Computer Vision

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M2R MoSIG option GVR
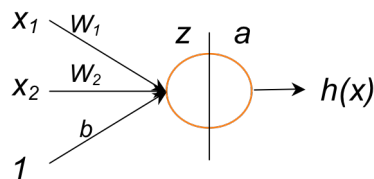
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Lesson 5

Exercises

You are presented with a single neuron with two inputs (X_1, X_2) and a single output a computed using a sigmoid $(F(z) = \sigma(z))$. Your network has been initialized with weights $W_1 = -0.2$ and $W_2 = +0.1$ and $b = +0.2$. Assume a learning rate of $\eta = 0.1$.

Your network should be trained to recognize the following training data:

m	x_1	x_2	y_m
1	1	0	1
2	0	1	1
3	0	0	0
4	1	1	0

a) Compute z, and a for $m=1$.
b) Compute $\delta_m = h(X_m) - y_m$ for $m=1$
c) Compute $\Delta W_1, \Delta W_2$, and Δb for $m=1$
d) Update W_1, W_2, and b for $m=1$.
e) Will your neuron converge for this training data?

Look-up Table of Sigmoid function:

$$f(z) = \frac{1}{1 + e^{-z}}$$

z	f(z)	z	f(z)	z	f(z)	z	f(z)	z	f(z)
-5	0.007	-4	0.018	-3	0.047	-2	0.119	-1	0.269
-4.9	0.007	-3.9	0.020	-2.9	0.052	-1.9	0.130	-0.9	0.289
-4.8	0.008	-3.8	0.022	-2.8	0.057	-1.8	0.142	-0.8	0.310
-4.7	0.009	-3.7	0.024	-2.7	0.063	-1.7	0.154	-0.7	0.332
-4.6	0.010	-3.6	0.027	-2.6	0.069	-1.6	0.168	-0.6	0.354
-4.5	0.011	-3.5	0.029	-2.5	0.076	-1.5	0.182	-0.5	0.378
-4.4	0.012	-3.4	0.032	-2.4	0.083	-1.4	0.198	-0.4	0.401
-4.3	0.013	-3.3	0.036	-2.3	0.091	-1.3	0.214	-0.3	0.426
-4.2	0.015	-3.2	0.039	-2.2	0.100	-1.2	0.231	-0.2	0.450
-4.1	0.016	-3.1	0.043	-2.1	0.109	-1.1	0.250	-0.1	0.475

z	f(z)	z	f(z)	z	f(z)	z	f(z)	z	f(z)
0	0.500	1	0.731	2	0.881	3	0.953	4	0.982
0.1	0.525	1.1	0.750	2.1	0.891	3.1	0.957	4.1	0.984
0.2	0.550	1.2	0.769	2.2	0.900	3.2	0.961	4.2	0.985
0.3	0.574	1.3	0.786	2.3	0.909	3.3	0.964	4.3	0.987
0.4	0.599	1.4	0.802	2.4	0.917	3.4	0.968	4.4	0.988
0.5	0.622	1.5	0.818	2.5	0.924	3.5	0.971	4.5	0.989
0.6	0.646	1.6	0.832	2.6	0.931	3.6	0.973	4.6	0.990
0.7	0.668	1.7	0.846	2.7	0.937	3.7	0.976	4.7	0.991
0.8	0.690	1.8	0.858	2.8	0.943	3.8	0.978	4.8	0.992
0.9	0.711	1.9	0.870	2.9	0.948	3.9	0.980	4.9	0.993