

COMP9444 Neural Networks and Deep Learning

Session 2, 2018

Exercises 7: Hopfield Networks

This page was last updated: 09/19/2018 11:27:46

1. Can the vector $[1, 0, -1, 0, 1]$ be stored in a 5-neuron discrete Hopfield network? If so, what would be the weight matrix for a Hopfield network with just that vector stored in it? If not, why not?
 2.
 - a. Compute the weight matrix for a Hopfield network with the two memory vectors $[1, -1, 1, -1, 1]$ and $[1, 1, 1, -1, -1]$ stored in it.
 - b. Confirm that both these vectors are stable states of this network.
 3. Consider the following weight matrix W :
$$\begin{array}{ccccc} 0.0 & -0.2 & 0.2 & -0.2 & -0.2 \\ -0.2 & 0.0 & -0.2 & 0.2 & 0.2 \\ 0.2 & -0.2 & 0.0 & -0.2 & -0.2 \\ -0.2 & 0.2 & -0.2 & 0.0 & 0.2 \\ -0.2 & 0.2 & -0.2 & 0.2 & 0.0 \end{array}$$
 - a. Starting in the state $[1, 1, 1, 1, -1]$, compute the state flow to the stable state using asynchronous updates.
 - b. Starting in the (same) state $[1, 1, 1, 1, -1]$, compute the next state using synchronous updates.
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Make sure you try answering the Exercises yourself, before checking the [Sample Solutions](#)