HW6

August 2, 2019

1 Technique Assignment 6: Neural Nets

1.1 Question 1

1.1.1 Part A

a. A = -3 + (-2)(2) - 2 = -9. f(A) = -1

Point A is classified correctly.

b. B = 3 + (3)(2) - 2 = 7. f(B) = 1

Point B is classified correctly.

c. C = 0 + (-1)(2) - 2 = -4. f(C) = -1

Point C is classified correctly.

d. D = 4 + (-1.5)(2) - 2 = -1. f(D) = -1

Point D is not classified correctly.

1.1.2 Part B

w1 = 1 + (1+1)(4) = 9, w2 = 2 + (1+1)(-1.5) = -1, b = -2 + (1+1) = 0
w1 = 9, w2 = -1, b = 0
new decision boundary = 9(x1) - (x2) + 0

1.1.3 Part C

a. Dnew = 9(4) - 1(-1.5) + 0 = 37.5

b. f(Dnew) = 1. Point D is classified correctly.

1.1.4 Part D

a. Anew = 9(-3) - 1(-2) + 0 = -25 . f(Anew) = -1

Point A is classified correctly.

b. Bnew = 9(3) - 1(3) + 0 = 24 . f(Bnew) = 1

Point B is classified correctly.

c. Cnew = 9(0) - 1(-1) + 0 = 1 . f(Cnew) = 1

Point C is not classified correctly.

d. Dnew = 9(4) - 1(-1.5) + 0 = 37.5 . f(Dnew) = 1

Point D is classified correctly.

1.2 Question 2

a. b3

b. W52

c. net6 = W63(3) + W(64)(4) + W(65)(5) + b6

d. y6 = f(net6)

1.3 Question 3

a. In calculus, the chain rule is a formula for computing the derivative of the composition of two or more functions. The chain rule for dependent functions relates to nerual nets as a neural net may include the derivatives of each layer with respect to the previous layer for all the layers. We use chain rule to update the weights in gradient descent.

b. Backpropagation of error is a method used to train neural networks that follow a gradient descent using the chain rule. We start with the output and work backwards to find how each weight influences the output.

c. Gradient descent is an algorithm that takes a local minimum of a function from taking steps proportional to the negative of the gradient of the model as the current point. It uses the gradient, which is the derivative at the point, of the error function with respect to the weights for updating the weights.

1.4 Question 4