EE 524 Machine Learning Lab

Assignment 7

23 November 2020

Gradient Descent Most of the Machine Learning problems boil down to optimization of loss functions. For convex loss functions, optimization is done using gradient descent. Find the concept for gradient descent here:

1. **2D function** Let the function be

$$f(x) = x^2 + 3x + 2$$

   Use the gradient descent algorithm to find the minima of this function.

2. **3D function** Let the function be

$$f(x_1, x_2) = x_1^2 + x_2^2$$

   Minimize this function using the gradient descent algorithm.

3. **Boolean Function Learning** Consider the boolean functions:

$$y = f(x_1, x_2) = x_1.x_2$$

$$y = f(x_1, x_2) = x_1 \oplus x_2$$

   Train a Perceptron with 2 inputs, and 1 output to learn these functions. Use the threshold according to the function. Use the Perceptron Learning Algorithm for this. Plot the data points with the 2 output classes(True and False) and the boundary that you learnt using the Perceptron Learning Algorithm.