HEBBIAN

April 16, 2025

[5]:
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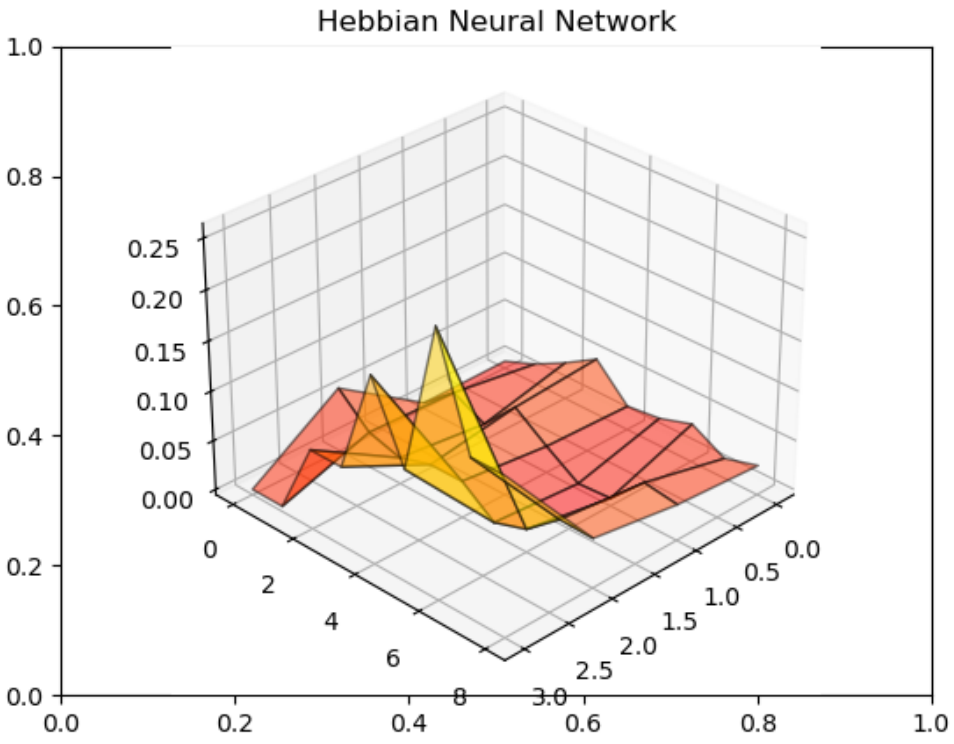
%matplotlib widget
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
g=0.3
inputs=[[1, 1, 1, 0, 0, 0, 0, 0, 0], [0, 0, 1, 1, 1, 0, 0, 0, 0], [0, 0, 0, 0,␣
 ↪1, 1, 1, 0, 0],\
    [0, 0, 0, 0, 0, 0, 1, 1, 1]]
inputs=np.array(inputs)
weights=np.random.rand(9,4)
weights=weights/np.sum(weights)
for epoch in range(1,100):
    for n in range(1,4):
        i=inputs[n,:]
        out=i @ weights
        index = np.argmax(out)
        value = out[index]
        active_inputs = i > 0;
        nk = sum(active_inputs);
        desired = active_inputs.T / nk
        wch = g * (desired - weights[:, index])
        weights[:,index]=weights[:,index]+wch
fig = plt.figure()
x = np.arange(weights.shape[1])  # 0 to 3
y = np.arange(weights.shape[0])  # 0 to 8
X, Y = np.meshgrid(x, y)
Z = weights
plt.title('Hebbian Neural Network')
ax = fig.add_subplot(111, projection='3d')
ax.view_init(elev=30, azim=45)
A = ax.plot_surface(X, Y, Z, cmap='autumn', alpha=0.5, edgecolor='k')
plt.show()
```



[2]:
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inputs
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[2]:
```
array([[1, 1, 1, 0, 0, 0, 0, 0, 0],
       [0, 0, 1, 1, 1, 0, 0, 0, 0],
       [0, 0, 0, 0, 1, 1, 1, 0, 0],
       [0, 0, 0, 0, 0, 0, 1, 1, 1]])
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