

In [9]:

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import numpy as np
import pandas as pd
```

In [25]:

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## Madaline XOR operation
alpha = 0.5
x = np.array([[1.0, 1.0, 1.0], [1.0, -1.0, 1.0], [-1.0, 1.0, 1.0], [-1.0, -1.0, 1.0]])
w = np.array([[0.05, 0.2, 0.3], [0.1, 0.2, 0.15]])
v = np.array([0.5, 0.5, 0.5])
w_diff = np.array([[0.0, 0.0, 0.0], [0.0, 0.0, 0.0]])
t = np.array([-1.0, 1.0, 1.0, -1.0])

df = pd.DataFrame(columns=['x1', 'x2', 'x3', 't', 'z_in1', 'z_in2', 'y_in', 'y', 'w11', 'w21', 'b1', 'w12', 'w22', 'b2'])
for k in range(3):
    for i in range(4):
        z_in1 = x[i].dot(w[0])
        z_in2 = x[i].dot(w[1])
        if(z_in1 >= 0):
            z1 = 1
        else:
            z1 = -1
        if(z_in2 >= 0):
            z2 = 1
        else:
            z2 = -1
        y_in = v[0] * z1 + v[1] * z2 + v[2] * 1
        if(y_in >= 0):
            y = 1
        else:
            y = -1
        if(t[i] != y):
            if(t[i] == 1):
                d1 = (z_in1 - 0) * (z_in1 - 0)
                d2 = (z_in2 - 0) * (z_in2 - 0)
                if(d1 < d2):
                    w_diff[0][0] = alpha * (1 - z_in1) * x[i][0]
                    w_diff[0][1] = alpha * (1 - z_in1) * x[i][1]
                    w_diff[0][2] = alpha * (1 - z_in1) * x[i][2]
                else:
                    w_diff[1][0] = alpha * (1 - z_in2) * x[i][0]
                    w_diff[1][1] = alpha * (1 - z_in2) * x[i][1]
                    w_diff[1][2] = alpha * (1 - z_in2) * x[i][2]
            if(t[i] == -1):
                if(z_in1 > 0):
                    w_diff[0][0] = alpha * (-1 - z_in1) * x[i][0]
                    w_diff[0][1] = alpha * (-1 - z_in1) * x[i][1]
                    w_diff[0][2] = alpha * (-1 - z_in1) * x[i][2]
                if(z_in2 > 0):
                    w_diff[1][0] = alpha * (-1 - z_in2) * x[i][0]
                    w_diff[1][1] = alpha * (-1 - z_in2) * x[i][1]
                    w_diff[1][2] = alpha * (-1 - z_in2) * x[i][2]

        w[0][0] = w_diff[0][0] + w[0][0]
        w[0][1] = w_diff[0][1] + w[0][1]
        w[0][2] = w_diff[0][2] + w[0][2]

        w[1][0] = w_diff[1][0] + w[1][0]
        w[1][1] = w_diff[1][1] + w[1][1]
        w[1][2] = w_diff[1][2] + w[1][2]

        w_diff[0][0] = w_diff[0][1] = w_diff[0][2] = w_diff[1][0] = w_diff[1][1] = w_diff[1][2] = 0.0
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df = df.append({'x1': x[i][0], 'x2': x[i][1], 'x3': x[i][2], 't': t[i], 'z_in1': z_in1, 'z_in2': z_in2, 'y_in': y_in, 'y': y, 'w11': w[0][0], 'w21': w[0][1], 'b1': w[0][2], 'w12': w[1][0], 'w22': w[1][1], 'b2': w[1][2]}, ignore_index=True)
```

In [26]:

df

Out[26]:

	x1	x2	x3	t	z_in1	z_in2	y_in	y	w11	w21	b1	w12	w22	b2
0	1.0	1.0	1.0	-1.0	0.550000	0.450000	1.5	1.0	-0.725000	-0.575000	-0.475000	-0.625000	-0.525000	-0.575000
1	1.0	-1.0	1.0	1.0	-0.625000	-0.675000	-0.5	-1.0	0.087500	-1.387500	0.337500	-0.625000	-0.525000	-0.575000
2	-1.0	1.0	1.0	1.0	-1.137500	-0.475000	-0.5	-1.0	0.087500	-1.387500	0.337500	-1.362500	0.212500	0.162500
3	-1.0	-1.0	1.0	-1.0	1.637500	1.312500	1.5	1.0	1.406250	-0.068750	-0.981250	-0.206250	1.368750	-0.993750
4	1.0	1.0	1.0	-1.0	0.356250	0.168750	1.5	1.0	0.728125	-0.746875	-1.659375	-0.790625	0.784375	-1.578125
5	1.0	-1.0	1.0	1.0	-0.184375	-3.153125	-0.5	-1.0	1.320312	-1.339062	-1.067187	-0.790625	0.784375	-1.578125
6	-1.0	1.0	1.0	1.0	-3.726562	-0.003125	-0.5	-1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563
7	-1.0	-1.0	1.0	-1.0	-1.048438	-1.070313	-0.5	-1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563
8	1.0	1.0	1.0	-1.0	-1.085937	-1.082812	-0.5	-1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563
9	1.0	-1.0	1.0	1.0	1.592187	-3.654688	0.5	1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563
10	-1.0	1.0	1.0	1.0	-3.726562	1.501562	0.5	1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563
11	-1.0	-1.0	1.0	-1.0	-1.048438	-1.070313	-0.5	-1.0	1.320312	-1.339062	-1.067187	-1.292187	1.285938	-1.076563

In []: