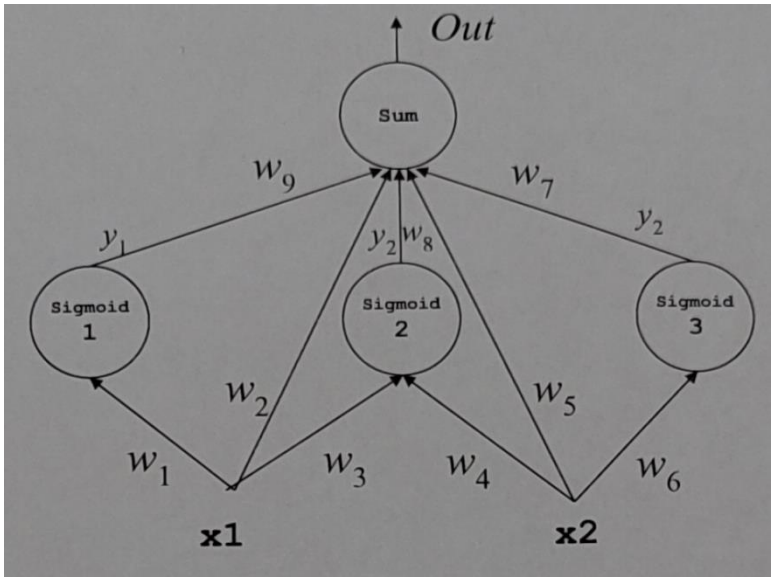
Name – Rishi Sankhla
Student No. – **33724434**

IS53002B: Coursework Assignment



Initial weights =[delta_w1 = 0.2, delta_w2 = 0.1, delta_w3 = 0.2, delta_w4 = -0.1, delta_w5 = -0.2, delta_w6 = 0.1, delta_w7 = -0.1, delta_w8 = 0.2, delta_w9 = -0.2], n=0.2

Here sigmoid is: $f(x) = \frac{1}{1+e^{-x}}$

Case 1: x1=0, x2=1, y=1

OutY1 = Sigmoid[(W1*x1)] = Sigmoid[(0.2*0)] = 0.5
OutY2 = Sigmoid[(W3*x1)+(W4*x2)] = Sigmoid[(0.2*0)+(-0.1*1)] = 0.4750
OutY3 = Sigmoid[(W6*x2)] = Sigmoid[(0.1*1)] = 0.5250
Out = (w9*OutY1)+(w2*x1)+(w8*OutY2)+(w5*x2)+(w7*OutY3) =
(-0.2*0.5)+(1*0)+(0.2*0.4750)+(-0.2*1)+(-0.1*0.5250) = -0.2575

---

beta_out = (y-Out) = (1-(-0.2575)) = 1.2575

---

delta_w9_Out = (n*beta_out*OutY1) = (0.2*1.2575*0.5) = 0.1257
delta_w2_Out = (n*beta_out*x1) = (0.2*1.2575*0) = 0
delta_w8_Out = (n*beta_out*OutY2) = (0.2*1.2575*0.4750) = 0.1195
delta_w5_Out = (n*beta_out*x2) = (0.2*1.2575*1) = 0.2515
delta_w7_Out = (n*beta_out*OutY3) = (0.2*1.2575*0.5250) = 0.1320

---

beta_Y1 = OutY1*(1-OutY1)*[(beta_out*w9)] =
0.5*(1-0.5)*(1.2575*-0.2) = -0.0629
beta_Y2 = OutY2*(1-OutY2)*[(beta_out*w8)] =
0.4750 *(1-0.4750)*(1.2575*0.2) = 0.0627

beta_Y3 = OutY3*(1-OutY3)*[(beta_out*w7)] =
0.5250*(1-0.5250)*(1.2575*-0.1) = -0.0314

---

delta_w1_Y1 = (n*beta_Y1*x1) = (0.2*-0.0629*0) = 0
delta_w3_Y2 = (n*beta_Y2*x1) = (0.2*0.0627*0) = 0
delta_w4_Y2 = (n*beta_Y2*x2) = (0.2*0.0627*1) = 0.0125
delta_w6_Y5 = (n*beta_Y3*x2) = (0.2*-0.0314*1) = -0.0063

