

INT301 Bio-Computation Week 14 Lab

Associative Memory

A Hopfield network can be created in Matlab by using the Matlab Neural Network Toolbox function *newhop*. The network functioning is simulated using the function *sim*. There are two variants of calling the function *sim*:

$$\text{result} = \text{sim}(\text{net}, M, [], \text{test})$$
$$\text{result} = \text{sim}(\text{net}, \{M, \text{iterations}\}, \{\}, \text{test})$$

where *M* is the number of test data, and the user cannot control the number of iterations in the first variant while in the second case the user can.

The *demo* file implements a Hopfield network which stores the binary format of the following four image patterns (which can be loaded from *4patterns.mat*):



Exercise 1: Read and understand the *demo* file, and execute the program to understand the pattern recovery process of Hopfield network.

Exercise 2: Check the network recall ability for perturbed/distorted versions of the stored patterns (e.g., by adding some random noise).

Exercise 3: Modify the *demo* file based on the dataset of four Chinese characters (the corresponding binary format can be loaded from the file *characters.mat*) to repeat Exercise 1 and 2:

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