Homework 1

Q1) Create a dataset like below and visualize it. Here $n = 100$ points where both classes have similar number of data samples, but not same (20 points).



Q2) Initialize the weights of the neural network with small random numbers. Use sequential mode to train your Adaline network using below weight update rule with a proper learning rate. Train for 500 iterations and show training error graph. Finally, output the classification accuracy before the training and after the training and the number of epochs (20 points).

$$w^{(t+1)} = w^{(t)} - \eta(\hat{y}_i - y_i)x_i$$

Q3) Initialize the weights of the neural network with small random numbers. Use batch mode to train your Adaline network using below weight update rule with a proper learning rate. Train for 20 iterations and show training error graph. Finally, output the classification accuracy before the training and after the training and the number of epochs (20 points).

$$w^{(t+1)} = w^{(t)} - \eta\frac{1}{n}\sum_{i=1}^{n}(\hat{y}_i - y_i)x_i$$

Q4) Initialize the weights of the neural network with small random numbers. Use mini-batch mode to train your Adaline network using below weight update rule with a proper learning rate. Use batch size of 10 where r^{th} batch is the set B_r and $|B_r|$ is the size of the batch, i.e. 10 samples. Train for 100 iterations and show training error graph. Finally, output the classification accuracy before the training and after the training and the number of epochs (20 points).

$$w^{(t+1)} = w^{(t)} - \eta\frac{1}{|B_r|}\sum_{i\in B_r}(\hat{y}_i - y_i)x_i$$

Q5) Use linear regression to classify your data. Compare the weights obtained using linear regression with sequential, batch, and mini-batch Adaline networks (20 points).