---

delta_w1 = delta_w1+delta_w1_Y1 = 0.2 + 0 = 0.2
delta_w2 = delta_w2+delta_w2_Out = 0.1 + 0 = 0.1
delta_w3 = delta_w3+delta_w3_Y2 = 0.2 + 0 = 0.2
delta_w4 = delta_w4+delta_w4_Y2 = -0.1 + 0.0125 = -0.0875
delta_w5 = delta_w5+delta_w5_Out = -0.2 + 0.2515 = 0.0515
delta_w6 = delta_w6+delta_w6_Y5 = 0.1 + (-0.0063) = 0.0937
delta_w7 = delta_w7+delta_w7_Out = -0.1 + 0.1320 = 0.032
delta_w8 = delta_w8+delta_w8_Out = 0.2 + 0.1195 = 0.3195
delta_w9 = delta_w9+delta_w9_Out = -0.2 + 0.1257 = -0.0743

new weights are =[delta_w1 = 0.2000, delta_w2 = 0.1000, delta_w3 = 0.2000, delta_w4 = -0.0875, delta_w5 = 0.0515, delta_w6 = 0.0937, delta_w7 = 0.0320, delta_w8 = 0.3195, delta_w9 = -0.0743], n=0.2

Case 2: x1=1, x2=0, y=0

OutY1 = Sigmoid[(W1*x1)] = Sigmoid[(0.2*1)] = 0.5498
OutY2 = Sigmoid[(W3*x1)+(W4*x2)] = Sigmoid[(0.2*1)+(-0.0875*0)] = 0.5498
OutY3 = Sigmoid[(W6*x2)] = Sigmoid[(0.0937*0)] = 0.5
Out = (w9*OutY1)+(w2*x1)+(w8*OutY2)+(w5*x2)+(w7*OutY3) =
(-0.0743*0.5498)+(0.1*1)+(0.3195*0.5498)+(0.0515*0)+(0.0320*0.5)= 0.2508

---

beta_out = (y-Out) = 0-0.2508 = -0.2508

---

delta_w9_Out = (n*beta_out*OutY1) = (0.2*-0.2508*0.5498) = -0.0276
delta_w2_Out = (n*beta_out*x1) = (0.2*-0.2508*1) = -0.0502
delta_w8_Out = (n*beta_out*OutY2) =(0.2*-0.2508*0.5498) = -0.0276
delta_w5_Out = (n*beta_out*x2) =(0.2*-0.2508*0) = 0
delta_w7_Out = (n*beta_out*OutY3) =(0.2*-0.2508*0.5) = -0.0251

---

beta_Y1 = OutY1*(1-OutY1)*[(beta_out*w9)] =
0.5498*(1-0.5498)*(-0.2508*-0.0743) = 0.0046
beta_Y2 = OutY2*(1-OutY2)*[(beta_out*w8)] =
0.5498*(1-0.5498)*(-0.2508*0.3195) = -0.0198
beta_Y3 = OutY3*(1-OutY3)*[(beta_out*w7)] =

0.5*(1-0.5)*(-0.2508*0.0320) = -0.0020

---

delta_w1_Y1 = (n*beta_Y1*x1) = (0.2*0.0046*1) = 0.0009
delta_w3_Y2 = (n*beta_Y2*x1) = (0.2*-0.0198*1) = -0.0040
delta_w4_Y2 = (n*beta_Y2*x2) = (0.2*-0.0198*0) = 0
delta_w6_Y5 = (n*beta_Y3*x2) = (0.2*-0.0020*0) = 0

---

delta_w1 = delta_w1+delta_w1_Y1 = 0.2 + 0.0009 = 0.2009
delta_w2 = delta_w2+delta_w2_Out = 0.1 + (-0.0502) = 0.0498
delta_w3 = delta_w3+delta_w3_Y2 = 0.2 + (-0.0040) = 0.196
delta_w4 = delta_w4+delta_w4_Y2 = -0.0875 + 0 = -0.0875
delta_w5 = delta_w5+delta_w5_Out = 0.0515 + 0 = 0.0515
delta_w6 = delta_w6+delta_w6_Y5 = 0.0937 + 0 = 0.0937
delta_w7 = delta_w7+delta_w7_Out = 0.0320 + (-0.0251) = 0.0069
delta_w8 = delta_w8+delta_w8_Out = 0.3195 + (-0.0276) = 0.2919
delta_w9 = delta_w9+delta_w9_Out = -0.0743 + (-0.0276) = -0.1018

final weights are:

w1=0.2009 w2=0.0498 w3=0.1960 w4=-0.0875 w5=0.0515 w6=0.0937
w7=0.0069 w8=0.2919 w9=-0.1018